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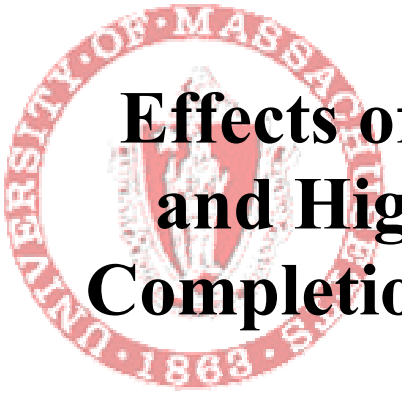

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Relationships between Students' High School and Middle School Experiences and Later Completion of a Bachelor's Degree

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Abstract

Using data from a national study spanning 12 years, I examined the effects of several middle-school and high-school variables on completion versus non-completion of the bachelor's degree. All young people in the study had attended college with the purpose of attaining the bachelor's. Several variables had practically significant effects on degree completion, with the strongest effects from the academically intensive science and math courses that participants took in high school. The Long-Term Educational Development model was formulated from the findings; and separate analyses for Asian Americans, Latinos, African Americans, and Whites support the applicability of the model. The model identifies the salient influences on students' long-term educational development. It is offered as a guide for counseling, education-career planning, and leadership and advocacy for students' educational development.

Over the last three decades, young people in the U.S. have increasingly focused on postsecondary educational goals. For example, in 1973, 43% of young women and 50% of young men enrolled in college soon after high-school graduation. In 2000, 66% of women and 60% of men entered college after high-school graduation (Wirt et al., 2002). Students' expectations for postsecondary educational attainment have likewise increased. Wirt and colleagues (2000) reported that in 1980, 35% of high-school seniors expected to later graduate with a four-year degree. In 1997, 56% expected to earn a bachelor's degree. This trend is consistent with the trend in students' occupational expectations. For example, 41% of high school sophomores in 1980 expected to be engaged in professional occupations, whereas 57% in 1990 expected to be engaged in professional occupations (Rasinski, Ingels, Rock, Pollack, & Wu, 1993).

There has been a concurrent trend in the advice that significant adults (i.e., parents, school counselors, teachers) provide to students regarding their college attendance. Rasinski et al. (1993) used national samples from 1980 and 1990 to compare high-school sophomores' reports of adults' recommendations. Rasinski et al. found that fathers, mothers, school counselors, and teachers were much more likely in 1990 to advise students to attend college. These increases were evident across socioeconomic classes, racial-ethnic groups, regions of the country, and

achievement test score levels. For example, 32% of Latinos who were sophomores in 1980 reported that counselors advised them to attend college after high school, whereas 65% in 1990 reported that counselors advised them to attend college. For sophomores in the lowest fourth of test-scorers, 26% reported in 1980 that school counselors advised them to attend college; whereas in 1990, 56% reported that counselors advised them to attend college.

The above changes are reflective of changes in the U.S. economy. The earnings gap between young people who have four-year college degrees and those who do not widened through the 1970s, 1980s, and 1990s (Alsalam, 1996; Snyder & Shafer, 1996; Wirt et al., 2000). Bachelor's degree attainment has received increasing attention on social and political levels. Adelman (1999) maintained that government officials and policymakers are increasingly using bachelor's degree completion rates as a measure of accountability for colleges. Wirt and colleagues (2002) reported that completion rates have increased over the last three decades. Rates have increased faster for women than for men; and increases have been evident for Latinos, African Americans, and Whites. However, disparity across racial-ethnic groups remains. In 2001 and in the 25 to 29 age range, 33% of Whites had completed a bachelor's or higher degree; whereas 18% of African Americans and 11% of Latinos had completed a bachelor's or higher degree.

There are very few studies of degree completion that go beyond basic reports of percentages, and there are even fewer studies that examine the influences of high school variables on degree completion (Adelman, 1999). There seem to be logical reasons for this dearth of studies. To study high school variables and degree completion, studies must be longitudinal and must follow students for at least a six-year period after high-school graduation. Adelman noted that students frequently attend more than one postsecondary institution; and therefore data on degree completion are difficult to collect. Given the importance of bachelor's degree completion for young people and society in general, and given the roles of schools and school counselors in students' educational and career development, knowledge regarding the effects of high-school variables on degree completion is sorely needed. That is, a model of long-term educational development has potential to begin to fill a wide and deep gap in the knowledge base.

Purpose of the Study

The purpose of the present study was to examine the effects of several background variables and high-school variables on bachelor's degree completion, thereby developing a model of long-term educational development. Background variables included gender, race-ethnicity, family socioeconomic status (SES), and eighth-grade reading and math cognitive ability. The remaining independent variables were high-school variables. High-school behavior variables included high-school attendance behavior, positive school behavior, and students' involvement in extracurricular activities. Parenting variables included parental involvement and parents' educational expectations for their children. Locus of control was the only self-perception variable. Two curricular variables were included, and these quantified the intensity of students' science and math courses finished in high school.

Data were from four data-collection waves—1988, 1992, 1994, 2000—of the National Educational Longitudinal Study of 1988 (NELS:88; National Education Longitudinal Study: 1988-2000 Data Files and Electronic Codebook System, 2002). These data were produced by the National Center for Education Statistics (NCES). I investigated only students who indicated that they expected to achieve at least a bachelor's degree. Otherwise, degree completion would likely confound with students' various educational and career goals. I also limited the study to only students who began attending a postsecondary institution within two years after graduation from high school. Otherwise, the timing of students' plans would likely confound with degree completion. Therefore, the sample included only students who intended to attain a bachelor's degree and had begun their college education soon after high-school; and thus, for the purposes of this study, completion of the bachelor's degree within eight years of high school graduation indicates realized educational expectations. Inversely, failure to complete the bachelor's in eight years indicates unrealized expectations.

The variables of major interest in my study were students' experiences and behavior in high school, rather than esoteric or theory-specific constructs or measures. It is not that such constructs or measures are not useful. Rather, my purpose was to develop a general model with broad and practical applicability—a model focusing on what high-school students experience and do. It would be theoretically informative to know what middle- and high-school variables influence young people's long-term educational development most. From a practical

perspective, it would be useful for school counselors and other educational and helping professionals to know the nature and character of these influences, thereby informing school counselors and others of how to help students in their long-term educational development.

The following research question was posed: What are the effects of background variables, high-school behavior variables, parenting variables, locus of control, and high-school course-taking on completion of the bachelor's degree? Analyses were performed for all participants together and separately for racial-ethnic groups. The main reasons behind separate analyses for racial-ethnic groups were that (a) nationally, there are large differences among groups in percentages of degree recipients and (b) analyses by racial-ethnic groups would help determine the universality of the model.

Literature Review

The purpose of the literature review was to use the best knowledge available to determine which middle- and high-school variables most likely influence bachelor's degree completion versus non-completion. I first reviewed theories that are most pertinent to formulating of a model of long-term educational development. Due to the relative absence of studies on degree completion, longitudinal studies of students' expectations for postsecondary attainment were reviewed. There are several national studies using educational expectations as an outcome (e.g., Hanson, 1994; Kao & Tienda, 1998; Trusty & Harris, 1999). Finally, two studies of degree completion (i.e., Adelman, 1999; Trusty & Niles, in press) were reviewed. These studies included some high school variables and their effects on degree completion. In determining variables to include in the present study, nationally representative, longitudinal studies were depended upon most.

Career Theory and Educational Development

In all theories of career development (e.g., Holland, 1997; Krumboltz, 1979, 1996; Super, 1990), the importance of young people's environmental contexts, families, abilities, self-perceptions, and educational experiences are recognized. Career theories, however, treat young people's career-related choices as the prominent outcome, and educational outcomes are viewed in terms of these choices. Otherwise, career theories are not typically specific on the strength of various high-school and middle-school influences on postsecondary educational attainment. Of

the major career development theories, Krumboltz' (1979, 1996) Social Learning Theory of Career Decision Making (SLTCDM) attributes the highest salience to people's learning experiences. Whereas all career theories consider young people's learning experiences as important, Krumboltz describes the nature and character of these influences.

In Krumboltz' (1979, 1996) SLTCDM, learning experiences are interpreted broadly, and include, for example, the courses that students take in school and students' extracurricular activities. People learn by observing their environments and by acting on their environments. People's learning experiences, their environmental circumstances, and their cognitive and emotional reactions to learning experiences and environments all influence their skills and career-related choices. Krumboltz makes the relevant point that early learning experiences strongly influence skills, goals, and later learning experiences. This theory is also useful because it attends to the dynamic interplay between environmental characteristics and young people's learning experiences, thereby rendering the theory flexible to groups outside the mainstream of U.S. society—groups for whom educational experiences likely differ from the mainstream (see Leung, 1995; Trusty, 2002b). From Krumboltz' perspective, learning experiences and the products of learning experiences (e.g., interests, values, choices, skills) are not at all static. Counselors and others in young people's environments help them develop by facilitating their learning.

