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The Relationship Between High School Vocational Education and Dropping Out

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EXECUTIVE SUMMARY

Despite the national goal of improving the high school graduation rate, no progress has been made toward improving that rate; in fact, from the perspective of some, the graduation rate has actually worsened. In 1989, the National Education Summit adopted several goals for the U.S. educational system, including that of increasing the high school graduation rate to at least 90 percent by the year 2000. Since that time, however, the graduation rate has not increased. Over the past decade, about 85 percent of students completed either a regular diploma or a high school equivalent. When the graduate rate is based only on those who completed a regular diploma, the rate declined from 81 to 77 percent during this period. Reducing the dropout rate is an important issue because research shows that, compared to high school graduates, dropouts are unemployed more often, earn less when they are employed, are more likely to receive public assistance, and are more likely to be incarcerated.

The 1998 Carl D. Perkins Vocational and Technical Education Act (hereafter, Perkins Act) recognized the importance of reducing the dropout rate by specifying high school graduation as one of the performance indicators for students who participate in vocational education. Historically, vocational education has been expected to serve the needs of students who do not expect to go to college, as well as those with low academic achievement—subgroups that are at risk of dropping out. By offering an alternative to academic courses—which non-college-bound and low-achieving students often have difficulty with or do not see the relevance of—it has been argued that vocational education could help these students stay in school.

This study examines whether vocational education can help reduce dropping out in high school, using a two-step process. In the first step, we use regression methods to calculate the relationship between vocational and other course-taking, and dropping out. Regression methods are used to adjust for student characteristics which research has found are related to both course-taking and dropping out.

In the second step, we use results from the regression analysis to calculate the average student's probability of dropping out when following two well-defined course-taking patterns: (1) the vocational concentrator program and (2) the basic academic program. The vocational concentrator program has students take three more courses in a single occupational area than would be required by the basic academic program, and three fewer low-level academic courses. The difference in a student's probability of dropping out when following the vocational concentrator and basic academic program is interpreted as the effect of vocational education on dropping out. We compared results for these two programs because the basic academic program seems to be a realistic alternative for a student who otherwise might follow the vocational concentrator one. The definitions of these programs are consistent with those from other studies.

The analysis is based on data collected for the National Education Longitudinal Study (NELS). The NELS contains longitudinal information for a nationally representative sample of eighth graders, and it provides accurate information about course-taking and dropping out. However, because the sample includes students who attended high school during the late 1980s to early 1990s, the NELS does not reflect any changes in vocational education that may have

occurred over the past decade. Nevertheless, analyzing these data is worthwhile, since similar information for a more recent cohort of students does not exist.

The main findings are as follows:

- ***The average high school student's chance of dropping out is the same when following the vocational concentrator or the basic academic program.*** This finding is consistent with a recent experimental evaluation of Career Academies—a high school reform effort which, among other things, provides students with more vocational education than they would otherwise have received.

- ***The result for the average high school student holds as well for several important subgroups of students.*** We examined results for four subgroups of students: (1) those who do not expect to go to college, (2) those with low academic achievement, (3) those in schools where a high proportion of students are eligible for free or reduced-price lunch, and (4) those in schools with high academic course-taking requirements for graduation. The first three subgroups help us understand how vocational education affects students who might be considered "special populations" in the Perkins Act. The fourth subgroup helps illustrate how vocational education affects today's students, many of whom are required to meet higher academic course-taking requirements to graduate than in the past.

- ***For students who want to pursue vocational education, dropping out is less likely when they concentrate in vocational education than when they explore, but only for those who do not expect to go to college.*** Students can also participate in vocational education by taking courses in a variety of occupational areas (hereafter, the vocational explorer program), which provides them with broader occupational training than would the concentrator program. For students with no college plans who want to pursue vocational education, the probability of dropping out drops from 19 to 16 percent when concentrating in vocational education instead of exploring. For the other three subgroups of students we examined, the probability of dropping out is the same, whether they follow the concentrator or the explorer program.

Generally, these findings indicate that vocational education does not reduce dropping out, although making progress toward that goal may require developing strategies that target students soon after they enter elementary school. Previous federal efforts to reduce dropping out at the high school level have shown, at best, mixed results, and the effectiveness of more recent efforts have yet to be assessed. Put differently, we currently do not have generally accepted approaches to reduce dropping out. One strand of research suggests that students drop out because of early school failure, which lowers their self-esteem and causes persistent school failure, which, in turn, cause some students to disengage from school and ultimately drop out. Another strand of research suggests that students drop out because they have different traits than those who graduate, including lower ability, lower motivation, lower expectations about the benefits of graduating, and greater success at jobs typically held by dropouts. Additional research is needed to understand why students drop out. However, if either of these hypotheses is correct, finding ways to reduce dropping out will be a challenging task because the reasons currently hypothesized suggest that students drop out for reasons that develop early in their lives.

I. INTRODUCTION AND SUMMARY OF FINDINGS

In 1989, the National Education Summit—a meeting between President George Bush and the nation's governors—adopted several goals for the U.S. educational system. One of those goals was to increase the high school graduation rate to at least 90 percent by the year 2000. Since that time, however, the graduation rate has not increased. Over the past decade, about 85 percent of students completed either a regular diploma or a high school equivalent. When the graduate rate is based only on those who completed a regular diploma, the rate declined from 81 to 77 percent during this period (Kaufman et al. 2000).[1]

Finding ways to reduce dropping out has been a challenge. Previous federal efforts to reduce dropping out at the high school level have shown, at best, mixed results, and the effectiveness of more recent efforts have yet to be assessed (U.S. General Accounting Office 2002). Put differently, we currently do not have generally accepted approaches to reduce dropping out. Reducing the dropout rate is an important issue because, compared to high school graduates, dropouts are unemployed more often, earn less when they are employed, are more likely to receive public assistance, and are more likely to be incarcerated (Wirt et al. 1998).

The 1998 Carl D. Perkins Vocational and Technical Education Act (hereafter, Perkins Act) recognized the importance of reducing the dropout rate by specifying high school graduation as one of the performance indicators for students who participate in vocational education. Historically, vocational education has been expected to serve the needs of students who do not expect to go to college, as well as those with low academic achievement—subgroups that are at risk of dropping out. It has been argued that vocational education may reduce dropping out among these students because they may find it more engaging or relevant than academic subjects.

This study examines whether vocational education can help reduce dropping out in high school, using a two-step process. In the first step, we use regression methods to calculate the relationship between occupational and other course-taking, and dropping out. Regression methods are used to adjust for student characteristics which research has found are related to both course-taking and dropping out.[2] These results are interpreted as the effect of taking an occupational course on dropping out.

In the second step, we use results from the regression analysis to calculate the average student's probability of dropping out when following several well-defined vocational and non-vocational course-taking programs. The programs differ along the number of credits a student takes in vocational and nonvocational courses. For example, we compute results for a vocational concentrator program and a basic academic program, where following the vocational concentrator program has a student take three more courses in a single occupational area than

[1] More recent statistics on the high school graduation rate (by completion of a regular diploma) are not available because the data source used to produce these statistics—the Current Population Survey—changed beginning in 2000 in ways that yield the more recent statistics incomparable with the earlier ones (Kaufman et al. 2001).

[2] As described below, the regression methods also incorporate the timing of dropping out and course-taking.

would be required by the basic academic program, and three fewer low-level academic courses.[3] The difference in a student's probability of dropping out when following the vocational concentrator and basic academic program is interpreted as the effect of vocational education on dropping out. We compared results for these two programs because the basic academic program seems to be a realistic alternative for a student who otherwise might follow the vocational concentrator one. The definitions of these programs are consistent with those from other studies. More details about our two-step process are provided in the Appendix.

This two-step process is used to understand how vocational education affects dropping out because students typically take a fixed number of credits in high school. Therefore, the decision of whether to participate in vocational education involves not only a decision of whether to take an occupational course (results produced by the first step), but also the number of occupational courses to take and the corresponding number of courses that are not taken in other subjects (results produced by the second step).

The analysis is based on data collected for the National Education Longitudinal Study (NELS). The NELS contains baseline and follow-up information for a nationally representative sample of eighth graders, as well as their high school transcripts. Therefore, we have accurate information about the courses students took and whether they dropped out. Because the sample is nationally representative, an additional advantage of using the NELS for this study is that the results apply to the nation's students and not a select sample. The main disadvantage of using the NELS is that the sample includes students who attended high school during the late 1980s to early 1990s. Therefore, these data do not reflect any changes in vocational education that may have occurred over the past decade. Nevertheless, examining results based on the NELS seems worthwhile, since similar information for a more recent cohort of students does not exist. More details about the NELS and our analysis file are provided in the Appendix.

The main findings are as follows:

- ***The average high school student's chance of dropping out is the same when following the vocational concentrator or the basic academic program.*** This finding is consistent with a recent experimental evaluation of Career Academies—a high school reform effort which, among other things, provides students with more vocational education than they would otherwise have received.

- ***The result for the average high school student holds as well for several important subgroups of students.*** We examined results for four subgroups of students: (1) those who do not expect to go to college, (2) those with low academic achievement, (3) those in schools where a high proportion of students are eligible for free or reduced-price lunch, and (4) those in schools with high academic course-taking requirements for graduation. The first three subgroups help us understand how vocational education affects students who might be considered "special populations"

[3] Table 1 later in the report presents our definitions of the vocational concentrator and basic academic programs, as well as other vocational programs we defined.

in the Perkins Act.[4] The fourth subgroup helps illustrate how vocational education affects today's students, many of whom are required to meet higher academic course-taking requirements to graduate than in the past.

- ***For students who want to pursue vocational education, dropping out is less likely when they concentrate in vocational education than when they explore, but only for those who do not expect to go to college.*** Students can also participate in vocational education by taking courses in a variety of occupational areas (hereafter, the vocational explorer program), which provides them with broader occupational training than would the concentrator program. For students with no college plans who want to pursue vocational education, the probability of dropping out drops from 19 to 16 percent when concentrating in vocational education instead of exploring. For the other three subgroups of students we examined, the probability of dropping out is the same, whether they follow the concentrator or the explorer program.

The rest of this report describes the analysis in greater detail. We begin by describing the approach we use to understand how vocational education affects dropping out. We then present our results about the relationship between vocational education and dropping out. Last, we present our conclusions and a possible next step toward identifying ways to reduce dropping out.

II. AN APPROACH TO UNDERSTANDING HOW VOCATIONAL EDUCATION AFFECTS DROPPING OUT

There are several hypotheses that may explain why vocational education reduces dropping out. Typically, most of the courses students take until they reach high school are in academic subjects. This could be frustrating for students who do not perform well in academic courses, or for students who do not see the relevance of these courses for the activities they want to pursue after leaving high school. This frustration could cause these students to become disengaged from school, which, as previous research suggests, could result in their dropping out (Finn 1989; Alexander et al. 2000). Vocational education may reengage these students because occupational courses are often fundamentally different from academic ones. Many academic courses focus on providing students with the skills needed to enter and succeed in postsecondary education. In contrast, many occupational courses focus on preparing students to succeed in the labor market. Students who are frustrated by academic courses may find occupational courses more interesting. Because of this interest, vocational education could, in fact, reduce dropping out. Vocational education may be particularly effective in reducing dropping out among students who plan to work immediately after high school.

