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Who Participates in New Vocational Programs?

A Preliminary Analysis of Student Data from NLSY97

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Executive Summary

This paper presents a first look at new data from the National Longitudinal Study of Youth 1997 (NLSY97). The two main purposes of this paper are (1) to compare students in combined academic/vocational programs with high school students in other curricular categories in 1997 and (2) to compare the 1997 patterns with those found in earlier surveys.

Previous studies have found that the proportion of high school students participating in vocational course sequences has declined during the 1980s and early 1990s, and vocational concentrators have increasingly represented a low-achieving segment of the student population. To counter these tendencies, public and private initiatives have promoted new forms of high school vocational education that include academic studies and lead to postsecondary education. A survey of high school administrators for NLSY97 found a marked increase in the prevalence of certain new vocational programs in the 1990s. This paper examines student data from NLSY97 to determine which students are participating in these new programs.

Our analysis focused on students who said they were pursuing a combined academic and vocational program of study. We found that they did indeed report relatively high rates of participation in career-related programs and activities; however, they did not report taking more math and science courses—the number of math and science courses they took was substantially less than students in the academic program, and closer to the number taken by students in the general and vocational programs.

Since the data do not tell us whether students who said they were in a combined academic/vocational program were actually participating in a deliberately structured sequence of academic and vocational learning experiences, these and other findings do not indicate whether or not schools that offer such deliberately structured sequences are including rigorous math and science courses.

Compared to students who said they were in a vocational program only, the students in a combined program were more similar to the overall student population in socioeconomic composition, though there was a relatively large proportion of females. Compared to vocational students, those in the combined program also expressed more confidence about completing high school and reported being less often absent from school.

Previous surveys from 1982 through 1994 found similar differences between vocational students and those who pursued a combined academic/vocational course of study. In the earlier surveys, students were classified according to completed high school transcripts rather than self-reports. Despite the difference in classification procedure, the earlier surveys also show that students in the combined category received better grades, registered fewer unexcused absences from school, and expressed more

confidence about finishing high school, compared to vocational concentrators. On the other hand, because of the way students in the combined category were defined in earlier surveys, they were more likely to have taken Algebra I and Biology than NLSY97 students who said they were enrolled in a combined academic/vocational program.

Definitional differences between NLSY97 and earlier surveys permit only approximate comparison of the change between 1994 and 1997 in the proportion of students pursuing a combined academic/vocational course of study. That proportion, which rose steadily from 1982 to 1994, appeared to continue its steady rise through 1997. More precise estimates of the trend will have to await the availability of completed transcripts from the NLSY97 sample.

In the meantime, this first look at the NLSY97 student data seems to confirm that new vocational programs, which permit students to combine academic and vocational studies, have moved career and technical education toward the mainstream of the high school curriculum and engaged a broader cross-section of the student population. Judgments about whether this trend is good or bad depend on beliefs about the purposes of vocational education in high school.

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Introduction

Conflicting crosscurrents have flowed through vocational education in American secondary schools during the 1980s and 1990s. Overall enrollment in vocational courses has fallen. But against this ebbing tide, an incoming current has brought a growing number of participants into new programs and curricula. While traditional vocational offerings have been geared toward immediate entry into specific occupations, new programs and course sequences are intended to prepare students for both college and careers, by combining a challenging academic curriculum with development of work-related knowledge and skill. The new combination aims to keep students' options open after high school: They can go to a two-year or four-year college and then work, go to work full-time and then back to college, or engage in paid employment and further education simultaneously.

Enrollment Trends and Evaluation Results

The overall decline in high school vocational enrollment is evident from student transcript data. Between 1982 and 1994, the average number of vocational credits completed by high school graduates declined from 4.7 to 4.0, or from 22 to 16% of total credits earned in all subjects. Although almost all high school graduates still completed at least one vocational course—the percentage declined only slightly during this period, from 98.2 to 97.2—the number of students who completed three or more courses in a single occupational program area slipped from 34 to 25%. Furthermore, students with disabilities, or with low grades, accounted for a growing proportion of vocational course-taking in high schools during this period (Levesque et al., 1999, pp. 33-36).

The decline in vocational enrollment may be due in part to uncertainty about the payoff from high school vocational education. Evaluation studies have found that graduates who took a coherent sequence of vocational courses in high school and did not enroll in postsecondary education are likely to obtain more regular employment and higher wages than other noncollege-going graduates provided that the vocational graduates find jobs in which they can use the specific occupational knowledge and skills taught in those courses (Bishop, 1989; Boesel, Hudson, Deich, & Masten, 1994; Stern, Finkelstein, Stone, Latting, & Dornsife, 1995). However, only a minority of vocational concentrators do succeed in finding jobs in their field of training. Furthermore, students who take more vocational courses in high school are less likely to enroll in postsecondary education, even though the additional earnings associated with bachelor's degrees rose to an all-time high in the late 1980s and 1990s (Boesel & Fredland, 1999; Goldin

& Katz, 1999). Concentrating in high school vocational education appears to bring mixed blessings.