The *status attainment model* comes from the field of sociology, and this model has been frequently applied to career development contexts (e.g., Hotchkiss & Borow, 1996; Leung, 1995; Trusty, 2002b). Hotchkiss and Borow noted that this model has existed for several years, and that its validity is well-supported through research. This model is also useful for individuals and groups outside the socioeconomic and cultural mainstream of U.S. society (see Leung, 1995; Trusty, 2002b). According to the status attainment model, students' SES and early academic ability influence performance in school. These variables, in turn, affect parents, whose expectations for their children and involvement in their children's education influence their children's educational and occupational expectations. Young people's expectations influence their educational and occupational attainment (Sewell, Haller, & Portes, 1969; Portes & Wilson, 1976). Recently, researchers (e.g., Hanson, 1994; Hossler & Stage, 1992) have added other variables to this model (e.g., self-perceptions, school experiences). The status attainment model attributes particular attention to parental influences and the effects of SES, and educational outcomes are

an inherent component of the model. However, students' course-taking and extracurricular involvement are generally not specified as variables in this model.

Educational Expectations and Aspirations

Most studies of young people's expectations for postsecondary educational attainment are based on the status attainment model (e.g., Hanson, 1994; Hossler & Stage, 1992; Trusty & Harris, 1999). These studies do focus on long-term educational development, and they do carry implications for degree attainment. Hanson (1994) studied *lost talent* using NCES national longitudinal data from the 1980s—the High School & Beyond Study (HS&B). Hanson's study included students who as high-school seniors (a) scored above the mean on standardized achievement tests and (b) had educational expectations for at least a bachelor's degree. That is, participants demonstrated early talent and initially had high expectations. Hanson quantified lost talent as (a) reduced educational expectations over time, and (b) unrealized educational expectations. Hanson defined unrealized expectations as a situation in which seniors expected to attain a bachelor's degree but had not attended a four-year college by six years after high school. Expectations were considered realized if participants had attended a four-year college by six years after high school. Hanson's indicator of unrealized versus realized expectations was weak because actual degree completion was not included in the categorization. Just because young people have attended college does not mean they have realized their expectations.

Despite this weakness in Hanson's (1994) study, the findings do provide direction for subsequent research including the present study. Hanson found that SES had the strongest influence on lost talent, with lower SES leading to more lost talent. Regarding high-school variables, lost talent was more evident for students who (a) were in the general high school program (versus the college preparatory program), (b) had lower scores on reading and math achievement tests, (c) had lower high-school grades, (d) were more external in their locus of control, and (e) had parents whose expectations for them were lower. Hanson reported that men were more likely than women to experience reduced and unrealized expectations. Hanson found, unexpectedly, that Whites were more likely than non-Whites to have reduced and unrealized expectations.

Trusty and Harris (1999) studied stable versus reduced educational expectations using NELS:88 data that spanned from the eighth grade to two years

after high school. As in the Hanson (1994) study, Trusty and Harris included only participants who had high early expectations and above average achievement. They found—consistent with Hanson's earlier findings—that SES had the strongest effect on stable versus reduced expectations. Internal locus of control and parents' personal involvement in their children's education had significant positive effects on stable, high expectations. Consistent with the Hanson study, Trusty and Harris found that Whites were more likely than Asian Americans, Latino Americans, and African Americans to have reduced their expectations over time.

Trusty (2000) studied stable versus reduced expectations across the same time period as in the Trusty and Harris (1999) study, but with a different group of participants. Participants in this study had high early expectations and below-average eighth-grade achievement in either reading or math. The strongest effects on stable educational expectations were from scores on eighth-grade math tests, SES, parents' expectations, and suspensions from school (negative effect). Consistent with earlier studies (Hanson, 1994; Trusty & Harris, 1999), Whites were more likely than Asian Americans, Latino Americans, and African Americans to have reduced expectations. Asian Americans were least likely to have reduced expectations.

Trusty (2002a) used national data to develop models specifically for African American women and men. Trusty examined the effects of middle- and high-school variables on the range of educational expectations (e.g., associate's, bachelor's, master's, doctoral degree) reported at a point two years after high-school graduation. Trusty found that variables influencing expectations were SES, early reading and math scores, and parents' expectations and involvement. In addition, African Americans' involvement in school activities had a significant positive effect on expectations, and behavior problems in high school had a significant negative effect on expectations. These two effects are consistent with the *blocked opportunities model* (Hanson, 1994; Kao & Tienda, 1998; Mickelson, 1990; Ogbu, 1991) and Ogbu's *collective oppositional identity* premise. Ogbu posited that African Americans often see little opportunity afforded them through education, and students become disillusioned and un-involved in high school. Disengagement is associated with behavior problems; and as this identity is internalized, lower educational expectations and lower attainment are the result. However, other findings, particularly the strong effects of early achievement on African Americans educational expectations, do not support the blocked opportunities model.

Regarding Latinos, Trusty, Plata, and Salazar (2003) used a national sample of Mexican Americans to develop a structural equation model of the influences of four latent variables—SES, early academic performance, parental influences, and self-perceptions—on Mexican Americans' educational expectations. The effects of parenting variables dominated the effects of other variables in this model for Mexican Americans, with parental involvement and parents' expectations having a strong positive influence on participants' expectations reported at late adolescence.

Bachelor's Degree Completion

Although studies using young people's educational expectations as the outcome have implications for long-term educational attainment, the true, explicit indicator of attainment is completion of degrees. Adelman (1999), through the U.S. Department of Education, completed a comprehensive study of degree completion using a national longitudinal sample from the High School and Beyond (HS&B) sophomore cohort. Students were followed from 1980—when they were high-school sophomores—to 1993, when they were around age 30. Some high-school variables were examined in this study (e.g., academic variables, demographics), but most of the variables included were college variables. Adelman found that the average number of years for completion of the bachelor's degree was 5 full academic years.

Adelman (1999) called attention to the finding that all high-school variables and college variables together explained 43% of the variability in bachelor's degree completion, noting the practical significance of the strong effects in the analyses. Adelman (1999) found that two variables were most important to degree completion: (a) the intensity of students' high school curricula, and (b) the continuity of students' college enrollment. Within students' high school curricula, finishing intensive high-school mathematics courses had the strongest effect on degree completion. Credits in intensive high school math courses were summed to create a math intensity variable. Adelman found that finishing one additional course beyond the Algebra 2 level (i.e., trigonometry, pre-calculus, and calculus) more than doubled the likelihood that students who started their college education would complete their bachelor's degrees. The effect of participants' high-school curricular experiences were stronger than effects of high-school test scores, high-school grade point average (GPA) or rank, high-school program or track, or background variables including SES and race-ethnicity.

Trusty and Niles (in press) used data from the latest NCES study (NELS:88) to study the effects of middle- and high-school variables on bachelor's degree completion. Students were followed from the eighth grade to when they were eight years out of high school (1988 to 2000). The Trusty and Niles study differs from the Adelman (1999) study in four important ways. First, to be included in the Trusty and Niles sample, students had to have attended college with the expectation of attaining the bachelor's degree. Adelman specified only that students had to have attended a four-year college. Second, Trusty and Niles studied only middle- and high-school variables, whereas Adelman focused most on college-level variables. Third, Trusty and Niles examined the separate effects of intensive math courses, including Algebra 2, trigonometry, pre-calculus, and calculus. Adelman added intensive math courses together to form a math intensity variable. Fourth, Trusty and Niles controlled for students' eighth-grade reading and math ability levels, whereas Adelman did not.

Although the purposes and methodologies of the Trusty and Niles (in press) study versus the Adelman (1999) study differed, findings were similar. Trusty and Niles found that each of the four intensive math courses (Algebra 2, trigonometry, pre-calculus, calculus) was important to degree completion. The positive effects were additive, and there was no threshold course or key course. When students completed any one of the four intensive math courses, students' likelihood of completing the bachelor's more than doubled. Additionally, the strong effects of math courses were present above and beyond students' reading and math ability levels upon entering high school. That is, the work that students did in high school (completing intensive math courses) paid off in college—over and above students' ability levels. Similar to Adelman's findings, Trusty and Niles found that of all high-school curricular areas, intensive math courses had the strongest effect on degree completion. However, there was a relatively strong effect from intensive high-school science courses (i.e., biology, chemistry, physics).

Trusty and Niles (in press) did not disaggregate data by groups (e.g., racial-ethnic groups). Adelman (1999), however, noted that the richest information was in the details of analysis. That is, when analyses were done for specific groups, the data were more revealing. Adelman reported that the strong effect of finishing intensive math courses on degree completion was evident across racial-ethnic groups. In fact, effects for African Americans and Latinos were stronger than effects for Whites. The strong effect of math course-taking was also evident across SES levels. These are important findings, suggesting that socioeconomic upward mobility for individuals

from lower SES and non-White groups is enhanced through earning credits in intensive high school math courses.