It is also possible that vocational education does not affect dropping out, or that it even increases dropping out. Vocational education may have no effect on dropping out because the lateness of vocational education in a student's educational career may make it difficult for

[4] The Perkins Act includes in its definition of "special populations" students who are educationally disadvantaged and those who are economically disadvantaged.

vocational education alone to reengage students. Vocational education may even increase dropping out, because students who take occupational courses early in high school may develop skills that are valued in the labor market before they are scheduled to graduate, which may encourage some students to drop out because they want to work (Agodini and Dynarski 1998). This may be especially true of students who do not plan to seek postsecondary education.

Measuring the Relationship Between Vocational Education and Dropping Out

Two frequently cited studies that examined the relationship between vocational education and dropping out have concluded that vocational education reduces dropping out. The first study was conducted by Rasinski and Pedlow (1994) and found that vocational education indirectly reduces dropping out—that is, vocational education increases a student's class rank, which, in turn, reduces dropping out. The second study was conducted by Plank (2001) and found that vocational education directly reduces dropping out, and that its effect is greatest when a student earns three vocational credits for every four academic credits.

These studies have significant limitations, however, leaving the relationship between vocational education and dropping out not well understood. Rasinski and Pedlow (1994) examined the relationship between occupational course-taking during the first two years of high school, and dropping out during the last two years. Therefore, their results indicate only the effect that early occupational course-taking has on later dropping out; their results do not indicate how occupational courses affect early dropping out, nor the effect of later occupational course-taking, which is when a significant amount of occupational course-taking occurs.

Although Plank (2001) examined the relationship between all vocational course-taking and all dropping out, his results may be inaccurate because his approach does not take into account when courses were taken relative to when students dropped out. Plank's measure of vocational course-taking is the ratio of vocational-to-academic credits students earned, and his outcome variable is whether a student ever dropped out during high school. Since most vocational courses are taken during the last two years of high school, the only students who have a high ratio of vocational-to-academic courses are those who did not drop out during the first two years. This can cause the problem of reverse-causality—where some students take more vocational classes because they did not drop out—but Plank's approach would indicate that they did not drop out because they took more vocational classes.[5]

We use a two-step process to better understand how vocational education affects dropping out. In the first step, we compute the relationship between dropping out during *each semester* of high school and occupational course-taking *up to the prior semester*, adjusted for other course-taking and student characteristics which, previous research has found, affect dropping out.[6]

[5] Plank's results also are based on all vocational courses—that is, occupational courses, as well as family/consumer sciences education courses and general labor market preparation courses. Therefore, his results reflect the average effect of all these courses, not just the effect of occupational courses.

[6] Prior studies that examined the relationship between dropping out and student characteristics measured in the later grades have found that a student's personal, family, and school characteristics are related to dropping out. Personal and family characteristics include low test scores, frequent absenteeism, disciplinary problems, frequently

Specifically, we compute the relationship between occupational course-taking during the first semester of high school and dropping out during the second semester, after adjusting for other course-taking during that time and the student's personal, family, and school characteristics.[7] For students who are still in school at the end of the second semester, we then compute the relationship between the cumulative course-taking during the first two semesters and dropping out during the third semester. We repeat this process for all remaining semesters. Finally, we compute the average effect of an occupational course on dropping out during any semester. The tables in the Appendix present the average effect of an occupational course and other courses on the probability of dropping out.

In the second step, we compute (using our results from the first step) a student's probability of *ever* dropping out when following the course-taking of a vocational and non-vocational program.[8] The difference in a student's probability of dropping out when following a vocational and a nonvocational program is interpreted as the effect of vocational education on dropping out. As described below, in our analysis, a student who follows a vocational or nonvocational program takes the same number of courses. However, following a vocational program instead of a nonvocational one means that a student takes more occupational courses and fewer other courses. We interpret the effect of vocational education in this way because students typically take a fixed number of courses during high school; thus, it seems reasonable to compare the effect of a vocational program to other programs students can pursue. More details about our two-step process are provided in the Appendix.

The dropout rate for a particular course-taking program is not the dropout rate associated with *completing* that program, but rather the dropout rate associated with *following* that program. We define a course-taking program as a path that students follow throughout high school which, if completed, would consist of 24 credits. For example, as described below, a vocational concentrator will take more vocational credits and fewer academic credits during each semester in high school than someone following a basic academic program. We calculate the dropout rate corresponding to a particular course-taking program as the sum across semesters of the

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(continued)

changing schools, being retained for at least one grade, low socioeconomic background, single-parent family, less-educated parents, and an older sibling who has already dropped out (Kaufman and Bradby 1992; Gleason and Dynarski 1998). School characteristics include school size, level of resources, supports that are available for students with academic or disciplinary problems, and academic standards for graduation (Cotton 1997; and Lillard and DeCicca 2001). Other research has found that students who participate in vocational education are more likely to have low test scores, low educational aspirations, and low socioeconomic backgrounds (Agodini et al. 2002). Since these factors have been shown to increase dropping out, failing to adjust for these factors could produce results that suggest vocational education increases dropping out, when, in fact, participation in vocational education may simply reflect other differences between participants and nonparticipants that are related to dropping out.

[7] We do not analyze dropping out during the first semester because too few students in our sample dropped out during the first semester to support the analysis.

[8] For ease of exposition, we refer to "ever dropping out" as simply "dropping out" from this point onward. There are students who drop out and return to high school at a later time. We consider these students terminal dropouts because the number of students who dropout and return at a later time is too small to support an analysis of this pattern of dropping out.

proportion of students following that program who drop out in each semester. Thus, we are not estimating the effect of *completing* a 24-credit program on dropping out, but rather the effect of *following* the course-taking path that corresponds to a given course-taking program.

Types of Vocational and Nonvocational Programs Examined

We compute a student's probability of dropping out when following the course taking of four different types of vocational programs we constructed (Table 1):

- ***Vocational concentrator program*** has a student earn five credits in occupational courses, three of which are in the same occupational area, and not enough credits in core academic subjects to complete an academic program.[9] This definition of the vocational concentrator program is similar to the definition used in other studies.[10]

- ***Vocational explorer program*** has a student follow the same course taking as the vocational concentrator program, except that the students does not earn three credits in the same occupational area. Recent studies suggest that this program is increasingly the way that vocational students organize their occupational course work (U.S. Department of Education 2002).

- ***Extreme vocational program*** has a student earn a larger number of credits (nine) in occupational courses and a smaller number of credits in core academic subjects, as compared to the vocational concentrator program. This course-taking pattern is similar to one that Plank (2001) found reduces dropping out.

- ***Integrated program*** has a student take the occupational courses needed to complete the vocational concentrator program, and enough credits in core academic subjects to complete the academic program. This is a course-taking pattern that many policymakers would like vocational students to complete.

[9] We define an academic student as one who did not meet the course taking of a vocational concentrator, but earned at least four credits in English and at least three credits in each of math, science, and social studies. This definition is similar to the "New Basics" core curriculum recommended by the National Commission on Excellence in Education (1983).

[10] Previous research that examined the effect of vocational education among students who graduated high school often compared outcomes of vocational concentrators with outcomes of other students. Students who earned at least three credits in the same occupational area were classified as vocational concentrators. Although a student only needed to earn three credits in the same occupational area to be classified as a vocational concentrator, the average vocational concentrator in the NELS earned a total of 5.6 credits of occupational courses—more than the three required credits. Similarly, although a student did not have to earn any credits in the core academic subjects in order to be classified as a vocational concentrator, the average vocational concentrator in the NELS earned 1.7 credits in low-level math, 1.3 credits in high-level math, 1.8 credits in low-level science, 0.7 credits in high-level science, 4.1 credits in English, and 3.3 credits in social studies. These course-taking patterns are similar to our definition of the vocational concentrator program—see Table 1.

TABLE 1

COURSE-TAKING PROGRAMS: NUMBER OF CREDITS EARNED IN VARIOUS SUBJECTS

Curriculum/Subject	Vocational Program				Non-Vocational Program
	Vocational Concentrator	Vocational Explorer	Extreme Vocational	Integrated	Basic Academic
Vocational Curriculum					
Occupational	5	5	9	4	2
Other vocational	1	1	1	1	1
At least 3 credits in one of the ten occupational area	Yes	No	Yes	Yes	No
Academic Curriculum					
Low-level math	1.5	1.5	0.5	2	3
High-level math	1	1	0	1	1
Low-level science	1.5	1.5	0.5	2	3
High-level science	1	1	0	1	1
English	4	4	4	4	4
Social studies	3	3	3	3	3
Fine arts and foreign language	2	2	2	2	2
Enrichment/Other Curriculum	4	4	4	4	4
Total Credits	**24**	**24**	**24**	**24**	**24**

Source: Authors' constructs, as described in the report.

To interpret the results, we compare them to a student's probability of dropping out when following the course-taking of one nonvocational program we constructed:

- ***Basic academic program*** has a student earn two credits in occupational courses (not enough to complete the vocational concentrator program) and not enough credits in core academic subjects to complete the academic program. This definition is similar to the definition of the general program used in other studies.[11]

We compare results for the vocational programs with results for the basic academic program because the basic academic program seems like a realistic alternative for a student who otherwise follows a vocational program.

The course-taking programs we constructed were defined in this way so that they differ from one another in clear-cut ways, making it easy to interpret results based on these programs. For example, relative to the basic academic program, the vocational concentrator program has a student earn three more credits in one of the ten occupational areas, but one-and-a-half fewer credits in each of low-level math and low-level science courses. Therefore, any difference in the probability that a student drops out by following the vocational concentrator program instead of the basic academic program can be attributed to substituting three credits in low-level math and low-level science courses, for three credits in one of the ten occupational areas.

Caveats

A methodological issue in this study is the ability to isolate the effect of vocational education from the factors related to both participation in vocational education and dropping out. For example, suppose that students with low levels of prior achievement are more likely than other students to drop out of high school. Also suppose that students who participate in vocational education have lower levels of prior academic achievement than other students. In this example, vocational students will appear to be more likely than other students to drop out; but the reason is differences in prior academic achievement, rather than participation in vocational education.