Even so, combining a vocational sequence with college-prep academic courses seems to yield positive results both economically and academically. Several recent studies have found that high school students who combine a substantial academic curriculum with a set of vocational courses do better than students who omit either one of these two components. This was first noted by Kang and Bishop (1989), who discovered a positive interaction between the number of academic courses and the number of vocational courses in predicting post-high school earnings for males who did not attend college. Arum and Shavit (1995) identified students who had taken a set of advanced academic courses, a sequence of vocational courses, or both. Four years after senior year, individuals who had completed both advanced academic and vocational courses in high school had the greatest likelihood of being employed in professional, managerial, or skilled jobs—or being enrolled in postsecondary education. Outcomes for this group were better, or at least as good, as those who had taken advanced academic courses but no vocational education. Levesque et al. (1999), in addition to replicating these results, also found that students who combined a college-prep academic curriculum with a specific vocational sequence had gains in math, reading, and science test scores during high school that were similar to the gains of students who took only the college-prep curriculum—and both of these groups gained substantially more than other students (p. 44).

In recent decades, some programs have been deliberately designed to combine academic and vocational instruction. Career academies are a prime example. These began in Philadelphia in 1969, spread to California and New York in the 1980s, and are now found in many states. Several evaluation studies have found that academy students were more successful than comparison groups of similar students in the same schools. In career academies, where a college-prep academic curriculum is organized around a broad career theme such as health, transportation, or finance, students had better attendance, completed more course credits, earned higher grades, and were more likely to graduate from high school (Stern, Dayton, & Raby, 1998).

The idea of combining vocational and academic coursework is also central to *High Schools That Work*, a network of more than 800 high schools engaged in raising academic achievement by blending a rigorous academic curriculum with modern vocational studies (Bottoms & Presson, 1995). It is also a key component of the "New American High Schools" identified by the U.S. Department of Education. Many of these schools are trying to raise academic standards and expectations by structuring the curriculum around students' career-related interests (Hudis & Visher, 1999).

In drawing conclusions from these previous studies, it is important to remember that findings based on longitudinal surveys or non-experimental evaluations do not prove cause and effect. The analysis can never fully eliminate the possibility of selection bias—that some unmeasured attributes of students account for both their participation in certain programs and their subsequent performance. For instance, the reason why students who are employed in jobs that use their specific occupational training earn higher wages may be that they enter high school already possessing specific abilities or interests which cause them to choose certain courses in which they can excel, and also cause them to perform well on jobs that tap those same interests or abilities. It is quite conceivable that the occupational courses themselves contribute little or nothing to the abilities and interests employers value. Similarly, the reason why students who take more vocational courses are less likely to enroll in postsecondary education may be that they come to high school less interested in the kind of bookish learning that schools emphasize, so they choose more hands-on courses while in high school, and are also more likely to stop their formal schooling as soon as they graduate. The vocational courses themselves may do nothing to deter them from going on to college.

By the same token, the reason why students who combine a strong academic curriculum with an occupational sequence perform better both at school and at work may be that they start high school already possessing more ambition, energy, self-discipline, or awareness of what it takes to do well in the world, which causes them to take a doubly demanding curriculum in high school and also to excel in their post-high school pursuits. Their built-in get-up-and-go might enable them to succeed just as well without the extra coursework.

Social scientists have tried hard to find ways of finessing the selection problem. One of the most sophisticated attempts is Altonji's (1995) analysis of data from the National Longitudinal Survey of the High School Class of 1972, which he describes as "the first systematic study of the effects of secondary school curriculum on postsecondary education and on success in the labor market" (p. 410). However, Altonji found a strange result: foreign language courses stand out as the best predictor of both post-high school wages and college attendance (Tables 2 and 3). No other academic or vocational subject had a consistently significant association with wages, although both "industrial" and "commercial" course-taking were negatively associated with college attendance. Altonji does not accept these results at face value (though the Modern Languages Association might be pleased if he did!). Unfortunately, despite the attempt to rid the data of selection bias, Altonji's findings and discussion do not inspire much confidence in the possibility of reaching clear conclusions about cause and effect from longitudinal survey data.

New Programs To Prepare Students for College and Careers

Although the consequences of different high school course-taking patterns are difficult to measure with precision, it is clear that certain groups of students have been more likely to participate in traditional vocational education. Specifically, students with low grades, students with disabilities, and students who are African American or Native American tend to take more vocational courses (Levesque et al., 1999, pp. 33-36). The tendency for less advantaged students to participate in vocational education goes back to the start of the 20th century, when vocational education was created as a separate track for noncollege-bound students (Counts, 1922).