Adelman's (1999) findings challenge the blocked opportunities model (Hanson, 1994; Kao & Tienda, 1998; Mickelson, 1990; Ogbu, 1991), suggesting that barriers to long-term achievement have been overcome by many students from minority groups, and that an intensive high-school curriculum is an important and viable route to long-term achievement for all students. Adelman noted that many high schools in lower SES areas do not offer intensive math courses, and this condition would definitely translate into blocked opportunities.

Methods

Design of the Study

Although results from Adelman's (1999) study and Trusty and Niles's (in press) study provide direction for the present study, the present study is more comprehensive with regard to students' high-school behavior and experiences. The pre-college variables that both the Adelman and the Trusty and Niles studies focused upon were high-school curricular variables, gender, race-ethnicity, and SES. In the present study, I included several other high-school variables (school behavior variables, parenting variables, self-perceptions) that would likely have effects on degree completion (see Hanson, 1994, Trusty, 2000, 2002a; Trusty & Harris, 1999; Trusty et al., 2003). The goal of the present study was to build a comprehensive, general model of the many pre-high-school and high-school influences on students' long-term educational development, and to test the applicability of the model for the major U.S. racial-ethnic groups (Asian Americans, Latinos, African Americans, Whites).

As in the Trusty and Niles (in press) study, I controlled for students pre-high-school cognitive ability. Therefore, background variables were gender, race-ethnicity, SES, reading ability, and math ability. High school variables fell into one of four groups: (a) high-school behavior variables, (b) parenting variables, (c) self-perceptions, and (d) course-taking variables. There was temporal asymmetry between the background variables and the high-school variables, but there was no temporal asymmetry among the high-school variables. That is, all background variables came from eighth grade data, but high-school variables reflected students' experiences and behavior across Grades 9 through 12. Therefore, the two broad

classes of variables, background variables and high school variables, were treated hierarchically in formulating the model. This arrangement is consistent with previous research investigating the effects of course-taking (Adelman, 1999; Maple & Stage, 1991; Trusty, 2002c; Ware & Lee, 1988), and it allows for gauging indirect effects in the models. That is, it is likely that some background variables have effects on high-school variables, which in turn have effects on degree completion.

Participants

Participants were 5,257 young people from the NELS:88 study (*National Education Longitudinal Study: 1988-2000 Data Files and Electronic Codebook System,* 2002). Participants had to meet several criteria to be included in the study. First, they had to belong to the NELS:88 high-school transcript panel sample. Participants in this sample were given weights to redistribute the sample to reflect the population of U.S. students. For example, particular racial-ethnic groups and private schools were over-sampled in NELS:88. The weights control for over-sampling, other differential selection probabilities, and nonresponse bias (Curtin, Ingels, Wu, & Heuer, 2002). Second, to be included in the study, participants had to have started their postsecondary education by June of 1994 (two years after graduation). This selection procedure excluded participants who elected to delay beginning their college education, and who therefore would not have had time to complete their degrees by June of 2000. Third, I selected only participants who indicated at the 1994 wave of data collection that they expected to achieve at least a bachelor's degree. This selection procedure excluded students who were attending postsecondary schools for some reason other than the bachelor's degree (e.g., associate's degree only), and it included students who were enrolled in two-year colleges but working toward the bachelor's. In the sample, 91% of participants had completed at least one full academic year at a postsecondary institution by August of 1994, and 9% had been enrolled for less than one academic year. Therefore, most participants had seven to eight years to complete the bachelor's degree, and a small percentage had six years to seven years to complete the bachelor's.

Of the 5,257 participants, 5% were Asian American, 9% were Latino, 11% were African American, 74% were White, and 1% were Native American Indians or Alaska Natives. With regard to community characteristics, 31% attended high school in urban areas, 43% in suburban areas, and 26% in rural areas. Regarding regions of the country, 22% attended high school in the Northeast, 25% in the Midwest, 33% in the South, and 19% in the West (1% had no data on region). Regarding college

characteristics, 42% started their postsecondary education at public four-year institutions, 32% at public two-year schools, and 22% at private four-year schools. The remaining 4% started at other types of institutions.

Variables

Bachelor's Degree Completion

In the NELS:88 Fourth Follow-Up, participants were asked several series of questions about their postsecondary educational experiences, including institutions attended and various degrees earned from institutions. Using these responses, I developed the dependent variable for the present study by determining whether students had or had not completed a bachelor's degree by the year 2000. Of all participants in the sample, 53% had earned the bachelor's degree and therefore had realized their expectations. The remaining 47% had not earned the bachelor's and therefore their expectations were unrealized.

Background Variables

Background variables were gender, race-ethnicity, SES, and reading and math cognitive ability. The race-ethnicity variable included the five, major U.S. racial-ethnic groups, including Asian and Pacific Islander Americans, Latino-Latina Americans, African Americans, White Americans, and Native American Indians including Alaska Natives. SES was a composite variable of the participants' family SES, and included parents' income, educational attainment, and occupational prestige. Reading and math test scores were from the eighth grade. These scores were *item response theory* (IRT) scores. They were formulated by NCES to provide estimates of students' cognitive abilities. IRT scores take into account item difficulty, items omitted by test-takers, the ability of items to discriminate among students of varying aptitude levels, and students' guessing at answers (Ingels et al., 1994).

High-School Variables

High-school behavior. Three high-school behavior variables were used, namely, attendance, positive school behavior, and involvement in extracurricular activities. I developed the first two of these variables through factor analysis of six items from twelfth-grade data (NELS:88 Second Follow-Up). The six items fell into two factors (scales). Attendance items assessed how often participants were late for school, skipped classes, and skipped school. Behavior items included how often students got into trouble, received in-school suspensions, and were suspended from

school. The original items were stated in the negative, indicating attendance problems and discipline problems. I inverted the scales so that higher scores indicated good attendance behavior and positive school behavior. Rotated factor loadings for items on their respective scales were all .64 or higher. The internal consistency reliability coefficients (alphas) were .64 for the Attendance scale and .52 for the Positive Behavior scale. The variable quantifying involvement in extracurricular activities was from one NELS:88 item. On this item, seniors indicated how much time they spent weekly participating in school-sponsored extracurricular activities. Responses were in eight ordered categories ranging from no hours per week to 25 or more hours per week.

Parenting variables. Two parenting variables were included, parental involvement and parents' expectations. I developed the Parental Involvement scale through factor analysis. Ten items from the NELS:88 Second Follow-Up (high-school senior data) were factor analyzed, and these items loaded on one factor. These items indicated the extent to which seniors perceived that parents discussed educational and career-related topics and concerns with them, and how often parents did things with them. This variable represents home-based parental involvement, and not school-based or other types of parental involvement. Similar parental involvement scales have been developed before from the same or similar NELS:88 items (e.g., see Keith, & Lichtman, 1994; Trusty, Watts, & Erdman, 1997). Factor loadings of all items in the un-rotated matrix were .52 or higher. The alpha for my sample was .84.

The second parenting variable, parents' expectations, was reported by parents on the Second Follow-Up Parent Questionnaire, administered in students' high-school senior year. This item indicated how much postsecondary education the parent completing the survey (mostly mothers) expected the child to achieve (e.g., associate's degree, bachelor's, master's, doctoral degree).

Locus of control. The Locus of Control scale was developed by NCES, and was composed of six items from the Second Follow-Up Student Questionnaire. The items assessed general perceptions of internal versus external locus of control, including attributions to effort or luck, and participants' perceived degree of control in meeting their goals. Trusty and Lampe (1997), using a general sample of over 10,000 NELS:88 seniors, found an internal consistency reliability estimate of .73 for the locus of control scale. Higher scores indicate a more internal locus of control.

Course-taking variables. Data on credits in intensive science and math courses came from participants' high-school transcripts. Similar to the procedure used Adelman (1999), credits from three advanced science courses—biology, chemistry, and physics—were summed to create the science intensity variable. Credits in four intensive math course—Algebra 2, trigonometry, pre-calculus, and calculus—were added together to create the math intensity variable. These are the most common advanced science and math courses offered in U.S. schools. For high-school courses, one Carnegie unit typically represents two semesters of completed coursework. Likewise, one-half unit represents one semester. In the NELS:88 transcript data, most participants who had some credit in the particular science and math courses had one unit. Several participants had one-half, or no units in particular courses. However, there were a few students with other fractions of units and some with two units in particular courses. For intensive science courses, percentages of participants in the sample who had one-half or more credits in particular courses were 95% for biology, 71% for chemistry, and 35% for physics. For intensive math courses, percentages with one-half or more credits were 65% for Algebra 2, 28% for trigonometry, 23% for pre-calculus, and 15% for calculus.