In our approach to determining the effect of vocational education, we adjust for important characteristics that are related both to participating in vocational education and dropping out; however, our approach (like those used by other studies) does not adjust for characteristics we do

[11] In the research described in the previous footnote, students who were not classified as vocational concentrators were classified as either academic or general students. A general student is one who did not meet the course taking of the vocational concentrator or academic program. Although a general student was not required to take any occupational courses or courses in core academic subjects, the average general student in the NELS earned credits in each of these subjects—specifically, 2 credits of occupational courses, 1.4 credits in low-level math, 1.7 credits in high-level math, 1.7 credits in low-level science, 0.9 credits in high-level science, 4.1 credits in English, and 3.5 credits in social studies. These course-taking patterns are similar to our definition of the basic academic program—see Table 1.

not observe. For example, suppose that motivation to succeed in high school—a characteristic we do not observe—affects dropping out. Also suppose that motivation to succeed in high school differs across students who do and do not participate in vocational education. Whether it is important to include motivation in the analysis depends on the extent to which it affects dropping out, after adjusting for all the characteristics included in our analysis. However, by definition, the relationship of dropping out to an unobserved factor such as motivation cannot be tested. Therefore, we interpret our results as the *relationship* between vocational education and dropping out, but not necessarily the *causal effect*. For ease of exposition, however, we will refer to this relationship as the effect of vocational education.

III. KEY FINDINGS

Table 2 presents a simple look at the relationship between vocational education and dropping out. The table shows the dropout rate during each semester of high school among two groups of students: (1) those who took a high proportion of occupational courses prior to each respective semester, and (2) those who took a low proportion.[12] For example, the dropout rate during the third semester is presented for students who took a high proportion of occupation courses during the first and second semesters, and those who took a low proportion.

These descriptive statistics indicate that dropout rates during several semesters are higher among students who took a high proportion of occupational courses than those who took a low proportion. During semesters five, six, and seven, students who took a high proportion of occupational courses prior to each respective semester were more likely to drop out than students who took a low proportion. For example, 4.5 percent of students who took a high proportion of occupational courses prior to the fifth semester dropped out during the fifth semester, compared to 2.0 percent among those who took a low proportion.

These statistics do not adjust for factors that other studies have found are related to dropping out, some of which may be related to participation in vocational education. Below, we examine how vocational education affects dropping out after adjusting for student characteristics that previous research has found affect dropping out. As described previously, the difference in a student's probability of dropping out when following a vocational and nonvocational program is interpreted as the effect of vocational education on dropping out.

[12] A student is considered to have taken a high proportion of occupational courses prior to a particular semester if more than 16 percent of the credits earned prior to that semester were in occupational courses. Students who did not meet this cutoff were considered to have taken a low proportion of occupational courses. We used this cutoff for the following reason. A student is often considered to be a vocational concentrator if at least 3 credits were earned in one of the ten occupational areas (Bradby and Hoachlander 1999). We considered a student to have taken a high proportion of occupational courses if 4 credits were earned in occupational courses. Considering that the average high school graduate in our sample earned about 24 credits, a student who earned 4 credits in occupational courses earned just over 16 percent of total credits in occupational courses.

TABLE 2

DROPOUT RATES DURING EACH HIGH SCHOOL SEMESTER, BY STUDENTS WHO TOOK DIFFERENT PROPORTIONS OF OCCUPATIONAL COURSES PRIOR TO EACH RESPECTIVE SEMESTER[a]

Semester	Total Number of Dropouts	Dropout Rates by Proportion of Occupational Courses Prior to Each Semester	
		High Proportion Occupational	Low Proportion Occupational
2	43	0.8	0.5
3	117	2.7	1.6
4	81	2	1
5	169	4.5	2.0*
6	123	2.9	1.3*
7	196	4.2	2.1*
8	64	1.4	0.7
9	47	1	1

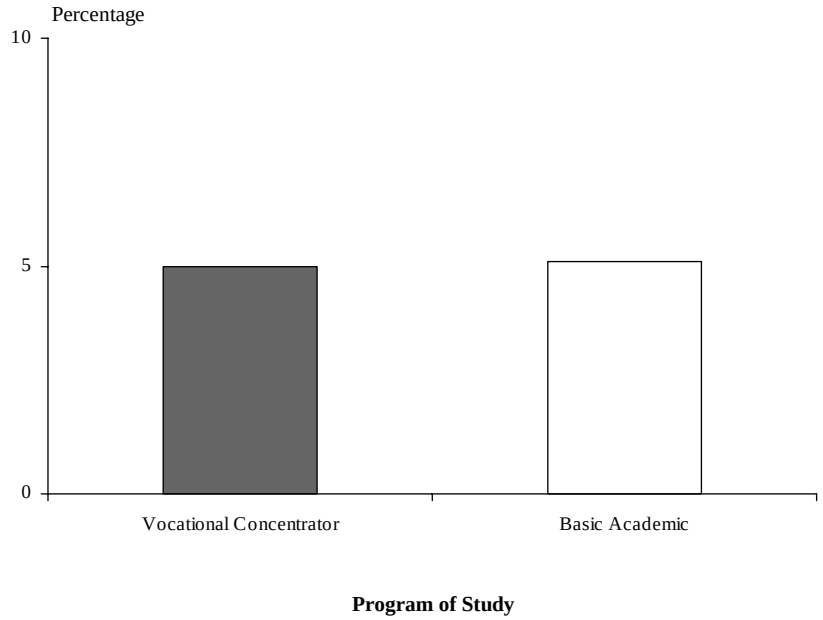
Source: Authors' calculations based on the National Education Longitudinal Study.

Note: A student is considered to have taken a high proportion of occupational courses if more than 16% of their total credits prior to each respective semester were taken in occupational courses. Students who did not meet this cutoff were considered to have taken a low proportion of occupational courses.

[a]The statistics in the table do not adjust for factors that other studies have found are related to dropping out, some of which may be related to occupational course taking.

*Significantly different (at the 0.05 level) from dropout rate among students who took a high proportion of occupational courses up to the prior semester.

Figure 1: Probability of Dropping Out When Following the Vocational Concentrator and Basic Academic Programs



Source: Authors' calculations based on the National Education Longitudinal Study.

Note: The course-taking definitions of the programs of study are described in the report.

The average high school student's chance of dropping out is the same when following the vocational concentrator or the basic academic program

Students who follow the vocational concentrator program are as likely to drop out as they would be had they instead followed the basic academic program (Figure 1). After adjusting for student characteristics, a student has about a 5 percent chance of dropping out if he or she follows either the vocational concentrator or the basic academic program. As described above, following the vocational concentrator program instead of the basic academic program means that a student earns three more credits in one of the ten occupational areas, but one-and-a-half fewer credits in each of low-level math and low-level science courses.

Results are similar for several important subgroups of students

The Perkins Act, which authorizes federal spending for vocational education, emphasizes the importance of meeting the needs of several special populations. These special populations include educationally and economically disadvantaged students. The subgroups studied in this report that represent these special populations are students with no college plans and low academic achievers (used to represent educationally disadvantaged students); and students from poor schools (used to represent economically disadvantaged students). Given the increased prevalence of high academic course-taking standards for graduation, we also study the subgroup of students who attended schools with high standards.[13] Other subgroups—including students who reported a disability, students who were classified as limited English proficient, and students who attended a vocational/technical school—can be defined, but the NELS does not contain adequate sample sizes to analyze their outcomes.

The probability of dropping out varies among the subgroups we examined; however, within each subgroup, the probability of dropping out is the same whether a student follows the vocational concentrator program or the basic academic program (Figure 2). After adjusting for student characteristics, the probability of dropping out is highest for students with no college plans, followed by low academic achievers, students from poor schools, and students who attended schools with high standards. Students with no college plans have about a 17 percent chance of dropping out, compared to about a 2 percent chance among students who attended schools with high standards. Within each subgroup, however, a student's chance of dropping out when following the vocational concentrator and basic academic program is not significantly different.

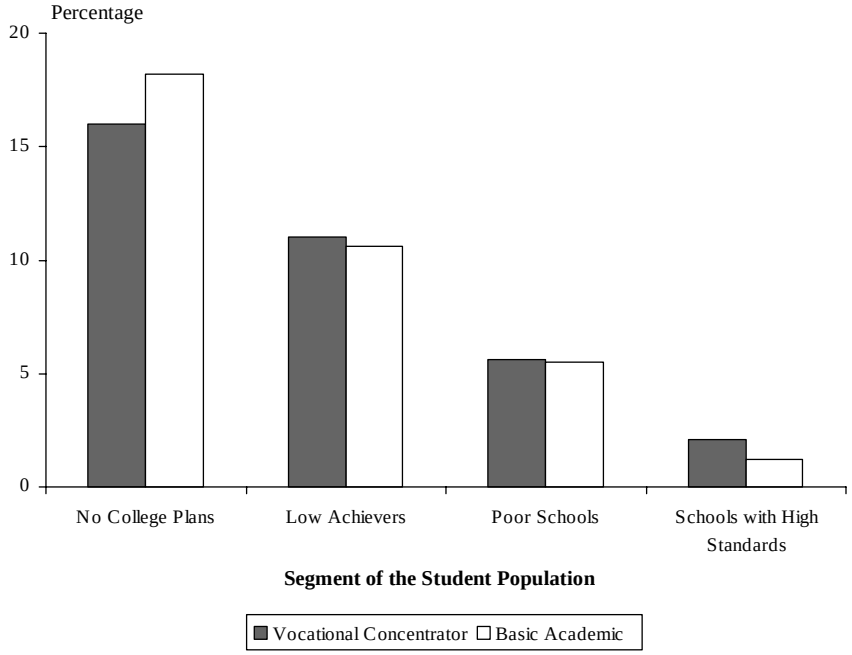
For students who want to pursue vocational education, concentrating is better than exploring, but only for those who do not expect to go to college

Students can participate in vocational education in various ways. One way is to concentrate or specialize their occupational course taking—that is, by completing the vocational concentrator program considered thus far. Another way students can participate in vocational education is to take courses in various occupational areas—that is, by completing what we call the vocational explorer program. As described above, the course-taking definitions of the concentrator and explorer programs are identical, except that in the concentrator program students earn at least three credits in one of the ten occupational areas, whereas in the explorer program students do not.

For overall students and for three of the four subgroups of students we examined, the probability of dropping out is the same whether a student follows the vocational concentrator or explorer program (Figure 3). The three subgroups include low academic achievers, students from poor schools, and students who attended schools with high standards.

[13] A student is considered to attend a school with high standards if the school requires the "New Basics" core curriculum for graduation. A student who completes the New Basics is one who earned four credits in English and three credits in each of math, science, and social studies.

Figure 2. Probability of Dropping Out When Following the Vocational Concentrator and General Academic Programs, for Subgroups of the Student Population



Source: Authors' calculations based on the National Education Longitudinal Study.