Recent reforms in vocational education at the local, state, and national levels are attempting to end the association between vocational education and low achievement. In particular, the 1990 and 1998 renewals of the Carl D. Perkins Vocational and Applied Technology Education Act would lower the barriers between vocational and academic curricula. Building on the precedents of career academies and *High Schools That Work*, these laws encourage the creation of course sequences that could attract a broader cross-section of students. Charles Benson, in a paper delivered in 1992 and published posthumously in 1997, articulated some of the objectives of the new vocationalism:

> The first is to enable almost all students, not just the minority, to obtain a thorough working knowledge of maths, sciences, and languages. That is, the first objective of the new vocationalism is to help many, many more students obtain a much higher standard of academic proficiency. The second objective, more obviously, is to help many, many more students gain such a level of occupational proficiency that they enter easily and quickly upon productive, rewarding and interesting careers. (p. 201)

The first survey that has attempted to measure how prevalent new vocational and school-to-work practices have become after the federal legislation of the 1990s is the National Longitudinal Study of Youth 1997 (NLSY97). The Survey of School Administrators, conducted in the fall of 1996 as part of the NLSY97, obtained data from 5,295 high schools (Visher, Lauen, Merola, & Medrich, 1998). An analysis by MPR Associates for the U.S. Department of Education found that the prevalence of certain new vocational and school-to-work practices did indeed increase dramatically in the 1990s. Table 1 summarizes some of the responses by schools to questions about whether they offered certain programs, and, if so, when the programs originated.

Table 1. Key Findings from *School-to-Work in the 1990s*[1]

Programs	Percent of schools offering each program[2]	Percent of programs that started between 1991 and 1995	Percent of programs that started between 1996 and 1998
Job Shadowing	43	57	13
Internship	25	55	14
Career Major	20	47	15
Mentoring	25	58	15
Tech Prep	50	72	7
School-Sponsored Enterprise	19	41	13
Apprenticeship	20	62	14
Cooperative Education	48	19	5

[1] The table is constructed from NLSY97 school survey data as reported in Visher et al., 1998.
[2] The NLSY97 School Survey collected survey data from a random sample of 5,295 schools containing a 12th grade during 1996. For more information, see Visher et al., 1998.

Tech Prep, apprenticeship, and mentoring show the largest percentages of new start-ups in the 1990s, according to Table 1. Cooperative education had the smallest percentage of programs starting in the 1990s, followed by school-sponsored enterprise. This is consistent with findings from a NAVE survey of high schools in 1990-1991, in which 49% of schools reported offering cooperative education and 19% sponsored school-sponsored enterprises (Stern et al., 1995, p. 10)—virtually identical to the percentages in Table 1. The 1990-1991 survey found only 7% of high schools offering Tech Prep and only 8% offering apprenticeship or school-to-apprenticeship.

Visher et al. (1998) also found 90% of schools reporting that teachers had attended conferences or workshops on integrating academic and vocational education, and 45% said that integrated academic and vocational curriculum was a feature of work-based learning activities offered by the school (p. 9). Schools also reported wide-scale participation in career awareness activities, work readiness, and school-to-work connecting activities such as program coordinators arranging work placements. New vocational and school-to-work activities were reported in all kinds of public schools throughout the United States, with schools in the South, the Midwest, and in urban areas having higher levels of activity. Vocational and technical high schools also reported a higher level of such activity than other schools.

Visher et al. (1998) included a section on student participation in certain programs.[1] Programs with the highest level of participation included career major (22%), job shadowing (12%), and Tech Prep (17%). Participation was below 10% in the other programs; however, the source of data was not students themselves, but estimates by the person filling out the questionnaire on behalf of the school. Visher et al. warned that "accurate counts are hard to achieve" with such data (p. 27). The NLSY97 Youth Survey will provide more definitive information about student participation.

[1] Programs included in this section of the report included career major, cooperative education, internship, apprenticeship, job shadowing, mentoring, school-sponsored enterprise, and Tech Prep.

Analysis of NLSY97 Student Data

If the new emphasis on academic enrichment significantly alters vocational education, then vocational education should attract students who are a more representative cross-section of the whole student population. Integrating academic and vocational instruction and linking secondary and postsecondary education through explicit course sequences (as in Tech Prep) should enable students to see clearer pathways from secondary to postsecondary education. Students who may have been deterred from participating in vocational education in the past because of its focus on employment immediately after high school and the resulting absence of preparation for postsecondary education should have fewer reservations about participating in new vocational programs.

Student data from the NLSY97 Youth Survey allows us to test these hypotheses for the first time. Specifically, we examine differences among students associated with four different curricular programs: (1) general, (2) college prep, (3) vocational/technical or business/commercial, and (4) academic and vocational combined. We examine demographic composition of students in different curricular programs, course-taking patterns, prior academic achievement, educational aspirations, school attendance, and participation in certain career-related activities.

Description of the Survey Data

The NLSY97 is a large-scale survey that was launched by the Bureau of Labor Statistics in 1997. The sample represents all U.S. household members born between January 1, 1980, and December 31, 1984. Data was collected on each eligible youth in the household, the parent/guardian who participated in the survey, and any additional parents regardless of whether they lived in the household or not.