Data Analysis

Missing Data

Less than 1% of potential participants had missing values on the dependent variable, and they were excluded from the data analysis. Regarding the independent variables, there were varying degrees of missing data. There were no missing data on gender, race-ethnicity, or units in intensive science and math courses. Not surprisingly, the variable with the most missing data was parents' expectations. Data for this variable were from the Second Follow-Up Parent Questionnaire, and 10% of parents were nonrespondents. Other percentages of missing data were as follows: parental involvement, 8%; reading and math cognitive ability, 7%; locus of control, 4%; and 1% or less for SES, high-school attendance, positive behavior, and extracurricular activities. To examine the impact of missing data on relationships among variables, I generated pair-wise and list-wise correlation matrices for all the variables. In comparing coefficients across the two matrices, coefficients differed little. For example, the pair-wise and list-wise correlations of parents' expectations to degree completion differed less than .01. Therefore, I concluded that systematic nonresponse bias did not have an appreciable effect on relationships among the variables; and for all participants with missing data on independent variables, the mean or median was imputed, depending on the scaling of the particular variable.

Logistic Regression

The dependent variable in the analysis, completion or non-completion of the bachelor's degree, was a dichotomous (two-category) variable. Although linear models easily accommodate dichotomous independent variables, they are not well-suited to analyses involving a dichotomous dependent variable (Menard, 1995). Logistic regression is the appropriate form of analysis when a multivariate analysis involves a dichotomous dependent variable and independent variables of mixed scaling (Agresti, 1990; Menard, 1995; Norusis, 1994). Also, the assumptions for logistic regression are less stringent than those for least squares regression or discriminant analysis (Menard, 1995). According to Adelman (1999), logistic regression is the most appropriate form of analysis for studying bachelor's degree completion.

Logistic regression models the natural log odds (B) relationships of a set of independent variables to a dependent variable (outcome). A log odds of 0 indicates no relationship of an independent variable to the outcome. A positive-sign log odds indicates a positive relationship between the independent variable and the outcome, whereas a negative log odds signifies an inverse relationship of the independent variable to the outcome.

Odds (e^B, 2.718^B) are inherently more practical and straightforward than log odds. Statistical odds are expressed in one number as a ratio, not as a two-number probability as in gambling applications (e.g., 2 to 1). Log odds of 0 translate to odds of 1 (no relationship between the independent and dependent variables, $2.718^0 = 1$). Positive log odds translate to odds greater than 1, and negative log odds translate to odds less than 1. There are no negative odds. An odds is the probability of an outcome divided by the probability of the outcome not happening. For example, the odds of getting a heads when flipping a coin is 1 (.5/.5); the odds of drawing a club from a deck of cards is .333 (.25/.75). In logistic regression, an odds for a particular independent variable indicates the change (increase or decrease) in the odds of an outcome for every one-unit increase in the independent variable.

Data Coding

Non-completion of the bachelor's degree was coded the value 0 and completion was coded the value 1. Therefore, independent variables with positive effects on degree completion have positive logistic regression coefficients and odds above the value 1. The independent variables SES, reading and math ability, high-

school behavior variables, parenting variables, and locus of control were expressed in z scores. Therefore, the unit of measurement for these variables was the standard deviation, and the odds for these variables signify the increase or decrease in the odds of the outcome (i.e., degree completion vs. non-completion) for every one-standard-deviation increase in the independent variable. For the race-ethnicity variable, deviation coding (effect coding) was used. Therefore, the odds for a particular racial-ethnic group indicates the likelihood of the outcome (i.e., degree completion) for that group as compared to all racial-ethnic groups taken together. The high-school course-taking variables (science intensity, math intensity) were expressed in the original high-school Carnegie units. Therefore, odds for these variables represent the increase or decrease in the odds of the outcome for every one-high-school-unit increase in science or math. Upon investigating the variability of the course-taking variables, the standard deviations were 1.14 for science intensity and .98 for math intensity. Both were close to the value 1; and therefore, the effects of standardized variables and course-taking variables are metrically comparable.

Logistic Regression Models

For all logistic regression analyses, variables were entered in two blocks (hierarchical logistic regression). The first block (model) included background variables. In the second block (model), high-school variables were added. Four interaction effects were examined through post hoc, logistic regression analyses. These four were two, two-way interactions between gender and each of the two course-taking variables; and two, two-way interactions between SES and each of the two course-taking variables. Adelman (1999) found that SES and course-taking did not interact. That is, effects of course-taking on degree completion did not differ at various SES levels. Adelman did not explore interactions involving course-taking and gender, but some studies of expectations (Hanson, 1994; Trusty, 2002a) suggest that the effects of academic variables may differ for women and men. Interactions were investigated by creating interaction terms through multiplying the variables of interest by one another. Interaction terms were then added to the equation with all other variables, including the two variables use to build the interaction (see Cohen & Cohen, 1975).

I was also interested to know, as was Adelman (1999), if the effects of high-school variables were consistent across racial-ethnic groups. This would be useful information for counselors and other professional school personnel. Because of the high percentage of White participants in the sample, information may be concealed

by analyses with aggregated data. Therefore, disaggregated analyses for Asian Americans, Latinos, African Americans, and Whites were performed. The numbers of Asian American, Latino, and African American participants were sufficient for analyses, but the number of Native American participants was not large enough to perform a separate analysis. Because the numbers of participants were relatively small in non-White groups, and because numbers of participants have profound effects on statistical tests, statistical tests were not performed in these analyses. Only odds ratios were reported for these groups—for comparative purposes to determine the applicability of the model to racial-ethnic groups. Additionally, the focus of my study was on practical significance and the strength of effects on bachelor's degree completion (see Thompson, 2002). In the aggregated analysis that included all sample members, statistical significance tests were performed on all logistic regression coefficients.

Sampling Design Effects

A two-stage sampling design was used in NELS:88. First, U.S. schools were sampled; then students were sampled within schools. This sampling practice and others produce smaller sample variances than variances from simple random samples, and typical statistical software programs calculate standard errors as if the data were from simple random samples. Therefore, the standard errors used to calculate the significance of statistics from NELS:88 data are spuriously small. Root design effects (DEFTS) should be employed with regression analyses (Curtin et al., 2002).

For the present study, I used AM software (American Institutes for Research, 2003) to produce standard errors that accounted for the complex sampling design. I divided these standard errors by simple-random-sample standard errors to produce DEFTS (see Ingels et al., 1994). These DEFTS were then multiplied by the standard errors resulting from the logistic regression analysis with SPSS software; and these adjusted standard errors were used in calculations of statistical significance, thereby accounting for the complex sampling design. The DEFTS ranged from 1.0 to 2.125, with a mean DEFT of 1.45 and a median DEFT of 1.5.

Results

Simple Associations Among Variables

Two independent variables in the analysis were categorical, namely, gender and racial-ethnic group. Regarding the simple association between gender and bachelor's degree completion, 58% of women in the sample completed the bachelor's; and 48% of men completed. Regarding racial-ethnic groups, the following were percentages of completers: Asian Americans, 61%; Latinos, 31%; African Americans, 36%; Whites, 58%; and Native Americans, 23%.

The remaining independent variables had ordinal, interval, or ratio scaling; and a bivariate correlation matrix including these variables and the dependent variable is presented in Table 1. Note that the variables with the strongest correlations to bachelor's degree completion were the high-school course-taking variables, math intensity and science intensity. Also, eighth-grade math ability had relatively strong correlations to the math and science intensity variables. The correlations of eighth-grade reading ability to science and math intensity were slightly weaker. Reading ability and math ability were highly correlated to one another, as were science intensity and math intensity.

The correlations of SES, reading ability, and math ability to bachelor's completion were somewhat weaker than those of course-taking variables to bachelor's completion; and the correlations of other variables to bachelor's completion were positive but relatively weaker still. The only other intercorrelations above $r = .30$ were between attendance and positive behavior and between SES and math ability.

Logistic Regression Models for All Participants

Results of the logistic regression models for the entire sample are presented in Table 2. The effect of gender on degree completion was relatively strong. The positive logistic regression coefficient and the odds greater than 1 signify that women were more likely to complete the bachelors than men. This effect was largely independent of the effects of high-school variables, as evidenced by only a small decrease in the size of the coefficient from Model 1 to Model 2. Interpreting the odds in the model in which all other variables were controlled (Model 2), women's odds of degree completion was 68% higher than the odds for men (odds for gender =

1.68). Note that the gender variable was not standardized, so direct comparisons of the gender effect to other effects are not tenable. The odds for gender—when standardized—was 1.30, less than half the percentage increase using the un-standardized scaling of the variable.

Overall racial-ethnic differences in degree completion were statistically significant in both models. Also, Asian Americans and Whites were significantly more likely than other groups to complete the bachelor's degree. Numbers of Native Americans were small, and therefore their results should be interpreted tentatively.

SES had a relatively strong effect on degree completion. The SES effect decreased slightly from Model 1 to Model 2, indicating that high-school variables mediated SES effects to a modest degree. The direct (independent) effect of SES—the effect with all other variables controlled (Model 2)—remained relatively strong. A one-standard-deviation increase in SES increased the odds of degree completion by 62%, net of the effects of all other variables.