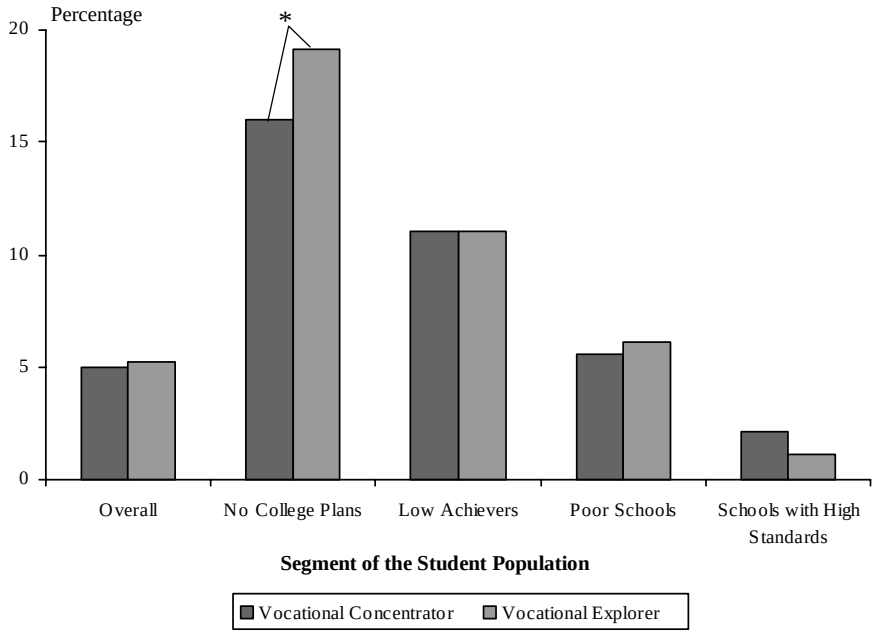
Note: The course-taking definitions of the programs of study are described in the report. The difference in the probability of dropping out between the two programs of study is not statistically significant for any of the subgroups.

However, for students with no college plans, the probability of dropping out is lower if they follow the vocational concentrator program instead of the explorer program. After adjusting for student characteristics, a student with no college plans has a 16 percent chance of dropping out when following the vocational concentrator program, compared to a 19 percent chance when following the explorer program—a difference of 3 percentage points. Thus, concentrating vocational coursework appears to have benefits over exploring in terms of reducing dropping out.

We also considered two other vocational programs—extreme vocational and integrated. The extreme vocational program has a student earn a high proportion of occupational credits—9 occupation credits out of 24 total credits—and is similar to a course-taking pattern that Plank (2001) found reduces dropping out.[14] The integrated program has students complete the vocational concentrator program and an advanced academic program—a pattern of courses that many policymakers would like to see vocational students complete.

[14] Considering that only 2 percent of our sample actually took such a high proportion of occupational credits, it is worth noting that this course-taking program may be an unrealistic alternative for many students, particularly since many of today's students need to meet high academic course-taking standards for graduation.

Figure 3. Probability of Dropping Out When Following the Vocational Concentrator and Vocational Explorer Programs, for Subgroups of the Student Population



Source: Authors' calculations based on the National Education Longitudinal Study.

Note: The course-taking requirements of the programs of study are described in the report.

*Difference is statistically significant at 0.05 level.

We find that following the extreme vocational program or the integrated program has no effect on dropping out relative to the low-level academic program, for students overall (Figure 4). Moreover, the extreme vocational and integrated programs do no better than a vocational concentrator or explorer program at reducing dropping out.[15]

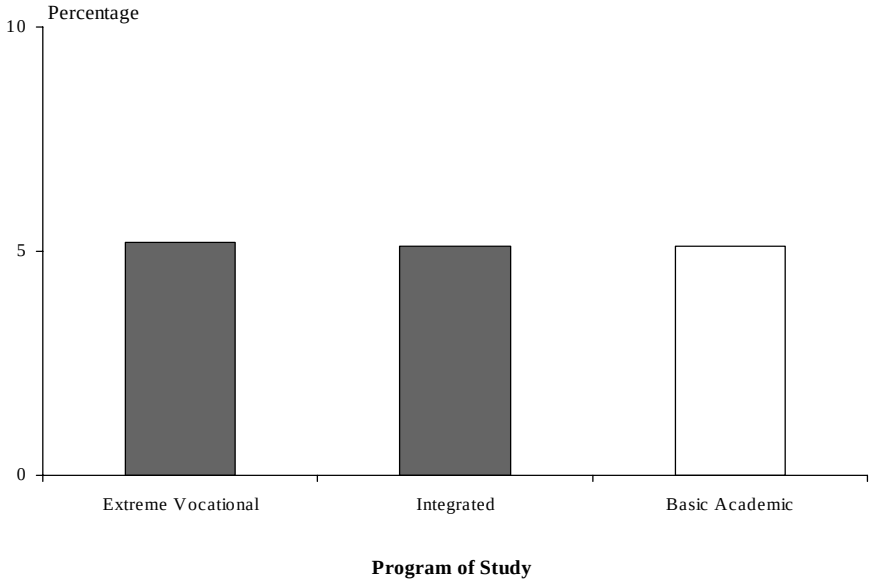
IV. CONCLUSIONS

The proposed 2005 federal budget calls for major changes to the vocational education program. One of those changes is to refocus vocational education toward a system that contributes to high school completion, student academic achievement, and college-going. Vocational education traditionally has focused on preparing students for the labor market, particularly among those who do not plan to pursue any postsecondary education.

Generally, this study finds that vocational education does not reduce dropping out. This is true for the average high school student, as well as several important subgroups of students. The

[15] Subgroup results are not presented because the number of students in each subgroup that actually took the large number of occupational credits in the extreme vocational program is too small to support the analysis.

Figure 4. Probability of Dropping Out When Following the Extreme Vocational, Integrated, and Basic Academic Programs



Source: Authors' calculations based on the National Education Longitudinal Study.

Note: The course-taking requirements of the programs of study are described in the report.

*Difference significant at 0.05 level.

subgroups include students who do not expect to go to college, students with low academic achievement, and students in schools where a high proportion are eligible for free or reduced-price lunch. We examined these subgroups to help us understand how vocational education affects educationally and economically disadvantaged students—the Perkins Act emphasizes the importance of meeting the needs of these students. We also examined students in schools with high academic course-taking requirements for graduation in order to illustrate how vocational education affects today's students, many of whom are required to meet higher academic course-taking requirements to graduate than in the past.

Our findings are consistent with a recent, experimental evaluation of Career Academies—a high school reform that, among other things, provides students with more vocational education than they would otherwise have received (Kemple 2001). The original goals of Career Academies were to both reduce dropping out among students who were at risk of dropping out, and to prepare them for the labor market. Since then, the goals of Career Academies have been expanded to include preparing students for college. Part of the approach for meeting these goals is to have students pursue a program of study that combines academic and career or technical education. An experimental evaluation of Career Academies was recently completed based on students who were scheduled to graduate high school by 1998. The evaluation found that Career Academies significantly increased the amount of academic and career or technical education

students received, but had no effect on high school graduation. This finding is true for overall students, as well as those who were at risk of dropping out.

Making progress toward dropping out may require developing strategies that target students soon after they enter elementary school. Previous federal efforts to reduce dropping out at the high school level have shown, at best, mixed results, and the effectiveness of more recent efforts have yet to be assessed (U.S. General Accounting Office 2002). Put differently, we currently do not have generally accepted approaches to reduce dropping out. One strand of research suggests that students drop out because of early school failure, which lowers their self-esteem and causes persistent school failure, which, in turn, cause some students to disengage from school and ultimately drop out (Finn 1989; and Alexander et al. 2000). Another strand of research suggests that students drop out because they have different traits than those who graduate, including lower ability, lower motivation, lower expectations about the benefits of graduating, and greater success at jobs typically held by dropouts (Eckstein and Wolpin 1999). Additional research is needed to understand why students drop out. However, if either of these hypotheses is correct, finding ways to reduce dropping out will be a challenging task because the reasons currently hypothesized suggest that students drop out for reasons that develop early in their lives.

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APPENDIX A

TECHNICAL DESCRIPTION OF DATA, METHODS, AND RESULTS

The findings in this report are based on careful statistical analysis of data from the National Education Longitudinal Survey (NELS). There are many technical details pertaining both to the preparation of the data for statistical analysis and the statistical analysis itself. This appendix describes those details.

This appendix consists of three main parts. The first part describes the preparation of the data for analysis, including processing high school transcript data and constructing control variables. The second part describes the statistical analysis, including the hazard model and estimation of predicted probabilities of dropping out for different programs of study. Finally, the complete hazard model results are presented, including the effect of control variables.

A. DATA PREPARATION

Information about dropping out comes from multiple sources which are often inconsistent. A clear understanding of how and when the data were collected is essential to properly define a dropout. For example, one possible mistake would be to misclassify some transfers as dropouts. This is because high schools often do not know that a student has transferred to another school and subsequently graduated. In such a case, someone could be misclassified as a dropout. This type of error would definitely reduce the efficiency of any estimation technique and might even cause a bias if transfers are correlated with course taking.

Careful processing of transcript data is also essential to properly account for the amount of vocational education taken by students. It has been shown previously that vocational course taking is underreported in self-reports relative to actual transcript data. If vocational courses are underreported, then a strong potential for bias exists. Though processing of the transcript data is costly, it is essential for an unbiased estimate of the effect of vocational programs.

This section describes:

- The NELS
- Our Analysis File
- Classification of Courses
- Control Variables

The National Education Longitudinal Study

Our analysis was based on the National Education Longitudinal Study (NELS). The base-year survey of the NELS was conducted in 1988 and contained a nationally representative sample of about 25,000 eighth graders. Follow-up surveys were conducted in 1990, 1992, 1994, and 2000. While respondents were of school age—which includes the 1988, 1990, and 1992 surveys—information was collected from students, one of their parents, two of their teachers, and their school's administrator. For this report, information from the 1988 survey is used to control for students' baseline characteristics and high school transcript data are used to measure the number of credits taken in different fields.

Analysis File

Sample

The sample used to analyze the effect of vocational education on dropping out began with 11,317 students who responded to all four waves of the NELS that are currently available and have transcript data. Students whose transcripts indicate that they transferred, left school for health reasons, or left school for an unknown reason were excluded from the sample. Students who dropped out before starting high school also were excluded from the sample, as were high school graduates who did not complete at least sixteen total credits and some credits in English. Last, the few students who dropped out during the first semester, and the few students who graduated during the fifth and sixth semesters were excluded from the sample because there were not enough students who either dropped out or graduated during these semesters to support the analysis. These exclusions resulted in a final sample size of 10,251 unique students.

High School Status

High school status was based on two pieces of information: (1) the reason why the student left high school according to the 1992 transcript data, and (2) the reason why the student reported leaving high school during the 1994 survey. The transcript data were collected just after most students graduated, whereas the survey data were collected two years after most students graduated. Students who were still enrolled according to the transcript data were classified as still enrolled. Students who either dropped out or graduated after June 1992 were classified as still enrolled. Students who dropped out or aged out according to the transcript data and reported not receiving a high school diploma in the survey data were classified as dropouts. Similarly, students who received a GED according to the transcript data and reported not receiving a high school diploma in the survey data were also classified as dropouts. Students were classified as high school graduates if they received a diploma (standard, honors, or special education) or a certificate of attendance according to the transcript and survey data.