For purposes of this study, the analytic sample consists of 4,250 youths who were in 9th-11th grades at the time of the interview. Twelfth graders were excluded because there were only 72 of them, and they were more than 2.5 times as likely to have skipped a grade than other students in the sample.

To make inferences about the high school population of the United States, each case in the analysis is weighted to represent a certain number of students in the population. The 4,250 unweighted cases thus represent a population of 9,167,845 9th-11th grade students. (For more information about the sampling methods and sampling weights, see Center for Human Resource Research, 1998).

In some sections of the analysis, linear and logistic regressions were used to analyze the relationship between participation in new vocational programs and certain behaviors such as taking Algebra. For these calculations, we multiplied the sample weight by a constant that is the

ratio of the mean sample weight to the sum of the sample weights. Deflating the sample weight in this way is necessary in order to obtain accurate estimates of the standard errors for the regression coefficients.

Tables 2a-c list the variables from the NLSY97 used in the analysis. Means, standard deviations, and percentages are calculated using sample weights. All information was self-reported at the time of the interview by the youths with the exception of the region and urban/rural variables. Race and ethnicity were the subjects of two separate questions, but we combined the two variables by including Hispanics of all races in a single category. Throughout the analysis, black refers to non-Hispanic black and white refers to non-Hispanic whites. The Hispanic variable includes individuals of all races who claimed Hispanic ethnicity.

Table 2a. Student Demographics

Variable	Percentage[1]	Unweighted N	Weighted N[1]
Total Sample	100.0	4,254	9,167,845
Gender			
Male	50.2	2,095	4,602,326
Female	49.8	2,159	4,565,519
Race/Ethnicity[2]			
White Non-Hispanic	70.6	2,198	6,468,475
Black Non-Hispanic	15.6	1,130	1,432,314
Hispanic All Races[3]	13.6	917	1,244,688
Gross Household Income[4]			
Low Income	18.3	966	1,677,286
Middle Income	36.2	1,399	3,322,887
High Income	18.2	635	1,673,029
Grade			
9th Grade	42.6	1,865	3,901,399
10th Grade	37.0	1,574	3,388,602
11th Grade	20.5	815	1,877,844
Geographic Location			
Urban	53.8	2,488	4,933,683
Rural	46.2	1,766	4,234,163
Northeast	19.8	793	1,813,291
North Central	27.2	1,005	2,494,886
South	32.3	1,490	2,958,443
West	20.7	966	1,901,224

[1] Percentages and weighted N were calculated using the sample weight provided by NLS.
[2] Frequencies do not add up to 100 because 0.2% of the sample did not report race or ethnicity.
[3] The survey contained a question about race and a question about Hispanic ethnicity. We combined the two items, grouping Hispanics of all races into one category.
[4] Frequencies do not add up to 100 because 27.2% of the analytic sample did not report gross household income. Low income = $26,000 or less, middle income = $26,001 through $70,001, and high income = $70,002 and greater.

Table 2b. Schooling Characteristics

Variable	Description	Weighted N	Mean	Standard Deviation
Eighth Grade Achievement[1]	Self-reported: .5 = mostly below Ds 1 = mostly Ds 1.5 = half Cs and half Ds 2 = mostly Cs 2.5 = half Bs and half Cs 3 = mostly Bs 3.5 = half Bs and half As 4 = mostly As	9,031,371	2.87	0.833
Probability of High School Diploma	Self-assessed probability of earning a high school diploma by the age of 20	6,823,690	94.72	16.8
Probability of College Degree	Self-assessed probability of earning a college degree by the age of 30	6,801,585	73.99	30.95
Absent	Days absent from school during previous semester	8,926,265	5.41	7.98
Late to School	Times late to school without an excuse	9,009,558	3.10	8.08

[1] In the NLSY97 dataset, this was coded on an eight-point scale. We recoded to a four-point scale to make it more comparable with standard measures of grade point average.

Comparison of New Vocational and Other Students

We classified students according to their answers to the following question: "What program or course of study were you enrolled in when you last attended high school?" Respondents could choose from the following options:

- General program
- College prep, academic or specialized academic
- Vocational technical or business and career
- Combination academic and vocational program
- Home school
- Special education
- Other

We identify students who chose "combination academic and vocational program" as participants in new vocational programs. In the analysis, we refer to these students as "combined" or "new vocational" students. Since the data do not tell us whether students who said they were in a combined