The effects of eighth-grade cognitive ability were positive and significant. The effect of reading ability decreased only slightly from Model 1 to Model 2, indicating that this effect was largely a direct effect. That is, high-school variables that were added in Model 2 did not mediate the effects of reading ability. The effect of eighth-grade math ability was much stronger, and decreased dramatically from Model 1 to Model 2, signifying that high-school variables, particularly course-taking, almost entirely mediated the effect of math ability on degree completion versus non-completion. That is, early math ability affected degree completion indirectly, via high-school science and math course-taking. With only background variables in the model (Model 1), a one-standard-deviation increase in math ability increased the likelihood of bachelor's degree completion versus non-completion by 58%. However, when high-school variables were considered (Model 2), math ability had no independent effect on degree completion.

Regarding the three high-school behavior variables, attendance had a significant effect on degree completion (see Table 2). This effect was positive, with a one-standard-deviation increase in good attendance behavior in high school resulting in a 25% increase in the odds of bachelor's degree completion versus non-completion, given all other background and high-school variables. The effect of positive high-school behavior was weak. The effect of participation in extracurricular activities was positive and significant. A one-standard-deviation

increase in extracurricular activities increased the odds of later completing the degree by 21%, net of the effects of all other variables.

Effects of both parenting variables were positive and statistically significant. A one-standard-deviation increase in parental involvement resulted in a 13% increase in the odds of degree completion, and a one-standard-deviation increase in parents' expectations resulted in a 19% increase in the odds of degree completion. Both these effects of parenting variables were independent of the effects of other variables, including one another. The effect of locus of control was positive, but relatively weak and nonsignificant.

The effects of course-taking variables were strong and positive. A one-high-school-unit increase in intensive science credits resulted in a 45% increase in the odds of completing the bachelor's degree by eight years later. The effect of math course-taking was even stronger. An addition of one-high-school credit in intensive math increased the odds of completing the bachelor's versus not completing the bachelor's by 73%. These effects of course-taking were independent of the effects of all other high-school variables and background variables, including eighth-grade reading and math ability.

With regard to the four interaction terms examined through post-hoc analyses, none were significant. Gender did not interact with science intensity or math intensity, and SES did not interact with either course-taking variable in its effects on degree completion. In fact, the logistic regression coefficients for all four interaction terms were very weak; all falling under .06 in absolute value; and standard errors for interaction-term coefficients were larger than the coefficients themselves in each case. In plain language, this absence of interaction effects means that the effects of course-taking were consistent across genders and SES levels.

Regarding effect size (R^2s), background variables alone explained 24% of the variability in bachelor's degree completion. High-school variables explained another 15% of variability in degree completion above and beyond that explained by background variables. All variables together accounted for 39% of the variability in degree completion. In this sample of young people who were pursuing the bachelor's degree, 53% had completed the bachelor's by eight-years after high school; 47% had not. The independent variables in the full equation (Model 2) correctly classified 77% of the actual completers and 71% of the actual non-completers, with an average percentage of correct classification at 74%.

Logistic Regression Models for Racial-Ethnic Groups

Numbers of Native American participants in the sample were too low for a separate analysis; therefore, this group was not included in analyses for racial-ethnic groups. As presented previously, percentages of participants who completed the bachelor's by racial-ethnic group were 61% for Asian Americans, 31% for Latinos, 36% for African Americans, and 58% for Whites. Groups also differed in the number of credits earned in intensive and science math courses. Regarding science and math credits respectively, the mean numbers of units were 1.55 and 2.68 for Asian Americans, .86 and 1.88 for Latinos, .98 and 2.04 for African Americans, and 1.35 and 2.47 for Whites. Note that the numbers of intensive science and math courses completed parallel the percentages of degree completers for racial-ethnic groups.

The odds for effects on bachelor's degree completion for Asian Americans, Latinos, African Americans, and Whites are presented in Table 3. Because of over-sampling and resulting lower sample weights for Asian Americans and Latinos, the weights for these two groups were adjusted upward to reflect the actual, un-weighted number of participants in the sample (see the note in Table 3). This procedure did not change the odds presented in Table 3.

With regard to gender, odds for all racial-ethnic groups were above the value 1, indicating that gender effects were consistent in the direction of effect (women more frequently completed). However, this effect was weaker for Asian Americans than for other groups; and the odds for gender was particularly high for Latinos. SES effects were positive for all groups, but strongest for African Americans and Whites. For Asian Americans, the SES effect decreased markedly from Model 1 to Model 2, indicating that a substantial portion of the SES effect was shared with high-school variables for this group.

The odds for eighth-grade reading ability were positive (above 1) for all groups, but higher for Asian Americans and Latinos and lower for African Americans and Whites. When considering the effects of background variables only (Model 1), the effects of eighth-grade math ability were stronger than the effects of reading ability. However, when high school variables were added to the equation (Model 2), the effects of math ability became much weaker, as in the analysis for the entire sample. That is, effects of math ability were indirect via course-taking in high

school. However, some direct effect remained for two groups, namely Asian Americans and African Americans.

The effects of high-school attendance behavior were positive and modest for all racial-ethnic groups, but slightly stronger for Asian Americans and Whites. The effects of positive school behavior were relatively weak for all racial-ethnic groups. Effects of extracurricular activities on bachelor's degree completion were positive for all racial-ethnic groups but inconsistent in strength across groups. Effects were relatively strong for African Americans and Latinos, moderate for Asian Americans, and relatively weaker for Whites.

Regarding parental involvement, effects were inconsistent across racial-ethnic groups. This effect was strongest for Asian Americans. The effect of parental involvement was negative for Latinos. However, the bivariate relationship of parental involvement to degree completion was positive for Latinos. It was determined that parental involvement became a suppressor variable in this equation (see Cohen & Cohen, 1975), suppressing error for parents' expectations, locus of control, SES, and other background and high-school variables. The effects of parents' expectations were positive and moderate for all racial-ethnic groups, and strongest for Asian Americans. The odds for locus of control was highest for Latinos, but this effect was moderate compared to effects of other variables. For groups other than Latinos, this effect was weak.

Regarding the intensity of high-school curricula, the odds for science intensity were fairly consistent across racial-ethnic groups, with the strongest effect for Asian Americans. The odds for math intensity varied more across racial-ethnic groups. This effect was strongest for Latinos and weakest for African Americans. For Asian Americans and African Americans, the odds for science intensity were higher than the odds for math intensity. For Latinos and Whites, the odds for math intensity were higher than the odds for science intensity.

In examining the effect sizes (R^2s) for racial-ethnic groups (see Table 3, bottom row), the effects of background variables were relatively strong for all racial-ethnic groups, explaining from 19% to 26% of the variability in bachelor's degree completion. The effects of high-school variables, taken together, were consistently strong for Asian Americans, Latinos, and Whites, and relatively weaker for African Americans. In gauging the added amount of variability in degree completion

explained by high-school variables, this amount was 22% for Latinos, 21% for Asian Americans, 16% for Whites, and 11% for African Americans.

In viewing the analyses for racial-ethnic groups holistically, it was evident that some variables had differing strengths of effects depending on the particular racial-ethnic group; whereas for some variables, effects were consistent across racial-ethnic groups. These findings suggest that educational development processes differ somewhat for racial-ethnic groups, but they do not differ markedly. The African American group differed most from other groups.

The Long-Term Educational Development Model

Based on results from analyses for the entire sample and analyses for racial-ethnic groups, a general model of long-term educational development (LTED model) was formulated. This model is presented in Figure 1. Background variables are in the first column, high-school variables appear in the second column, and the outcome is positioned on the right side of the figure. The relative strengths of effects are indicated by the size and darkness of the arrows in the figure. Note that the strongest effect on bachelor's degree completion is from course-taking. Math ability has no direct effect on degree completion, but it has a strong indirect effect via course-taking. The SES effect is next in strength. The effects of high-school behavior, gender, and race-ethnicity are next in strength as depicted by smaller and less-dark arrows. The effects of parenting and reading ability are relatively weaker still. Although the effects of some variables are weak relative to the effects of others, all hold some practical importance in the model.

Note that some interrelationships among independent variables are not depicted in the model. For example, SES had moderate correlations to reading ability, math ability, and intensive course-taking. Whereas the effects of SES might be important to reading and math ability and course-taking, the indirect effects of SES and other background variables, excluding math ability, were much less practically important than the direct effects. This was evidenced by only small decreases in effects other than math ability from the model with background variables only (Model 1 in Table 2) to the full model (Model 2 in Table 2). However, these and other interrelationships might nonetheless be practically important if, for example, tested ability or course-taking are the outcomes of interest. Effects of positive behavior and locus of control were not included in the model

because their practical significance seemed limited. However, as noted below, locus of control may carry some practical significance for particular racial-ethnic groups.

The model would need only slight adjustments for Asian Americans and Latinos. For Asian Americans, the gender effect was weaker and the parenting effect was stronger than depicted in Figure 1. For Latinos, the gender effect was stronger than the effect depicted. The effect of locus of control may hold some practical significance for Latinos, although not depicted in the model because this effect was weak for other groups. For African Americans, the model seems to fit least well. For this group, the effect of extracurricular activities (high-school behavior) was stronger than the separate effects of either course-taking variable. However, the cumulative effects of math ability and course-taking were strong relative to effects of other variables for African Americans. The SES effect was relatively strong for African Americans. Overall, the effects of high-school variables were weaker for African Americans than for the other groups.