There were some inconsistencies between the transcript and survey data. Some students were coded as having received a high school diploma or certificate of attendance in the transcript data, whereas the survey data indicate that they had received a GED, were working toward an equivalency, or had neither graduated nor received a GED. Some other students were coded as having dropped out or received a GED in the transcript data, whereas the survey data indicate that they received a high school diploma. In these cases, we classified the student as a graduate if he or she earned at least 16 total credits and took at least one course in English. Otherwise, the student was classified as a dropout.

The semester during which students left school was based on information about “date left school” in the 1992 transcript data. We compared “date left school” with the last semester during which a student passed a course. If a dropout passed a course during the semester that the transcript data indicate they dropped out, the “date left school” was changed to the subsequent semester.

Classifying Vocational and Other Course Taking

The NELS contains information about each high school course taken by sample members. For each course, this information includes the title of the course, the academic year and semester during which it was taken, the number of credits earned, and the Classification of Secondary School Courses (CSSC) code of the course. The CSSC contains the title/description and six-digit code for each course offered by high schools.

Using the CSSC code of each course, we placed each course into a Revised Secondary School Taxonomy (RSST) category. The RSST assigns to the same category all courses that, according to their titles/descriptions, cover the same material. Through this method, the more than 2,000 CSSC codes that would otherwise characterize the course-taking behavior of students in our analysis file can be reduced to a little over 100 distinct RSST categories. The RSST categories can also be aggregated into a lower number of broad subject areas. Bradby and Hoachlander (1999) list the CSSC codes included in each RSST category.

We determined the cumulative number of credits that students had earned during each of the eight semesters that span the 1988-1989, 1989-1990, 1990-1991, and 1991-1992 academic years. For example, the cumulative number of credits earned by a student in the fall 1989 semester includes credits earned during the fall 1988 semester, the spring 1989 semester, and the fall 1989 semester. We then classified the credits earned by students into the following 10 categories:

- ***Low-level math.*** This category includes math courses taken most frequently by students who take vocational courses. These include general math, consumer math, pre-algebra, algebra 1, and occupationally related math.
- ***High-level math.*** This category includes math courses taken most frequently by students who take academic courses. These include geometry, algebra 2 through pre-calculus, advanced math, and unified math.
- ***Low-level science.*** This category includes science courses taken most frequently by students who take vocational courses. These include biological science, earth science, and physical science.
- ***High-level science.*** This category includes science courses taken most frequently by students who take academic courses. These include survey science, chemistry, and physics.
- ***English courses.*** This category includes all English courses: English as a Second Language, English survey language skills, English survey grades 7 and 8, English survey ESE/functional, English survey basic grades 9 through 12, English survey regular grades 9 through 12, English survey advanced/honors grades 9 through 12, literature, composition and writing, and speech.
- ***Social studies.*** This category includes all social studies courses: American history, world history, government and politics, economics, behavioral sciences, geography, social sciences, and humanities.

- ***Fine arts and foreign language.*** This category includes all fine arts courses: visual arts, music, dance, and theater arts. It also includes all foreign language courses: Spanish, French, German, Latin, Italian, and other languages.

- ***Family and consumer sciences education and general labor market preparation.*** This category includes all family and consumer sciences education ("Voc A") courses: home economics, child development, clothing, construction, consumer education, and food and nutrition. It also includes all general labor market preparation ("Voc B") courses: basic keyboarding/typewriting, industrial arts, career preparation/general work experience, and technology education.

- ***Specific labor market preparation.*** This category includes all courses in the 10 specific labor market preparation ("Voc C") areas: agriculture and renewable resources, business, marketing and distribution, health care, public and protective services, trade and industry, technology and communications, personal and other services, food service and hospitality, and child care and education.

- ***Enrichment/other courses.*** This category includes all enrichment courses: general skills, health, physical, and recreational education, religion and theology, and military science.

The number of credits students earned during the fall and spring semesters of a particular academic year was determined according to the following criteria:

- Credits earned in first semester, first trimester, and first and second quarter courses were attributed to the fall semester.

- Credits earned in second semester, third trimester, and third and fourth quarter courses were attributed to the spring semester.

- Credits earned in yearlong and second trimester courses were divided equally between the fall and spring semesters.

- Courses with ambiguous information for the term during which they were taken were randomly assigned to one of the two semesters of the academic year.

- Courses with missing information for the term during which they were taken were treated as yearlong courses and divided equally between the fall and spring semesters, provided the student received at least one credit for the course; otherwise, the course was treated as a semester-long course and randomly assigned to one of the two semesters of the academic year.

- Courses taken during other academic years—such as before high school—were not counted.

- If a student either dropped out or graduated during the fall semester, all credits earned during that academic year were attributed to the fall semester.

Other Variables Used in the Analysis

We included in the models several characteristics of students, their parents, and their schools. These include characteristics that previous work we did indicates are related to vocational education participation (Agodini et al. 2002). The full set of characteristics is:

Sex

Race/ethnicity

Socioeconomic status

Disability status

Number of risk factors

Pre-high school math and reading test scores

Pre-high school educational aspirations

High school geographic location

High school level of urbanicity

Type of high school, including public/other and voc-tech/not.

High school free and reduced-price lunch participation

High school academic standards

B. STATISTICAL METHODOLOGIES AND ISSUES

Once the data have been properly prepared, appropriate statistical methodologies must be chosen. The timing of course taking and dropping out is complicated and can cause bias if not modeled accurately. Therefore, the discrete time hazard model is an essential part of our analysis. Other important methodological issues include correcting for measurement error in test scores (an important control variable), weights, and calculating predicted probabilities of dropping out for different programs of study.

This section describes:

- Adjustments for measurement error in prior achievement
- Weights
- Discrete time hazard model
- Predicted probabilities of dropping out

Adjusting for Measurement Error in Prior Achievement

If a variable in a statistical model is measured with error, the parameter estimate for that variable will be downward-biased and parameter estimates for other variables included in the statistical model that are correlated with that variable will be either upward- or downward-biased. Two particularly important variables in the statistical models estimated in this study are eighth grade math and reading test scores. These variables adjust for the inherent ability of students and the courses taken before high school.

Since previous research suggests that test scores measured with error can lead to misleading results about the effect of course-taking on student outcomes (Meyer 1992), we included predicted test scores in our analyses instead of actual test scores. The predicted scores were based on parameter estimates of a statistical model that regressed the actual eighth grade test scores on variables that were hypothesized to affect "true" student achievement, but not any measurement error that might exist in "measured" student achievement. Ideally, we would like to include in this statistical model course taking just before students were administered the eighth grade tests, since Meyer (1992) showed that this information helps create a predicted score that more accurately adjusts for prior achievement. Unfortunately, the NELS does not contain middle school transcript information. Therefore, we used other variables that are hypothesized to affect true eighth grade achievement—including self-reported course taking during the past year; self-reported grades obtained in last year's course taking; feeling/attitudes about school; educational aspirations; and family background. In work that is available on request, we found that the variables we used to create predicted test scores perform as well as the ones Meyer (1992) used.

Weights

All statistics were computed using weights in order to ensure that our analysis is based on a nationally representative sample. A weight provided by the NELS (F3PNLWT) applies to students who responded to all four surveys—one of the criteria that students had to meet in order to be included in our analysis files. However, students also had to have transcript information to be included in our analysis files. If students who have transcript information were similar to those how did not, the weight provided by the NELS would have been adequate. However, students who have transcript information differ from those who do not. In particular, various characteristics of students (age, sex, race, socioeconomic status, achievement, educational expectations, risk of dropping out) and the schools they attended (type, region, level of urbanicity) affected the likelihood of having transcript information. We used these characteristics and the weight provided by the NELS (F3PNLWT) to produce a weight that applies to students in our analysis files. In particular, using students who responded to all four NELS surveys, we estimated a weighted logistic regression to determine each student's predicted probability of having transcript information. The inverse of this predicted probability was multiplied by the weight provided by the NELS to produce a weight that applies to students in our analysis files.

Discrete-Time Competing-Risk Hazard Model

To determine the effect of vocational education on dropping out, we estimated a discrete-time competing-risk hazard model. In our context, the term "hazard" means the probability that a student either drops out or graduates during a particular semester, given that the student had not dropped out or graduated before that semester. It is a "competing-risk" model because there are two possible outcomes—dropping out or graduating—rather than just one. (Students who are still enrolled at the end of the follow-up period are considered to be censored observations.) It is a "discrete-time" model because time is measured in semesters, as opposed to a more continuous measure, such as days.

Our specification of this model assumes that, among students who are enrolled at the beginning of a particular semester, their high school status at the end of that semester is related to pre-high school achievement, the cumulative number of credits taken in high school up to the prior semester, and their characteristics. For example, the model assumes that, among students who are enrolled at the beginning of the third semester, their high school status at the end of the third semester is related to pre-high school achievement, the cumulative number of credits taken during the first and second semesters of high school, and their characteristics. The credit variables and characteristics included in the model are described below.

Parameters of the model were estimated using a multinomial logit model. The data include one observation for each semester the student was enrolled in high school. Observations are identified by variables that indicate the semester to which the observation pertains. Consider, for example, a student who dropped out during the fourth semester. This student has four observations in the analysis file. High school status on the observations that pertain to semesters one, two, and three are coded as still enrolled, whereas high school status on the observation that pertains to semester four is coded as dropped out. Students who were still enrolled during the eighth semester have eight observations in the analysis file. In addition to all the variables of interest—such as course-taking variables—the multinomial logit model included dummy variables that indicate the semester to which the observation pertains.

To determine the effect of vocational courses on the probability of *ever* dropping out, we first calculated the predicted probability of dropping out during each semester using parameter estimates of the multinomial logit model and appropriately chosen values for the explanatory variables. These predicted probabilities are the hazard rates for each semester. Since the probability of ever dropping out is merely the sum of the unconditional probabilities of dropping out during each semester, these hazards can be used to calculate the unconditional probability of dropping out during each semester. The formula for that is:

$$P\{D_t = 1\} = H_t^d \prod_{i=1}^{t-1} \left(1 - H_i^g - H_i^d\right)$$

where $D_t = 1$ *if dropout during time* t

H_t^d *is the hazard of dropping out during time* t

H_t^g *is the hazard of graduating during time* t

Then, the probability of ever dropping out for person j is:

$$PD_j = \sum_{t=1}^{T} P\{D_t = 1\}$$

Predicted Probabilities of Dropping Out for Different Programs of Study

In order to determine the effect of vocational education relative to other programs of study, we calculate the mean predicted probability of ever dropping out for everyone in the data set using several different patterns of course taking (these were described in Section II). The difference between any two mean predicted probabilities is interpreted as the effect of one of the programs relative to the other. The standard errors of these differences are estimated using bootstrap techniques.

The general procedure for constructing predicted outcomes is:

1. Estimate the hazard model described above, where the probability of dropping out is affected by different course credits and control variables. Save the parameter estimates (the β values) from this step.

2. Choose different programs for which predicted probabilities are desired. For example, one could choose a vocational program having 4 vocational credits and 6 academic credits, or an academic program with 0 vocational credits and 10 academic credits.