Table 2c. Participation in Certain Courses and School Programs

Variable	Description	Percent	Weighted N
Math[1]			9,115,629
Algebra	NA	82.4	7,555,030
Geometry	NA	41.7	3,826,659
Algebra II	NA	25.3	2,328,667
No Math	Student had not taken and was not taking any of these three courses.	16.5	1,509,247
Science			9,123,741
Biology	NA	65.5	6,000,977
Chemistry	NA	21.0	1,927,157
Physics	NA	11.1	1,013,530
No Science	Student had not taken and was not taking any of these three courses.	28.3	2,597,108
Career-Related Programs[2]			9,158,583
Career Major	Participating in a defined sequence of courses with an occupational focus	18.2	1,672,392
Career Mentor	Had been matched with a mentor	4.4	403,736
Job Shadowing	Had spent time following workers	12.5	1,148,899
School-Sponsored Enterprise	Involved in the production of goods or services for use by others	8.9	817,506
Tech Prep	In a planned program of study with a defined career focus and link to postsecondary education	7.6	697,859
Cooperative Education	In a program combining academic and vocational studies with a job in a related field	6.7	618,342
Internship/ Apprenticeship	Had worked for an employer in order to learn about an industry	4.3	395,345
No Career-Related Program	Did not participate in mentoring, job shadowing, school enterprise, co-op, or internship/apprenticeship	69.0	6,324,996

[1] Students were asked if they had taken (or were enrolled in at the time of the interview) the given math and science course between 7th grade and the time of the interview.
[2] Definitions are those provided to respondents on the NLSY97 Youth Survey.

academic/vocational program were actually participating in a deliberately structured sequence of academic and vocational learning experiences, our analysis cannot be construed as an evaluation of such deliberately structured programs as career academies, pathways, majors, or clusters.

There is some concern about using student self-identification to classify a student's curricular program or track. Rosenbaum (1980) found a significant difference between student-reported and school-reported classifications in the 1972 National Longitudinal Study of Youth. Since then, researchers have debated the best method for identifying a student's curricular program. Some support using the student's self-placement because of its meaning to the student (Gamoran, 1987; Gamoran & Mare, 1989). Others support using the school's placement of a student because it is seen as more accurate (Rees, Argys, & Brewer, 1996; Rosenbaum, 1980).

A third way to measure program placement is to look at students' transcripts and assign students to categories depending on their combination of courses. For example, Vanfossen, Jones, and Spade (1987) labeled students by their concentration of math and science classes. Lucas and Gamoran (1993) used Lucas's system of course-based indicators to position students in the track structure. Arum and Shavit (1995) used both student self-identification and transcript-based indicators to measure curricular programs. They found that their transcript-based definition gave a larger estimate of students in the vocational track and smaller estimates of students in general and academic tracks; however, analysis using both the transcript measure and the self-identification measure gave "relatively consistent results" (p. 193).

Although transcripts may accurately record the courses a student took, this information does not immediately tell us whether that student should be classified as academic, vocational, general, or something else. Any definition of curricular programs that is intended to apply to the country as a whole must be artificial and somewhat arbitrary because there is no standard nationwide definition of what a vocational, general, or academic student is. Researchers must use their own judgment to determine how students should be classified. We ourselves follow such a procedure later in this paper when we compare results from previous surveys based on transcript data.

Each method for classifying students has advantages and disadvantages. Students' self-classifications presumably reflect their self-perceptions and desires, but do not correlate perfectly with actual courses taken. Classifications by school personnel may accurately reflect groupings within a school, but they are not comparable across schools. Transcript-based classifications by definition have an exact correspondence with courses taken, but they also embody the judgments of researchers outside the context of a particular school or program. Each kind of measure has its own validity and provides different information.

Demographic Differences Among Curricular Groups

Based on students' self-classifications, Table 3 shows the percentage of students in the general, academic, vocational, and combined categories, within demographic groups.[2] Significant differences in curricular

Table 3. Percentage of Students in Each Major Curricular Category, Within Demographic Groups: Total Sample[1]

Variable	General	Academic	Vocational	Combined
Gender***				
Male	59.1	28.9	5.7	6.3
Female	53.9	36.7	4.3	5.0
Race/Ethnicity***				
White Non-Hispanic	54.2	36.5	3.9	5.3
Black Non-Hispanic	55.7	25.6	10.2	8.4
Hispanic	69.7	21.1	4.7	4.5
Household Income***				
Low Income[2]	68.3	17.3	8.2	6.1
Middle Income	56.5	33.8	3.9	5.8
High Income	44.2	50.0	2.3	3.5
Geographic***				
Urban[3]	60.5	28.8	5.0	5.7
Rural	51.9	37.5	5.0	5.6
Northeast	45.5	40.3	8.4	5.8
North Central	61.2	29.1	3.4	6.3
South	49.6	37.9	6.2	6.3
West	71.8	22.5	2.0	3.7
Grade***				
9th	64.3	25.6	5.1	5.0
10th	54.1	35.7	4.5	5.8
11th	44.9	42.6	5.6	6.9
Total	56.5	32.8	5.0	5.7

[1] - $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$ based on the Pearson Chi Square Statistic for the unweighted cell distribution

[2] Low income = $26,000 or less, middle income = $26,001 through $70,001, and high income = $70,002 and greater

[3] Both geographic variables, Urban/Rural and Region, were significant at the .001 level.