Discussion and Implications

For this study, a nationally representative sample was used to investigate the effects of background and high-school variables on completion of the bachelor's degree, and these results were used to formulate a general model of long-term educational development (LTED model, see Figure 1). All participants in the sample—when they were attending college—indicated that they expected to receive at least a bachelor's degree. In the results section of this article and elsewhere, the terminology *bachelor's degree completion* was used in describing the dependent variable. Because all participants in the study expected to complete the bachelor's degree, degree completion signifies realized educational expectations in the eight-year, post-high-school time-frame. Inversely, non-completion of the bachelor's degree in the eight-year time-frame signifies unrealized expectations.

Background variables and high-school variables had strong influences on realized and unrealized expectations. In the analysis for all participants together, background variables (gender, race-ethnicity, SES, early reading and math ability) accounted for 24% of the variability in bachelor's degree completion. High-school variables (high school behavior, parenting, locus of control, and course-taking) accounted for an additional 15% of variability in degree completion. Together, background and high-school variables accounted for 39% of the variability in degree completion, a practically significant effect size.

The strongest effects on degree completion were from high-school course-taking and SES. Finishing one additional unit of intensive high-school math increased the odds of degree completion by 73%, and finishing one additional unit of intensive science increased the odds of degree completion by 45%, while controlling for all other variables including pre-high-school math ability. A one-standard-deviation increase in SES resulted in a 62% increase in the likelihood of degree completion, while controlling for all other variables. These effects, viewed separately and together, were surprisingly strong given that I did not consider the effects of any college variables (e.g., college major) or other post-high-school variables (e.g., having children). It seems that students' background characteristics and their high school experiences have a profound influence on whether they realize their postsecondary academic goals or not.

Academics and Degree Completion

With regard to academic variables (ability and course-taking), results indicate that math matters most in students' long-term educational development. In the analysis models that included background variables only, math ability was more important to degree completion than reading ability. This was the case in the analysis for the entire sample, and in analyses for the four racial-ethnic groups. Early math ability was strongly related to intensive course-taking in high school, and course-taking, in turn, had a strong effect on degree completion. The effects of course-taking were weaker for African Americans than for other groups. But even for African Americans, when the effects of all academic variables are considered, math makes a substantial difference in completion of the bachelor's degree. Effects of course-taking were also not conditional on gender or SES level, as evidenced by weak coefficients for the four interaction terms. Stated differently, the effects of course-taking did not differ for genders or across SES levels.

The effects of math course-taking were stronger than effects of science course-taking in the entire sample, and for Latinos and Whites. However, for African Americans and Asian Americans, the effects of science course-taking were stronger. In many ways, it is not valid to compare the effects of the two course-taking variables. Intensive math course-taking and science course-taking are related to one another, as evidenced by the strong correlation between them. Math is an integral part of science courses, especially chemistry and physics. Therefore, it is more appropriate to conceptualize science and math course-taking holistically rather than

specifically. This conceptualization is consistent with the depiction of course-taking in the LTED model in Figure 1.

Findings regarding the indirect effects of math ability suggest that what matters most about academics is what students do, over and above what they are capable of doing. That is, the courses that students completed in high school dominated the effects of the capability students brought to high school; and it seems that when students continue to develop their math skills in high-school by taking intensive courses, the rewards in college are great. This is not to say that early ability is not important. Early ability is salient in that it leads students on a trajectory toward more intensive course-work in high school, which in turns leads students on a trajectory toward bachelor's degree completion. Although the study included no variables from earlier than the eighth grade, it is obvious that math skills developed before the eighth-grade are important to students' realization of their long-range goals. Educational development trajectories start early in students' educational careers. In addition to early math ability, early reading ability carries some influence, especially for Asian Americans and Latinos, groups for whom English is more likely a second language.

It is surprising that almost half the young people in my sample, all of whom had attended college with the purpose of attaining a bachelor's degree, did not complete the degree by eight years after high school. The percentages of Latinos and African Americans who did not complete the degree were even higher. It is also surprising that a sizeable percentage of young people in the sample had not finished many credits in intensive science and math courses, particularly math. These findings, coupled with findings of the strong influences of course-taking, lead to the conclusion that a large number of students were not taking the high-school courses they needed for reaching their goals. Students would therefore have benefited from more and better advising, individual planning, and counseling regarding their goals.

The findings from this study provide much-needed direction for middle- and high-school counselors in advising, individual planning, and counseling with students. Most basic of all, if students are advised by counselors, teachers, and parents to pursue the bachelor's degree, or if students have goals of completing the bachelor's degree, students should be advised and encouraged to take intensive science and math courses in high school. My results suggest that postsecondary education should be an important topic of discussion (a) when students are planning their high-school programs of study in the eighth grade and earlier and (b) as

students progress through high school. Students, parents, and teachers should be informed of the strong influences of high-school course-taking, and the LTED model (Figure 1) is a means of supplying this information.

On the surface, encouraging students' high expectations for postsecondary education seems entirely positive for students' development. However, when counselors and other adults encourage high expectations while students exert little effort, adults enable students in denying the reality of the importance of their efforts in high school (see Rosenbaum, 2003). Becoming enrolled in college and having expectations of attaining the bachelor's degree were not enough for almost half the students in my sample. When students do not take the intensive science and math courses that they need to prepare them for college, counselors should help students develop alternative plans more consistent with their preparation.

All professional school counselors know that all able students do not choose to enroll in the more intensive science and math courses in high school. The students for whom the long-term negative consequences are most serious are underachieving students. For example, an able sixth-grader does not perform well in math class. The student therefore is not placed in pre-algebra in the seventh grade or eighth grade, and does not take Algebra 1 in the eighth- or ninth-grade, instead choosing lower-level math and science courses. This student has not only entered a path toward underachievement in high school, but also the student's long-term educational development has likely been subverted. If counselors and teachers use only one source of data for advising and course-selection (i.e., prior performance in class), then students are likely to be led down the long path of underachievement.

If counselors are to help the students, richer data are needed; and these data come in two forms: (a) subjective data from teachers, parents, and students and (b) objective test data. Regarding subjective data, teachers and parents recognize underachievement more readily than counselors. Therefore, the counselor needs to communicate effectively and often with teachers, parents, and the student about the student's ability and performance. Regarding objective test data, the counselor should have indicators of both the student's ability and performance. If the counselor communicates effectively and if multiple sources of data are used, the student in the previous example may be helped to avoid the vicious circle of underachievement, avoid failure in reaching goals, and evade the loss of talent. When the earnings potential of college graduates versus non-college graduates is considered (see Wirt et

al., 2000), the long-term negative economic and social consequences of underachievement become obvious.

A useful means for organizing individual planning data is through students' four-year or six-year education-career plans. Brown and Trusty (in press) note that written education-career plans should include data on students' goals, requirements for reaching goals, abilities, achievement, course-taking plans, and extracurricular activities; and they should include data from teachers and parents (e.g., teachers' and parents' perceptions of students' goals and behavior, parents' involvement and expectations).

There is another major means for helping students with academics and bachelor's degree completion. In many U.S. schools, a full, intensive science and math curriculum is not offered; and therefore many students do not have the *opportunity to learn*. These schools are most often in low SES areas and have high percentages of students from minority groups (Lee, Burkam, Chow-Hoy, Smerdon, & Geverdt, 1998). Professional school counselors can help students in such schools by advocating for an intensive curriculum that meets students' needs. If counselors make administrators, teachers, parents, and students aware of the need for creating opportunity to learn, demand for an intensive curriculum and effective instruction will be generated. An intensive curriculum should not exist for only the most talented and best-behaved students. For instance, higher-level math courses could be offered in extended time formats to accommodate students with average ability levels. The nonsignificant, nonexistent interaction between SES and intensive course-taking supports the point that intensive course-taking helps young people at all SES levels in reaching their goals of the bachelor's degree. Leadership and advocacy for an intensive and effective high-school curriculum is supported by the American School Counselor Association National Model (ASCA, 2003). Again, counselors could use data from the present study and the LTED model to educate stakeholders in this area.

Krumboltz' (1979, 1996) SLTCDM focuses squarely on young people's opportunity to learn. For example, if a young person holds little interest or skill in a particular area or subject, it is not automatically assumed that that young person has some deficiency. Rather, it is assumed that the person has had limited opportunity to gain learning experiences in that area. Therefore, counselors facilitate students in gaining new learning experiences; that is, counselors help create opportunity to learn. Findings regarding the strong influences of academic variables on degree

completion are consistent with the major tenet of Krumboltz' theory, that previous learning experiences (e.g., high-school courses completed) are the major influence on subsequent learning experiences, skills, and actions (e.g., bachelor's degree completion).