3. For each program chosen in step #2 and the parameter estimates from #1, calculate predicted probabilities for every student (PD_j, as described above). This is done by using each student's actual values for control variables, but substituting the values from step #2 for the course credit variables.

4. For each program, average the predicted outcomes across all individuals. Find the difference in average predicted outcomes between two different programs to see the "effect" of one program relative to that of the other.

5. The standard errors of these differences are found through bootstrapping, with 500 replications. Specifically, 500 samples of students are randomly chosen with replacement from the original sample. For each of these samples, the data described

earlier (with multiple semesters per student) are constructed, and the hazard analysis is performed. Desired statistics are recorded for each sample (for example, the difference in the predicted probability of dropping out for a basic academic program and a vocational concentrator program). The variance of each statistic across the 500 replications is then identified, enabling calculations of significance.

C. REGRESSION RESULTS

Tables A.1−A.5 present regression results for the discrete time hazard models estimated for this report. Table A.1 shows results for all students. Tables A.2−A.5 show results for the subgroups no college plans, low achievers, poor schools, and high academic standards. The subgroup models were estimated using the full sample, but with an interaction between a subgroup indicator, vocational credits, the vocational concentrator variable, and interactions of vocational credits and low-level academic credits.

The values presented in the tables are marginal effects based on parameter estimates. Since parameter estimates have no clear interpretation beyond sign and significance, we chose to present the marginal effect of an additional unit of a given variable on the probability of dropping out in any given semester. This is the effect on the hazard rate, not the marginal effect on the probability of ever dropping out (although, clearly, these two are very closely related). To find the full marginal effect of occupational courses, it is necessary to take into account the marginal effect on the occupational variable and the effect of the interaction between occupational and low-level academic credits (the 9th, 11th, and 12th rows in Tables A.1−A.5). To see the effect of concentration while holding all else equal, see the 10th row in each table.

TABLE A.1

MARGINAL EFFECTS OF COURSES AND CHARACTERISTICS ON HIGH SCHOOL STATUS, ALL STUDENTS

	Dropped Out	Graduated	Still Enrolled
Cumulative Number of Credits Earned In:			
Academic Courses[a]			
Low-level math	-0.004**	0.004***	0.0002***
High-level math	-0.011***	0.004***	0.006
Low-level science	-0.007***	0.003***	0.003***
High-level science	-0.005**	0.001**	0.003
English	-0.005***	0.005***	-0.001*
Social studies	-0.005***	0.004***	0.001
Other academic classes	-0.005***	0.002***	0.003**
Vocational Courses			
General labor market preparation and family and consumer sciences education	-0.004***	0.003***	0.002
Specific labor market preparation	-0.005***	0.004***	0.002***
Concentration indicator	-0.002	0.002	0
Enrichment/Other Courses	-0.005***	0.002***	0.003**
Course Interactions			
SLMP* low-level math	0	-0.001***	0.001**
SLMP* low-level science	0.002**	-0.0005**	-0.001***
Semester Dummies			
Third	0.008***	-0.00001***	-0.008***
Fourth	0.015***	-0.00001***	-0.015***
Fifth	0.067***	-0.00001***	-0.067***
Sixth	0.099***	-0.00001***	-0.099***
Seventh	0.22***	0.022***	-0.241***
Eighth	0.213***	0.005***	-0.218***
Ninth	0.397***	0.352***	-0.749***
Pre-High School Student Characteristics			
Sex			
Male	-0.006***	-0.002**	0.008***
Female			
Race/Ethnicity			
White/Other			
Black	-0.007***	-0.004***	0.012***
Hispanic	-0.004**	-0.003**	0.007**
Socioeconomic Status			
1st Quartile (lowest)	0.009***	-0.002	-0.008**
2nd Quartile	0.007**	-0.001	-0.006
3rd Quartile	0.005*	0	-0.005*
4th Quartile (highest)			

TABLE A.1 (*continued*)

	Dropped Out	Graduated	Still Enrolled
Student Has a Disability			
Yes	0.002	-0.001	-0.001
No			
Ever Held Back			
Yes	0.011***	-0.001	-0.009***
No			
Number of Risk Factorsb			
None or one			
Two or more	0.003	0	-0.003**
Math Test Score\d			
Lowest third	-0.003	0.003*	0
Middle third	-0.002	0.001	0.001
Highest third			
Reading Test Score\d			
Lowest third	0.006	-0.003	-0.003
Middle third	0.006*	0	-0.006
Highest third			
Time Spent Doing Homework Per Week			
Less than three hours	-0.001	0.001	0
Three hours or more			
Educational Aspirations			
High school diploma or less	0.006***	0.001	-0.007***
Pursue postsecondary education			
Locus of Control			
Lowest third	0.001	-0.002***	0.002
Middle or highest third			
Pre-High School Parent Characteristics			
Mother's Education			
High school diploma or less	0.002	0.001	-0.003
Any post-secondary education			
High School Characteristics			
Geographic Location			
Northeast	0	-0.003***	0.003
North Central	-0.005*	0.003**	0.002
South	-0.001	-0.001	0.001
West			
Level of Urbanicity			
Urban			
Suburban	0	0	0
Rural	0.001	0	-0.001
Type of School			
Public	-0.001	0.002	-0.001
Other			

TABLE A.1 (*continued*)

	Dropped Out	Graduated	Still Enrolled
Vocational/Technical School			
Yes	0.003	-0.001	-0.002
No			
Percent Receives Free/Reduced-Price Lunch			
Less than or equal to 50 percent			
More than 50 percent	-0.001	0	0
School Requires New Basics			
Yes	-0.001	-0.003***	0.004
No			
Unweighted Sample Size			

Source: Authors' calculations based on the National Education Longitudinal Study (NELS). Statistics were computed using sample weights.

Note: Marginal effects are based on parameter estimates of a multinomial logit model, which regressed the outcome on all of the characteristics in the table. The "---" indicates the reference category within each characteristic. For example, the number in the row labeled "specific labor market preparation" and the column labeled "overall 1992 high school graduates" indicates the change in the outcome from taking an additional credit in occupational courses, all other characteristics in the table held equal. The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

[a]"High level" refers to classes taken most frequently by students who pursue an academic curriculum while "low-level" refers to classes taken most frequently by students who pursue a vocational curriculum. Low-level academic classes are general math, consumer math, pre-algebra, algebra 1, occupationally related math, biological science, earth science, physical science, and engineering. High-level academic classes are geometry, algebra 2 through pre-calculus, advanced math, unified math, survey science, chemistry, and physics.

[b]This variable measures the number of "at risk of school failure" factors that were present for the student. The factors include the following six measures: limited English proficiency, sibling dropped out of high school, home alone for more than three hours a day, parent is single, parent has less than a high school diploma, and income less than $15,000.

[c]Predicted test scores were included in the model, instead of actual test scores. The predicted scores were based on parameter estimates of a statistical model that regressed the actual scores on variables that were hypothesized to affect "true" student achievement, but not any measurement error that might exist in "measured" student achievement. We used these types of variables in the interest of creating predicted test scores that were purged of measurement error. Using test scores that are purged of measurement error ensures that the coefficient on the test score variable is not downward biased, and that coefficients on other variables that are correlated with test scores are not biased (either upward or downward).

[d]The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

*Significantly different from zero at the .10 level, two-tailed test
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

TABLE A.2

MARGINAL EFFECTS OF COURSES AND CHARACTERISTICS ON HIGH SCHOOL STATUS, STUDENTS WITH NO COLLEGE PLANS

	Dropped Out	Graduated	Still Enrolled
Cumulative Number of Credits Earned In:			
Academic Courses[a]			
Low-level math	-0.005***	0.004***	0.001***
High-level math	-0.012***	0.005***	0.007
Low-level science	-0.007***	0.003***	0.004***
High-level science	-0.006***	0.001**	0.005
English	-0.004***	0.005***	-0.001
Social studies	-0.004***	0.004***	0
Other academic classes	-0.006***	0.002***	0.004**
Vocational Courses			
General labor market preparation and family and consumer sciences education	-0.004***	0.003***	0.001
Specific labor market preparation	-0.006***	0.003***	0.002***
Concentration indicator	0.004	0.002	-0.006
Enrichment/Other Courses	-0.005***	0.002***	0.003*
Course Interactions			
SLMP* low-level math	0	0***	0.001**
SLMP* low-level science	0.002	0	-0.001***
Subgroup Variables			
Subgroup* Low-level math	0.004	0.001	-0.005*
Subgroup* High-level math	0.002	-0.002	-0.001
Subgroup* Low-level science	0.001	-0.002	0.001
Subgroup* High-level science	0.005	0.001	-0.006
Subgroup* English	-0.003*	0.002	0.002
Subgroup* Social studies	-0.002	0	0.003**
Subgroup* Other academic classes	0.002	0	-0.002
Subgroup* Other vocational classes	-0.001	-0.001	0.002**
Subgroup* Enrichment	0.002	0.001	-0.004
Subgroup* SLMP	-0.001	0.001*	0
Subgroup* SLMP* low-level math	0	0	0.001
Subgroup* SLMP* low-level science	0	0	0
Subgroup* Concentration indicator	-0.012***	0.002	0.01
Semester Dummies			
Third	0.008***	-0.00001***	-0.008***
Fourth	0.015***	-0.00001***	-0.015***
Fifth	0.067***	-0.00001***	-0.067***
Sixth	0.101***	-0.00001***	-0.101***
Seventh	0.223***	0.022***	-0.245***
Eighth	0.216***	0.005***	-0.222***
Ninth	0.396***	0.351***	-0.747***

TABLE A.2 (*continued*)

	Dropped Out	Graduated	Still Enrolled
Pre-High School Student Characteristics			
Sex			
Male	-0.007***	-0.002**	0.008***
Female			
Race/Ethnicity			
White/Other			
Black	-0.007***	-0.004***	0.012***
Hispanic	-0.004**	-0.003**	0.007**
Socioeconomic Status			
1st Quartile (lowest)	0.009***	-0.002	-0.008**
2nd Quartile	0.007**	-0.001	-0.005*
3rd Quartile	0.006*	0	-0.005*
4th Quartile (highest)			
Student Has a Disability			
Yes	0.002	-0.002	0
No			
Ever Held Back			
Yes	0.01***	-0.001	-0.009***
No			
Number of Risk Factors[b]			
None or one			
Two or more	0.003*	0.001	-0.004**
Math Test Score[c]			
Lowest third	-0.003	0.003*	0
Middle third	-0.002	0.001	0.001
Highest third			
Reading Test Score[d]			
Lowest third	0.006*	-0.003	-0.004
Middle third	0.006*	0	-0.006*
Highest third			
Time Spent Doing Homework Per Week			
Less than three hours	-0.001	0.001	0
Three hours or more			
Educational Aspirations			
High school diploma or less	0.008**	-0.009	0.001***
Pursue postsecondary education			
Locus of Control			
Lowest third	0.001	-0.002***	0.002
Middle or highest third			
Pre-High School Parent Characteristics			
Mother's Education			
High school diploma or less	0.002	0.001	-0.003
Any post-secondary education			

TABLE A.2 (*continued*)

	Dropped Out	Graduated	Still Enrolled
High School Characteristics			
Geographic Location			
Northeast	0	-0.004***	0.004
North Central	-0.005**	0.003**	0.003
South	-0.001	-0.001	0.001
West			
Level of Urbanicity			
Urban			
Suburban	0	0	-0.001
Rural	0.002	0	-0.001
Type of School			
Public	-0.001	0.002	-0.001
Other			
Vocational/Technical School			
Yes	0.003	-0.001	-0.002
No			
Percent Receives Free/Reduced-Price Lunch			
Less than or equal to 50 percent			
More than 50 percent	-0.001	0	0.001
School Requires New Basics			
Yes	-0.001	-0.003***	0.004
No			
Unweighted Sample Size			

Source: Authors' calculations based on the National Education Longitudinal Study (NELS). Statistics were computed using sample weights.