[2] Students who chose "other" in response to the curricular program item on the NLSY97 were included in the general program population as were students who did not respond to the question. Analysis showed that both of these groups were similar to students identifying with the general curricular program. There were only 13 special education students in the entire NLSY97 sample. This population is of interest to us because of the Perkins mandate to include more special education students in vocational programs; however, because of their small representation in our sample, we are unable to address the participation and characteristics of this group.

participation are apparent between groups defined by gender, race/ethnicity, household income, geographic location, and grade level. The main differences are in the proportions of students who identify with the academic and general programs. Differences in the vocational and combined categories are smaller because only a little more than 10% of all students place themselves in one of these categories.

Because students in the upper grades have more room in their schedule for electives, they are more likely to identify with a specific curricular program than students in the lower grades. Also, other characteristics that we associate with curricular program participation, such as career and educational aspirations, are likely more established in the upper grades than the lower grades and this, too, might affect how students identify their course of study. Accordingly, Table 3 shows a pronounced decline from 9th to 10th grades and from 10th to 11th grades in the percentage of students who identify themselves with the general program. For these reasons, we conducted the rest of the analysis with both the complete sample and also a subsample made up of students in the 11th grade. Table 4 shows the percentage of 11th grade students in the general, academic, vocational, and combined categories, within demographic groups.

Table 4. Percentage of Students in Each Major Curricular Category, Within Demographic Groups: Eleventh Grade[1]

Variable	General	Academic	Vocational	Combined
Gender				
Male	48.5	39.9	5.5	6.1
Female	41.6	45.0	5.7	7.7
Race/Ethnicity***				
White Non-Hispanic	41.9	46.6	4.5	7.0
Black Non-Hispanic	44.0	38.0	10.3	7.6
Hispanic	64.9	22.5	7.1	5.5
Household Income***				
Low Income	58.3	24.8	10.9	6.0
Middle Income	48.3	41.4	3.5	6.8
High Income	33.7	57.8	2.4	6.1
Geographic[2]				
Urban**	50.1	37.9	5.5	6.5
Rural	39.3	47.5	5.8	7.4
Northeast***	34.5	44.7	8.7	12.1
North Central	45.9	41.1	4.9	8.1
South	39.9	48.4	5.9	5.8
West	63.7	32.7	2.8	.8
Total	45.0	42.4	5.7	6.9

[1] ~ $p < .1$, * $p < .05$, ** $p < .01$, *** $p < .001$ based on the Pearson Chi Square Statistic for the unweighted cell distribution

[2] Urban/Rural is a separate variable from the Region variable. Urban/Rural is significant at $p < .01$ whereas Region is significant at $p < .001$.

Table 4 also shows the demographic makeup of students in each curricular classification. It allows us to compare directly whether the composition of students in the combined program reflects the overall population more than the vocational program does. With respect to income and racial/ethnic composition, it does. In fact, the combined group is more similar to the population as a whole than any of the other three curriculum groups in terms of income and racial/ethnic composition. In contrast, the traditional vocational group contains a relatively small proportion of whites and a large proportion of students from low-income households. The combined group does contain a large proportion of females, however.

Differences in Math and Science Course-Taking

The NLSY97 Youth Survey asked students which math and science classes they were taking or had taken between 7th grade and the time of the interview. The nature of the question encourages students to fit whatever math courses they had taken into the categories from which they were able to choose. Thus, a class the student thought of as algebra would be reported as algebra even if it did not include algebra. This ambiguity may be more important for science than for math because of the greater variety of titles given to science classes. For example, a student may categorize Physical Science as Physics. Despite the resulting imprecision, the results give an approximate indication of differences among groups of students.

Not surprisingly, Table 6 shows that students who classify themselves as academic generally report taking more of Algebra, Geometry, and Algebra II. Traditional vocational students are generally the least likely to enroll in these classes. In 11th grade, students in the combined curriculum are similar to general students in the proportion taking or having taken Geometry

Table 5. Percentage of Students Belonging to Various Demographic Groups, Within Each Major Curricular Category: Eleventh Grade[1]

Variable	General	Academic	Vocational	Combined	Total
Gender					
Male	51.0	44.2	46.3	41.3	47.1
Female	49.0	55.8	53.7	58.7	52.9
Race/Ethnicity***					
White Non-Hispanic	67.9	80.3	57.6	74.1	73.0
Black Non-Hispanic	14.5	13.3	27.1	16.3	14.8
Hispanic	17.6	6.5	15.3	9.6	12.2
Household Income***					
Low Income	24.5	11.0	45.7	17.9	19.2
Middle Income	52.9	48.1	38.5	52.9	50.2
High Income	22.5	40.9	15.8	29.2	30.6

[1] - p < .1, * p < .05, ** p < .01, *** p < .001 based on the Pearson Chi Square Statistic for the unweighted cell distribution

and Algebra II. But one out of five students in the combined category, and one out of three in the vocational category, had not taken and were not taking Algebra, Geometry, or Algebra II by 11th grade. Given that these classes are critical for admission and preparation for a four-year college, the results indicate that a large proportion of both the vocational and new vocational populations are not receiving the academic education they need to prepare for higher education.[3]