Parenting and Degree Completion

The effects of both parenting variables on young people's realized expectations were positive and statistically significant, but the effect of parents' expectations was stronger. A one-standard-deviation increase in parents' expectations—reported by parents when their children were seniors—increased the likelihood of degree completion by 33% for Asian Americans, by 22% for African Americans, by 21% for Latinos, and by 18% for Whites. These findings are consistent with the status attainment model (e.g., Sewell et al., 1969) and with previous research (e.g., Trusty, 2000, 2002a). Remember that all young people in the sample themselves expected to attain the bachelor's degree. Therefore, parents' expectations affected degree completion above and beyond their children's own expectations. That is, when parents hold high expectations for their children's postsecondary attainment, their children are more likely to realize their own expectations. In this context, parents' expectations seem more practically significant.

Parental involvement was reported by young people when they were high-school seniors. This variable quantified parents' home-based involvement—including communication regarding education and career, and parents' educational support. The effect of parental involvement was strongest for Asian Americans but modest for other groups.

School counselors should educate parents on how they influence their children's educational development. For example, the LTED model could be shared with parents at Parent Teacher Organization (PTO) meetings, and in other activities and meetings with parents. The *educational goal transmission process* is strong (see Trusty & Pirtle, 1998). Parents serve as a continual source of educational, economic, and social support for their children; whereas counselors' influences are more temporal in nature. Through taking a longitudinal view of students' educational development, the role of parents becomes more apparent to counselors; and thus, counselors might serve students best through working with their parents because parents also influence students' course-taking.

High-School Behavior and Degree Completion

Of the three high-school behavior variables, good attendance and engagement in extracurricular activities had the strongest effects on realized expectations. Overall, these effects were not as strong as the effects of course-taking and SES. However, they were statistically significant and seem practically significant. Regarding attendance, it is logical that poor attendance behavior in high school (e.g., skipping classes, skipping school) would translate into poor attendance behavior in college. Perhaps if students and parents knew of these effects, students would take their attendance behavior more seriously in high school and college. The effects of attendance behavior were strongest for Asian Americans and Whites.

The effects of involvement in extracurricular activities were strongest for African Americans and Latinos. A one standard deviation increase in involvement in extracurricular activities resulted in increases in the odds of degree completion by 63% for African Americans and 53% for Latinos. As stated in the introduction of this article, the percentages of African American and Latino young people in the general U.S. population who have earned the bachelor's degree are considerably lower than the percentage of Whites (Wirt et al., 2002). Similarly, in my sample, the percentages of African Americans and Latinos who completed the bachelor's degree were much lower than the percentages for Whites and Asian Americans. My findings suggest that involvement in extracurricular activities is an important resilience factor for African Americans and Latinos. For African Americans, the effect of extracurricular activities was the strongest effect of any single high-school or background variable. This finding is partially consistent with the blocked opportunities model (Mickelson, 1990; Ogbu, 1991). That is, students from minority groups may perceive low levels of opportunity through education, and may become disengaged from school, thereby lowering their expectations and eventual attainment. The blocked opportunities model is stated in the negative, but the positive is also supported by my results. Engaging in extracurricular activities carries a particular bonus for African Americans and Latinos. Perhaps extracurricular activities are an important means of school engagement for students from these two groups. The effects of positive school behavior, the third high-school behavior variable, were weak for all racial-ethnic groups. This finding is inconsistent with the blocked opportunities model and Ogbu's model for African Americans.

What is important for professional school counselors to know is that involvement or non-involvement in extracurricular activities makes a difference in

degree completion—particularly for African Americans and Latinos. Thus, school counselors should work to help African American and Latino students (and other students also) become involved and engaged in the broader school environment. Counselors should advocate for students on two levels: First, counselors should work on a programmatic level to help develop various school-sponsored extracurricular activities that are attractive for African American and Latino students. It seems that surveys (e.g., needs assessments, focus groups) involving students and parents regarding their preferences and ideas would be a logical starting point. Second, counselors should work with individual students and groups of students and parents to encourage participation in extracurricular activities. Helping individual students become engaged in extracurricular activities should be a component of individual planning and students' four- or six-year plans. In addition, good school attendance and intensive course-taking reflect students' involvement, engagement, and effort regarding high school. The LTED model in Figure 1 is a straightforward way of educating students and parents, and a means of guiding school personnel in establishing curricular and extracurricular opportunities that help students realize their long-term educational goals.

Background Variables and Degree Completion

SES had a strong influence on degree completion, and this finding is consistent with the status attainment model (Sewell et al., 1969). A one standard deviation increase in SES increased the odds of bachelor's degree completion by 62%, while controlling for effects of all other variables. In analyses for racial-ethnic groups, SES effects were strongest for Whites and African Americans. The literature has shown that SES has influences on all types of achievement at all educational levels, and it seems logical that SES would have a strong effect on postsecondary attainment because many family resources are required for college. My results support this logic. High school variables mediated the effect of SES to only a small extent, and the overwhelming portion of the SES effect was direct. However, there was one exception. For Asian Americans, high school variables did mediate the effect of SES on degree completion.

SES is not a manipulable variable like course-taking, parenting, or high-school behavior; and counselors and schools cannot influence SES as they can influence these other variables. However, the strong effects of SES inform counselors that lower SES students and families will need increased attention and effort to help students reach their goals. I found no SES by Course-Taking

interaction; and therefore, intensive course-taking is one source of educational resilience for lower SES young people. This finding is consistent with Adelman's (1999) findings.

Racial-ethnic group membership had a significant effect on students' realized versus unrealized goals, even when SES and other variables were controlled. Asian Americans and Whites were more likely to complete the bachelor's, and Latinos and African Americans were less likely. This finding is consistent with population demographics (Wirt et al., 2002), but it is inconsistent with previous research using educational expectations as the outcome (Hanson, 1994; Trusty, 2000; Trusty & Harris, 1999). Findings from the present study are more valid because the degree completion outcome is more objective than the educational expectations outcome. The differences among racial-ethnic groups reflected in the effect in the analysis for the entire sample is noteworthy (Table 2). However, the effects of variables in the analyses for separate racial-ethnic groups (Table 3) and the LTED model (Figure 1) provide information on how to help young people from various groups in their long-term educational development.

Gender had a relatively strong effect on realized versus unrealized expectations. Women were more likely than men to complete the bachelor's. This finding is consistent with the national trend regarding the genders and degree completion. That is, degree-completion rates have increased faster for women than for men; and since the mid 1990s, more women than men in the 25 to 29 age range have attained bachelor's degrees (Wirt et al., 2002). In separate analyses for racial-ethnic groups, gender effects were strong for Latinos, African Americans, and Whites, but comparatively weaker for Asian Americans. Interaction analyses suggest that for both genders, taking intensive science and math courses is a viable means of increasing the likelihood of realizing high postsecondary educational goals.

Evaluating School Counseling Best Practices

In this section I present a summary of the implications of the findings. Particular attention is devoted to school counseling practices that influence the variables salient to students' long-term educational development. For accountability and program evaluation purposes, I include methods by which school counselors can evaluate their efforts in influencing these salient variables. The reader should note that some traditional means of evaluation and accountability (e.g., number of

students accepted into postsecondary institutions, scores on college entrance examinations) are not included.

1. Inform students, teachers, parents, and administrators of the salient influences on students' long-term educational development (LTED model). *Evaluation: Frequencies of stakeholders informed through various means (e.g., guidance, PTO presentations, printed materials, program web-sites).*

2. Develop and use an effective system for individual education-career planning. *Evaluation: Frequencies of student advising, counseling sessions, guidance lessons, and other activities focusing on students' education-career planning.*

    a. Help every student develop an appropriate, written (electronic or printed) education-career plan. In schools where student-to-counselor ratios are high, use guidance as a format for developing plans. *Evaluation: Frequencies of students with completed plans appropriate to their abilities and goals.*
    b. Pay particular attention to students' long-term education-career goals and the degree of consistency between goals and academic effort. *Evaluation: Frequencies of students who are exhibiting effort (e.g., intensive course-taking, other course-taking) and completing tasks consistent with goals; number of students who dropped intensive courses.*
    c. Inform students of various postsecondary education-career options; and when appropriate, help students develop back-up plans (alternative plans). *Evaluation: Students' indicated knowledge of various postsecondary options (evaluated through guidance); frequencies of students with appropriate back-up plans.*
    d. Include parent and teacher input into education-career planning. *Evaluation: Percentage of plans with parent and teacher input; levels of agreement among parties on students' plans and goals (student-parent-counselor- teacher consistency regarding students' plans and goals).*
    e. Use students' education-career plans as a means for helping them become involved in rewarding extracurricular activities. *Evaluation: Students' levels of involvement in extracurricular activities and adherence to plans.*

3. Provide leadership and advocacy for an intensive high-school curriculum and effective instruction. *Evaluation: Time-task analysis of leadership and advocacy*

efforts in school curriculum development and efforts promoting effective instruction.