Note: Marginal effects are based on parameter estimates of a multinomial logit model, which regressed the outcome on all of the characteristics in the table. The "---" indicates the reference category within each characteristic. For example, the number in the row labeled "specific labor market preparation" and the column labeled "overall 1992 high school graduates" indicates the change in the outcome from taking an additional credit in occupational courses, all other characteristics in the table held equal. The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

[a]"High level" refers to classes taken most frequently by students who pursue an academic curriculum while "low-level" refers to classes taken most frequently by students who pursue a vocational curriculum. Low-level academic classes are general math, consumer math, pre-algebra, algebra 1, occupationally related math, biological science, earth science, physical science, and engineering. High-level academic classes are geometry, algebra 2 through pre-calculus, advanced math, unified math, survey science, chemistry, and physics.

[b]This variable measures the number of "at risk of school failure" factors that were present for the student. The factors include the following six measures: limited English proficiency, sibling dropped out of high school, home alone for more than three hours a day, parent is single, parent has less than a high school diploma, and income less than $15,000.

TABLE A.2 (*continued*)

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[c]Predicted test scores were included in the model, instead of actual test scores. The predicted scores were based on parameter estimates of a statistical model that regressed the actual scores on variables that were hypothesized to affect "true" student achievement, but not any measurement error that might exist in "measured" student achievement. We used these types of variables in the interest of creating predicted test scores that were purged of measurement error. Using test scores that are purged of measurement error ensures that the coefficient on the test score variable is not downward biased, and that coefficients on other variables that are correlated with test scores are not biased (either upward or downward).

[d]The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

*Significantly different from zero at the .10 level, two-tailed test
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

TABLE A.3

MARGINAL EFFECTS OF COURSES AND CHARACTERISTICS ON HIGH SCHOOL STATUS, STUDENTS WITH LOW ACADEMIC ACHIEVEMENT

	Dropped Out	Graduated	Still Enrolled
Cumulative Number of Credits Earned In:			
Academic Courses[a]			
Low-level math	-0.004	0.003***	0.0002***
High-level math	-0.014***	0.004***	0.009*
Low-level science	-0.008***	0.003***	0.005***
High-level science	-0.004	0.002**	0.002
English	-0.002	0.006***	-0.004
Social studies	-0.003***	0.004***	-0.001
Other academic classes	-0.006***	0.002***	0.004*
Vocational Courses			
General labor market preparation and family and consumer sciences education	-0.003***	0.003***	0
Specific labor market preparation	-0.006**	0.002***	0.004***
Concentration indicator	-0.005	0	0.005
Enrichment/Other Courses	-0.006***	0.002***	0.005**
Course Interactions			
SLMP* low-level math	-0.001*	0	0.001
SLMP* low-level science	0.003***	0	-0.003***
Subgroup Variables			
Subgroup* Low-level math	0	0	-0.001
Subgroup* High-level math	0.005	0.002	-0.007***
Subgroup* Low-level science	0.002	-0.001	-0.001
Subgroup* High-level science	-0.002	0	0.002***
Subgroup* English	-0.004*	-0.002*	0.006***
Subgroup* Social studies	-0.003	-0.001	0.004***
Subgroup* Other academic classes	0.001	0	-0.001
Subgroup* Other vocational classes	-0.002	0	0.002**
Subgroup* Enrichment	0.002	0.003***	-0.004
Subgroup* SLMP	0.002	0.002***	-0.004
Subgroup* SLMP* low-level math	0.001	-0.001***	0
Subgroup* SLMP* low-level science	-0.002*	0	0.003***
Subgroup* Concentration indicator	0.008	0.003	-0.011
Semester Dummies			
Third	0.008***	-0.00001***	-0.008***
Fourth	0.015***	-0.00001***	-0.015***
Fifth	0.063***	-0.00001***	-0.063***
Sixth	0.094***	-0.00001***	-0.094***
Seventh	0.211***	0.023***	-0.234***
Eighth	0.202***	0.005***	-0.208***
Ninth	0.394***	0.345**	-0.738***

TABLE A.3 (*continued*)

	Dropped Out	Graduated	Still Enrolled
Pre-High School Student Characteristics			
Sex			
Male	-0.007***	-0.001**	0.008***
Female			
Race/Ethnicity			
White/Other			
Black	-0.007***	-0.004***	0.011***
Hispanic	-0.004**	-0.003**	0.007***
Socioeconomic Status			
1st Quartile (lowest)	0.009**	-0.002	-0.007**
2nd Quartile	0.007**	-0.002	-0.006
3rd Quartile	0.006*	0	-0.006
4th Quartile (highest)			
Student Has a Disability			
Yes	0.002	-0.001	0
No			
Ever Held Back			
Yes	0.011***	-0.001	-0.009***
No			
Number of Risk Factors[b]			
None or one			
Two or more	0.003	0.001	-0.004**
Math Test Score[c]			
Lowest third	-0.002	0.004*	-0.001***
Middle third	-0.004	0.001	0.003
Highest third			
Reading Test Score[d]			
Lowest third	0.009**	-0.001	-0.008***
Middle third	0.005*	0	-0.004
Highest third			
Time Spent Doing Homework Per Week			
Less than three hours	-0.001	0.001	0
Three hours or more			
Educational Aspirations			
High school diploma or less	0.006***	0.001	-0.007***
Pursue postsecondary education			
Locus of Control			
Lowest third	0	-0.002***	0.002
Middle or highest third			
Pre-High School Parent Characteristics			
Mother's Education			
High school diploma or less	0.002	0.001	-0.003
Any post-secondary education			

TABLE A.3 (*continued*)

	Dropped Out	Graduated	Still Enrolled
High School Characteristics			
Geographic Location			
Northeast	0	-0.003***	0.003
North Central	-0.005**	0.003**	0.003
South	-0.001	-0.001	0.001
West			
Level of Urbanicity			
Urban			
Suburban	0	0	0
Rural	0.001	0	-0.001
Type of School			
Public	-0.002	0.001	0
Other			
Vocational/Technical School			
Yes	0.003	-0.001	-0.002
No			
Percent Receives Free/Reduced-Price Lunch			
Less than or equal to 50 percent			
More than 50 percent	0	0	0
School Requires New Basics			
Yes	-0.002	-0.003***	0.004
No			
Unweighted Sample Size			

Source: Authors' calculations based on the National Education Longitudinal Study (NELS). Statistics were computed using sample weights.

Note: Marginal effects are based on parameter estimates of a multinomial logit model, which regressed the outcome on all of the characteristics in the table. The "---" indicates the reference category within each characteristic. For example, the number in the row labeled "specific labor market preparation" and the column labeled "overall 1992 high school graduates" indicates the change in the outcome from taking an additional credit in occupational courses, all other characteristics in the table held equal. The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

[a]"High level" refers to classes taken most frequently by students who pursue an academic curriculum while "low-level" refers to classes taken most frequently by students who pursue a vocational curriculum. Low-level academic classes are general math, consumer math, pre-algebra, algebra 1, occupationally related math, biological science, earth science, physical science, and engineering. High-level academic classes are geometry, algebra 2 through pre-calculus, advanced math, unified math, survey science, chemistry, and physics.

[b]This variable measures the number of "at risk of school failure" factors that were present for the student. The factors include the following six measures: limited English proficiency, sibling dropped out of high school, home alone for more than three hours a day, parent is single, parent has less than a high school diploma, and income less than $15,000.

TABLE A.3 (*continued*)

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[c]Predicted test scores were included in the model, instead of actual test scores. The predicted scores were based on parameter estimates of a statistical model that regressed the actual scores on variables that were hypothesized to affect "true" student achievement, but not any measurement error that might exist in "measured" student achievement. We used these types of variables in the interest of creating predicted test scores that were purged of measurement error. Using test scores that are purged of measurement error ensures that the coefficient on the test score variable is not downward biased, and that coefficients on other variables that are correlated with test scores are not biased (either upward or downward).

[d]The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

*Significantly different from zero at the .10 level, two-tailed test
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

TABLE A.4

MARGINAL EFFECTS OF COURSES AND CHARACTERISTICS ON HIGH SCHOOL STATUS, STUDENTS IN SCHOOLS WITH HIGH POVERTY

	Dropped Out	Graduated	Still Enrolled
Cumulative Number of Credits Earned In:			
Academic Courses[a]			
Low-level math	-0.004***	0.004***	0.0002***
High-level math	-0.012***	0.005***	0.007
Low-level science	-0.007***	0.003***	0.003***
High-level science	-0.003*	0.001*	0.002
English	-0.004***	0.005***	-0.001
Social studies	-0.005***	0.004***	0.001
Other academic classes	-0.005***	0.002***	0.003***
Vocational Courses			
General labor market preparation and family and consumer sciences education	-0.005***	0.003***	0.002
Specific labor market preparation	-0.006***	0.004***	0.002***
Concentration indicator	-0.002	0.002	0
Enrichment/Other Courses	-0.006***	0.002***	0.004**
Course Interactions			
SLMP* low-level math	0	-0.001***	0.001**
SLMP* low-level science	0.002**	-0.001**	-0.001***
Subgroup Variables			
Subgroup* Low-level math	0.002	-0.006**	0.004
Subgroup* High-level math	0.006*	-0.001	-0.006
Subgroup* Low-level science	-0.001	-0.001	0.002
Subgroup* High-level science	-0.013***	0.004***	0.009
Subgroup* English	-0.002	0.002	0
Subgroup* Social studies	0	-0.002	0.001
Subgroup* Other academic classes	0	0.002***	-0.002
Subgroup* Other vocational classes	0.002	0.001	-0.004
Subgroup* Enrichment	0.003	-0.003**	0
Subgroup* SLMP	0.001	0.001	-0.002
Subgroup* SLMP* low-level math	0.001	0.002***	-0.002
Subgroup* SLMP* low-level science	-0.001	0.001	0
Subgroup* Concentration indicator	-0.003	0.001	0.002
Semester Dummies			
Third	0.008***	-0.00001***	-0.008***
Fourth	0.015***	-0.00001***	-0.015***
Fifth	0.067***	-0.00001***	-0.067***
Sixth	0.099***	-0.00001***	-0.099***
Seventh	0.22***	0.022***	-0.242***
Eighth	0.213***	0.005***	-0.218***
Ninth	0.396***	0.35***	-0.746***