Table 6. Percentage of Students in Each Curricular Program Who Took Certain Math Courses: Total Sample and 11th Grade[1]

	Algebra		Geometry		Algebra II		No Math[2]	
	All	11th	All	11th	All	11th	All	11th
General	77.4	91.6	68.1	62.2	17.6	47.1	21.8	7.9
Academic	94.6	98.0	61.8	91.1	39.5	75.1	5.1	.9
Vocational	72.0	67.2	71.1	53.1	22.5	43.9	28.0	33.2
Combined	79.2	78.8	60.4	63.4	24.0	45.9	20.2	20.0
Total	82.9	92.1	58.0	74.1	25.4	58.8	16.6	7.2

[1] Differences in each of the eight columns are significant at $p < .001$ based on the Pearson Chi Square Statistic for the unweighted cell distribution.
[2] "No Math" means a student had not taken and was not taking Algebra, Geometry, or Algebra II.

Again, it is important to remember that students in the combined category are not necessarily participating in well-structured programs such as career academies or pathways. The results here, therefore, do not reveal the course-taking patterns of students in such deliberately structured programs.

The results are different for science than for math. Eleventh grade students in the academic and vocational programs were the most likely to have taken any of the science courses and students in the combined track were the most likely to have taken none of the science classes. Combined students were the least likely to have taken or been enrolled in Biology and Chemistry. The prominence of the vocational students in science courses is

[3] Table 6 shows that a higher proportion of the total combined and vocational population reported taking Algebra than did the 11th grade sample. This is troubling because one would assume that the further advanced a student is the more likely they would have taken Algebra, a course normally taken before 11th grade. We posit two possible explanations. First, academic standards are a focal point of recent educational reform. Rising course requirements and stricter graduation criteria may have had a greater effect on the younger students in the sample than the older students. Second, in the same manner, the 1990 Perkins requirements that schools provide vocational students a solid academic core of classes may also have had a greater impact on younger students in the cohort.

Table 7. Percentage of Students in Each Curricular Program Who Took Certain Science Courses: Total Sample and 11th Grade[1]

	Biology		Chemistry		Physics		No Science[2]	
	All	11th	All	11th	All	11th	All	11th
General	58.8	90.4	15.2	44.9	11.0	13.0	34.5	5.8
Academic	77.2	97.9	31.6	66.3	10.3	16.8	19.1	1.0
Vocational	66.9	94.2	21.2	42.3	17.7	20.1	22.2	1.6
Combined	67.4	87.2	19.0	35.8	10.5	17.8	28.7	12.8
Total	65.8	93.6	21.1	53.2	11.1	15.4	28.5	4.0

[1] Differences in six of the eight columns are significant at $p < .001$ based on the Pearson Chi Square Statistic for the unweighted cell distribution. Differences in the two columns under "Physics" are not significant.
[2] "No Science" means a student had not taken and was not taking Biology, Chemistry, or Physics.

unexpected given their course record in mathematics. The poor participation on the part of the combined students is also unexpected given the supposedly more academic nature of their studies. The high participation rate of vocational students is possibly explained by the fact that they take more technical and applied science courses than students in the other programs. Without transcript data, it is difficult to delve more deeply into the meaning of these patterns. The trend analysis that is reported later in this report reveals that vocational students were the least likely to take science courses in 1982, 1990, and 1994, according to actual transcript data.

Differences in course-taking patterns for 11th graders in different curricular programs may be influenced by student characteristics such as family income, prior academic achievement, or race. We used logistic regression to measure associations between these variables and course-taking. Results are provided in Table 8. Students who reported having earned a higher GPA in 8th grade took more math and science, as did students who said they were in an academic program. Students who reported bigger household incomes took more math, but not more science. Controlling for these and other characteristics, black students also took more math. The coefficients suggest that students in the combined category take more math and science than students in the vocational group, but t-tests indicate that the differences are not statistically significant.

Differences in Prior Achievement and Expected Future Education

With regard to prior achievement in school and educational expectations for the future, students participating in a combined curriculum are again similar to students in the general program. Both are below the academic students and slightly higher than traditional vocational students in prior achievement and future expectations. Prior achievement is measured by self-reported GPA in 8th grade (on a scale of 1 to 4). The difference between