4. Provide leadership, advocacy, and counseling in promoting good school attendance. *Evaluation: Time-task analysis of efforts aimed at increasing attendance; school attendance data, including class attendance.*

5. Engage in leadership and advocacy for students' participation in school-sponsored extracurricular activities (for all students, and for African American and Latino students in particular). *Evaluation: Frequencies of students' participation in extracurricular activities.*

    a. Help create engaging extracurricular activities for students. *Evaluation: Extracurricular activities initiated and continuing.*
    b. Encourage students' participation through counseling, advising, guidance, and individual planning. *Evaluation: Time-task analysis of counselor efforts targeting increases in participation in extracurricular activities; frequencies of students' participation.*

Although the evaluation activities enumerated above are not time-consuming or difficult, they do provide important data. These data would be informative for students, administrators, teachers, parents, and school board members.

Conclusion

Several aspects of the LTED model (see Figure 1) suggest it is a model of engagement-disengagement. That is, if students are engaged in school—through their attendance, participation in extracurricular activities, and intensive course-taking—and if parents are engaged through their expectations for and involvement with their children, then young people are more likely to realize their goals of bachelor's degree completion. The inverse is also true. The strong effects evident from the analyses place a great deal of responsibility for students' success in college on their middle- and high-school behavior and experiences, and school personnel and parents share in this responsibility. These strong effects imply that for many students, intervention after high school is *too little-too late*, and for many students who hold goals for professional occupations, career foreclosure actually comes in high school. College variables such as discontinuous enrollment or grades are likely

only symptoms of other variables from high school or earlier, namely, variables identified in the present study.

The LTED model is a practical and useful tool for several reasons. The model explains a high degree of variability in bachelor's degree completion, even though no post-high-school variables are considered. Several variables that are readily manipulated by counselors, students, parents, and schools are identified in the model. The model targets what students spend most of their time doing in school, namely, taking courses and participating in extracurricular activities. The model's focus is broad. It speaks to what students do and what parents do; and it carries implications for what schools, teachers, administrators, and counselors should do. The model identifies what is important in counselors' work with individuals and their work at the broader, programmatic level. The model requires no special assessments or measurements; however it does imply the need for thorough student data in helping students with course selection and individual planning. The model generalizes well to racial-ethnic groups, but generalizes less well for African Americans. In the model, multiple contexts are considered; that is, the effects of high school variables were examined while accounting for the influences of family, environmental, and individual contexts. Additionally, the model covers a considerable span of time and was developed with data spanning 12 years.

This study and the resulting model only begin to fill the deep gap in our knowledge base. More studies are needed on students' long-term educational development. The model formulated in this study is a general model, and the model could be elaborated to more specific contexts. For example, I did not consider students' majors in college, and it is likely that various high-school experiences influence college experiences differently depending on students' majors. Also, studies are needed that focus on specific populations, such as rural or urban young people. The model depicted herein could serve as a starting point for generating models that are more particular to populations and situations.

Subsequent studies should target the high-school variables and processes that are important to degree completion. For example, it would be useful to have empirically generated models or strategies for individual planning. The validity and effectiveness of these models could be determined by demonstrating that they help students set appropriate goals and behave consistently with their goals (i.e., take courses consistent with their goals). The outcome variable used in generating and validating such models should be completion of intensive courses because course-

taking is more highly related to long-term educational development than high-school grades, scores on tests, or other typical achievement outcomes (see Adelman, 1999). There is currently very little research literature or even theoretical literature on school counselors' roles in individual planning, even though this counselor role is salient (Gysbers & Henderson, 2000), and even though individual-planning tasks such as course-selection are so critical to young people's long-term educational development.

Young people's educational development is not temporally compartmentalized, as evidenced by the results of the present study and Adelman's (1999) study. In many ways the professions of counseling and education are victimized by the compartmentalization of our institutional and professional structures. Students and families are likewise victimized. We have college counselors and we have school counselors, and the distributors of knowledge—professional journals—are usually specific to these areas. Perhaps these professional structures are another reason that there are so few studies or prior empirical models that span students' educational development in a comprehensive way. Results from the present study and Adelman's study reveal that a K-12 perspective or a higher-education perspective on educational development is inadequate for a large and growing majority portion of young people in the U.S., namely, those pursuing the bachelor's degree soon after high school. These limited perspectives can mislead us by turning our attention away from students' long-range goals, their previous academic and extracurricular experiences, and their developmental processes. Clearly, an educational development perspective that spans kindergarten through four years of college (K-16) is needed to understand and help this large group of young people.

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Table 1
Bivariate Corrleations Among Continuous Variables for All Participants (N = 5,257)

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Bachelor's Completion		.32	.29	.32	.19	.13	.17	.15	.20	.16	.40	.44
2. SES			.25	.30	.01	-.04	.11	.16	.23	.10	.26	.27
3. Reading Ability				.65	.05	.13	.09	.09	.14	.15	.33	.37
4. Math Ability					.08	.11	.16	.03	.18	.18	.43	.54
5. High-School Attendance						.36	.09	.13	.03	.10	.19	.22
6. Positive Behavior							.05	.13	.03	.20	.11	.12
7. Extracurricular Activities								.10	.07	.09	.16	.16
8. Parental Involvement									.09	.22	.08	.08
9. Parents' Expectations										.08	.24	.25
10. Locus of Control											.16	.19
11. Science Intensity												.59
12. Math Intensity												

Table 2

Effects of Background and High-School Variables on Bachelor's Degree Completion for All Participants (N = 5,257)

	Model 1			Model 2		
Variable	*B*	*SE B*[a]	Odds	*B*	*SE B*[a]	Odds
Background Variables						
Gender	.53***	.10	1.69	.52***	.12	1.68
Race-Ethnicity[b]						
Asian American	.50***	.15	1.64	.48**	.15	1.62
Latino	-.11	.12	.90	-.09	.13	.92
African American	-.06	.13	.94	-.16	.12	.85
White	.26*	.10	1.29	.30**	.10	1.35
Native American	-.59		.56	-.54		.58
SES	.58***	.06	1.79	.48***	.06	1.62
Eighth-Grade Cognitive Ability						
Reading Ability	.19**	.07	1.21	.17**	.07	1.19
Math Ability	.46***	.09	1.58	.01	.08	1.01
High-School Variables						
High-School Behavior						
Attendance				.22***	.06	1.25
Positive Behavior				.05	.06	1.05

Extracurricular Activities	.19**	.07	1.21
Parenting			
Parental Involvement	.12*	.05	1.13
Parents' Expectations	.17**	.05	1.19
Locus of Control	.09	.07	1.09
High School Course-Taking			
Science Intensity	.37***	.05	1.45
Math Intensity	.55***	.08	1.73

Note. Logistic regression coefficients (*B*s) for continuous variables are standardized coefficients except those for course-taking variables, which are expressed in high-school units. Nagelkerke R^2 in Model 1 = .24, in Model 2 = .39.
*$p < .05$, **$p < .01$, ***$p < .001$.
[a]Standard errors were adjusted upward for the complex sampling design.
[b]Race-ethnicity overall differences were significant ($p < .01$) in both models. Race-ethnicity was deviation coded, with the Native American group as the comparison category. The *B* for this group was calculated as the negative sum of coefficients for other groups, and the odds were calculated from the *B*s (e.g., $2.718^{-.54} = .58$).

Table 3

Odds for Effects of Background and High-School Variables on Bachelor's Degree Completion for Racial-Ethnic Groups

	Asian American		Latino		African American		White	
n[a]	583		631		582		3,898	
	M1	M2	M1	M2	M1	M2	M1	M2
Background Variables								
Gender	1.38	1.20	1.85	2.56	1.80	1.52	1.70	1.71
SES	1.48	1.14	1.44	1.47	1.73	1.57	1.89	1.72
Reading Ability	1.44	1.44	1.39	1.20	1.11	1.12	1.19	1.17
Math Ability	2.00	1.27	1.60	1.07	1.61	1.19	1.57	.99
High-School Variables								
High-School Behavior								
Attendance		1.29		1.19		1.13		1.28
Positive Behavior		1.14		1.08		1.13		1.03
Extracurricular Activities		1.29		1.53		1.63		1.13
Parenting								
Parental Involvement		1.28		.82		1.02		1.17
Parents' Expectations		1.33		1.21		1.22		1.18
Locus of Control		1.08		1.22		1.00		1.11

High School Course-Taking								
Science Intensity	1.75		1.51		1.47		1.44	
Math Intensity	1.54		2.15		1.20		1.79	
Nagelkerke R^2	.26	.47	.22	.44	.20	.31	.19	.35

Note. M1 is Model 1; M2 is Model 2. Odds for continuous variables are from standardized coefficients except for course-taking variables, which are expressed in high-school units.
[a]Because of over-sampling of Asian Americans and Latinos, weights were adjusted only for these groups to set the *n* to the actual, un-weighted *n*.

Figure 1. Long-Term Educational Development (LTED) model.