TABLE A.4 (*continued*)

	Dropped Out	Graduated	Still Enrolled
Pre-High School Student Characteristics			
Sex			
Male	-0.006***	-0.002**	0.008***
Female			
Race/Ethnicity			
White/Other			
Black	-0.007***	-0.004***	0.011***
Hispanic	-0.004**	-0.003**	0.007**
Socioeconomic Status			
1st Quartile (lowest)	0.01***	-0.002	-0.008**
2nd Quartile	0.007**	-0.001	-0.006
3rd Quartile	0.005*	0	-0.005*
4th Quartile (highest)			
Student Has a Disability			
Yes	0.002	-0.001	0
No			
Ever Held Back			
Yes	0.011***	-0.001	-0.009***
No			
Number of Risk Factors[b]			
None or one			
Two or more	0.003*	0.001	-0.004**
Math Test Score[c]			
Lowest third	-0.003	0.003*	0
Middle third	-0.002	0.001	0.001
Highest third			
Reading Test Score[d]			
Lowest third	0.006	-0.003*	-0.003
Middle third	0.006*	0	-0.006
Highest third			
Time Spent Doing Homework Per Week			
Less than three hours	-0.001	0.001	0
Three hours or more			
Educational Aspirations			
High school diploma or less	0.006***	0.001	-0.007***
Pursue postsecondary education			
Locus of Control			
Lowest third	0.001	-0.002***	0.002
Middle or highest third			
Pre-High School Parent Characteristics			
Mother's Education			
High school diploma or less	0.003	0.001	-0.003
Any post-secondary education			

TABLE A.4 (*continued*)

	Dropped Out	Graduated	Still Enrolled
High School Characteristics			
Geographic Location			
Northeast	0	-0.003***	0.004
North Central	-0.005*	0.003***	0.002
South	0	-0.001	0.001
West			
Level of Urbanicity			
Urban			
Suburban	0	0	-0.001
Rural	0.002	0	-0.002
Type of School			
Public	-0.001	0.002	-0.001
Other			
Vocational/Technical School			
Yes	0.003	-0.002	-0.001
No			
Percent Receives Free/Reduced-Price Lunch			
Less than or equal to 50 percent			
More than 50 percent	-0.003	-0.002	0.005
School Requires New Basics			
Yes	-0.001	-0.003***	0.004
No			
Unweighted Sample Size			

Source: Authors' calculations based on the National Education Longitudinal Study (NELS). Statistics were computed using sample weights.

Note: Marginal effects are based on parameter estimates of a multinomial logit model, which regressed the outcome on all of the characteristics in the table. The "---" indicates the reference category within each characteristic. For example, the number in the row labeled "specific labor market preparation" and the column labeled "overall 1992 high school graduates" indicates the change in the outcome from taking an additional credit in occupational courses, all other characteristics in the table held equal. The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

[a]"High level" refers to classes taken most frequently by students who pursue an academic curriculum while "low-level" refers to classes taken most frequently by students who pursue a vocational curriculum. Low-level academic classes are general math, consumer math, pre-algebra, algebra 1, occupationally related math, biological science, earth science, physical science, and engineering. High-level academic classes are geometry, algebra 2 through pre-calculus, advanced math, unified math, survey science, chemistry, and physics.

[b]This variable measures the number of "at risk of school failure" factors that were present for the student. The factors include the following six measures: limited English proficiency, sibling dropped out of high school, home alone for more than three hours a day, parent is single, parent has less than a high school diploma, and income less than $15,000.

TABLE A.4 (*continued*)

[c]Predicted test scores were included in the model, instead of actual test scores. The predicted scores were based on parameter estimates of a statistical model that regressed the actual scores on variables that were hypothesized to affect "true" student achievement, but not any measurement error that might exist in "measured" student achievement. We used these types of variables in the interest of creating predicted test scores that were purged of measurement error. Using test scores that are purged of measurement error ensures that the coefficient on the test score variable is not downward biased, and that coefficients on other variables that are correlated with test scores are not biased (either upward or downward).

[d]The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

*Significantly different from zero at the .10 level, two-tailed test
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

TABLE A.5

MARGINAL EFFECTS OF COURSES AND CHARACTERISTICS ON HIGH SCHOOL STATUS, STUDENTS IN SCHOOLS WITH HIGH ACADEMIC STANDARDS

	Dropped Out	Graduated	Still Enrolled
Cumulative Number of Credits Earned In:			
Academic Courses[a]			
Low-level math	-0.004**	0.002**	0.002***
High-level math	-0.01***	0.004***	0.006
Low-level science	-0.008***	0.003***	0.005***
High-level science	-0.005**	0.002***	0.003
English	-0.005***	0.005***	-0.0002**
Social studies	-0.005***	0.004***	0.001
Other academic classes	-0.006***	0.002***	0.004**
Vocational Courses			
General labor market preparation and family and consumer sciences education	-0.004***	0.003***	0.001
Specific labor market preparation	-0.006***	0.002***	0.004***
Concentration indicator	-0.004	0	0.003
Enrichment/Other Courses	-0.006***	0.002***	0.004***
Course Interactions			
SLMP* low-level math	0	0.0005**	-0.0005*
SLMP* low-level science	0.002**	0	-0.002***
Subgroup Variables			
Subgroup* Low-level math	0.002	0	-0.002
Subgroup* High-level math	-0.005	0.001	0.004
Subgroup* Low-level science	0.007	0.001	-0.008**
Subgroup* High-level science	-0.002	0	0.001
Subgroup* English	0.001	0.001	-0.002
Subgroup* Social studies	-0.001	-0.001*	0.002
Subgroup* Other academic classes	0.004***	-0.001***	-0.003
Subgroup* Other vocational classes	-0.001	-0.001*	0.003
Subgroup* Enrichment	0.009**	0.002	-0.011
Subgroup* SLMP	0.001	0.001**	-0.002***
Subgroup* SLMP* low-level math	-0.002	-0.001***	0.003
Subgroup* SLMP* low-level science	-0.004**	0	0.004*
Subgroup* Concentration indicator	0.013	0.005*	-0.018
Semester Dummies			
Third	0.008***	-0.00001***	-0.008***
Fourth	0.016***	-0.00001***	-0.016***
Fifth	0.067***	-0.00001***	-0.067***
Sixth	0.1***	-0.00001***	-0.1***
Seventh	0.221***	0.023***	-0.244***
Eighth	0.214***	0.006***	-0.219***
Ninth	0.398***	0.346***	-0.744***

TABLE A.5 (*continued*)

	Dropped Out	Graduated	Still Enrolled
Pre-High School Student Characteristics			
Sex			
Male	-0.006***	-0.002**	0.008***
Female			
Race/Ethnicity			
White/Other			
Black	-0.007***	-0.004***	0.011***
Hispanic	-0.004**	-0.003**	0.007***
Socioeconomic Status			
1st Quartile (lowest)	0.009**	-0.002	-0.008**
2nd Quartile	0.007**	-0.001	-0.005
3rd Quartile	0.006*	0	-0.006*
4th Quartile (highest)			
Student Has a Disability			
Yes	0.002	-0.001	-0.001
No			
Ever Held Back			
Yes	0.01***	-0.001	-0.009***
No			
Number of Risk Factorsb			
None or one			
Two or more	0.003	0.001	-0.003**
Math Test Score\d			
Lowest third	-0.003	0.003	0
Middle third	-0.002	0.001	0.001
Highest third			
Reading Test Score\d			
Lowest third	0.006*	-0.003	-0.004
Middle third	0.006*	0	-0.006
Highest third			
Time Spent Doing Homework Per Week			
Less than three hours	-0.001	0.001	0
Three hours or more			
Educational Aspirations			
High school diploma or less	0.006***	0.001	-0.007***
Pursue postsecondary education			
Locus of Control			
Lowest third	0	-0.002***	0.002
Middle or highest third			
Pre-High School Parent Characteristics			
Mother's Education			
High school diploma or less	0.003	0.001	-0.004
Any post-secondary education			

TABLE A.5 (*continued*)

	Dropped Out	Graduated	Still Enrolled
High School Characteristics			
Geographic Location			
Northeast	0	-0.004***	0.004
North Central	-0.005**	0.003**	0.003
South	-0.001	-0.001	0.002
West			
Level of Urbanicity			
Urban			
Suburban	0	0	-0.001
Rural	0.002	0	-0.002
Type of School			
Public	-0.001	0.002*	-0.001
Other			
Vocational/Technical School			
Yes	0.003	0	-0.003
No			
Percent Receives Free/Reduced-Price Lunch			
Less than or equal to 50 percent			
More than 50 percent	-0.001	0	0
School Requires New Basics			
Yes	-0.012***	-0.006	0.018***
No			
Unweighted Sample Size			

Source: Authors' calculations based on the National Education Longitudinal Study (NELS). Statistics were computed using sample weights.

Note: Marginal effects are based on parameter estimates of a multinomial logit model, which regressed the outcome on all of the characteristics in the table. The "---" indicates the reference category within each characteristic. For example, the number in the row labeled "specific labor market preparation" and the column labeled "overall 1992 high school graduates" indicates the change in the outcome from taking an additional credit in occupational courses, all other characteristics in the table held equal. The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

[a]"High level" refers to classes taken most frequently by students who pursue an academic curriculum while "low-level" refers to classes taken most frequently by students who pursue a vocational curriculum. Low-level academic classes are general math, consumer math, pre-algebra, algebra 1, occupationally related math, biological science, earth science, physical science, and engineering. High-level academic classes are geometry, algebra 2 through pre-calculus, advanced math, unified math, survey science, chemistry, and physics.

[b]This variable measures the number of "at risk of school failure" factors that were present for the student. The factors include the following six measures: limited English proficiency, sibling dropped out of high school, home alone for more than three hours a day, parent is single, parent has less than a high school diploma, and income less than $15,000.

TABLE A.5 (*continued*)

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[c]Predicted test scores were included in the model, instead of actual test scores. The predicted scores were based on parameter estimates of a statistical model that regressed the actual scores on variables that were hypothesized to affect "true" student achievement, but not any measurement error that might exist in "measured" student achievement. We used these types of variables in the interest of creating predicted test scores that were purged of measurement error. Using test scores that are purged of measurement error ensures that the coefficient on the test score variable is not downward biased, and that coefficients on other variables that are correlated with test scores are not biased (either upward or downward).

[d]The marginal effect for a particular characteristic was considered to be statistically significant if the multinomial logit coefficient for that characteristic was statistically significant. The complex sample design of the NELS was taken into consideration when calculating the statistical significance of the multinomial logit coefficients.

*Significantly different from zero at the .10 level, two-tailed test
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.