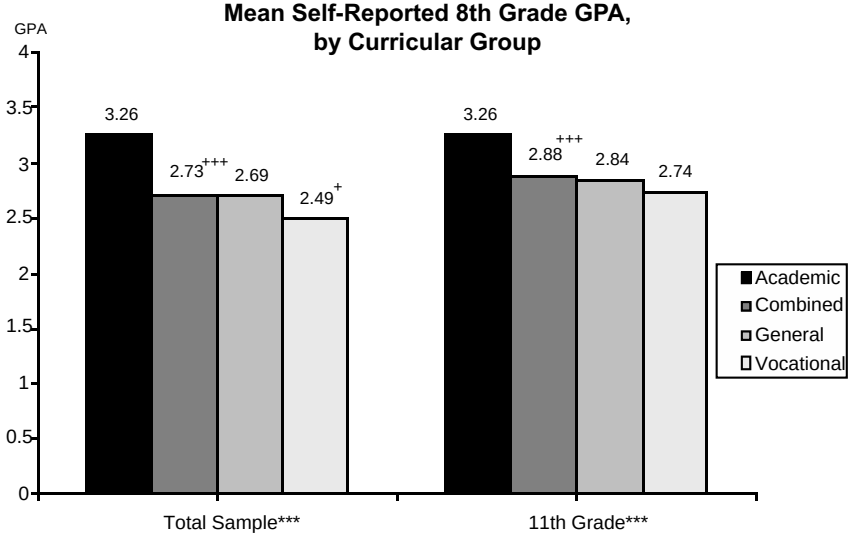
Table 8. Logistic Regressions Predicting 11th Grade Participation in Math and Science Classes (Standard errors in parentheses)[1]

	No Math	No Science	Algebra	Biology
Gross Household Income	-1.6E-05* (6.59E-06)	1.11E-06 (6.414E-06)	1.50E-05* (6.003E-06)	6.85E-06 (5.982E-06)
No Reported Income[2]	-.2495 (.3376)	-.0267 (.4213)	.2657 (.3165)	-.1961 (.3193)
Gender	-.1645 (.3767)	.6275 (.4212)	.2001 (.2842)	-.5472~ (.3206)
Black Non-Hispanic	-.9311* (.4687)	-1.5151 (.9679)	.7533~ (.4244)	.4216 (.4693)
Hispanic All Race	-.2913 (.4155)	.4245 (.4624)	.3893 (.4115)	-.2923~ (.3788)
8th Grade GPA	-.6118** (.2042)	-.6854* (.2671)	.4949** (.1906)	.7182*** (.2075)
Academic	-1.8023** (.5782)	-2.0695** (.7599)	1.1543** (.4214)	1.4478** (.4614)
Vocational	1.6885*** (.3879)	-1.4594 (1.304)	-1.5691*** (.3824)	.6061 (.6636)
Combined	1.0588** (.3969)	.8806~ (.4843)	-1.0452** (.3838)	-.2949 (.4560)
Constant	.2777 (.6965)	-.1.3578 (.9048)	.0199 (.6560)	.3775 (.7087)

[1] ~ = p < .1, * = p < .05, ** = p < .01, *** = p < .001 based on a Wald Chi Square Statistic.
[2] For students who did not report household income, we substituted the mean household income. The variable "No Reported Income" is coded 1 for those who did not report income (about 1/3 of all students) and 0 for those who did.

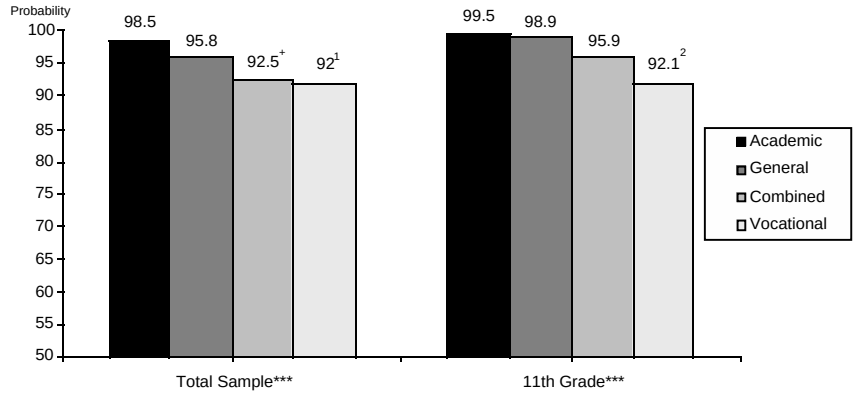
the vocational student mean GPA and the combined student mean GPA is statistically significant. To gauge educational expectations, students were asked to assess their probability of earning a high school diploma by the age of 20 and their probability of earning a college degree by the age of 30. The latter question did not specify a two- or four-year degree. The mean expectation of high school graduation for 11th grade students in the vocational program is significantly lower than the mean expectations of 11th grade students in the combined program; however, their college expectations are essentially the same and do not differ greatly from the expectations of students in the general program. Figures 1-3 display the means on achievement and expectation measures for students in the four curriculum categories.

Figure 1
Mean Self-Reported 8th Grade GPA, by Curricular Group



Note: Tests of significance are based on one-way analysis of variance. Asterisks denote significance of omnibus test for whether any difference exists among the four groups: * p < .05, ** p < .01, *** p < .001. Tests of significance of differences between pairs of categories are based on Tukey-Bonferroni post-hoc analysis. Plus signs above a bar indicate that the group denoted by that bar is significantly different from the group denoted by the adjacent bar to its left: + p < .05, ++ p < .01, +++ p < .001.

Figure 2
Mean Self-Assessed Probability of Earning a High School Diploma by the Age of 20, by Curricular Group

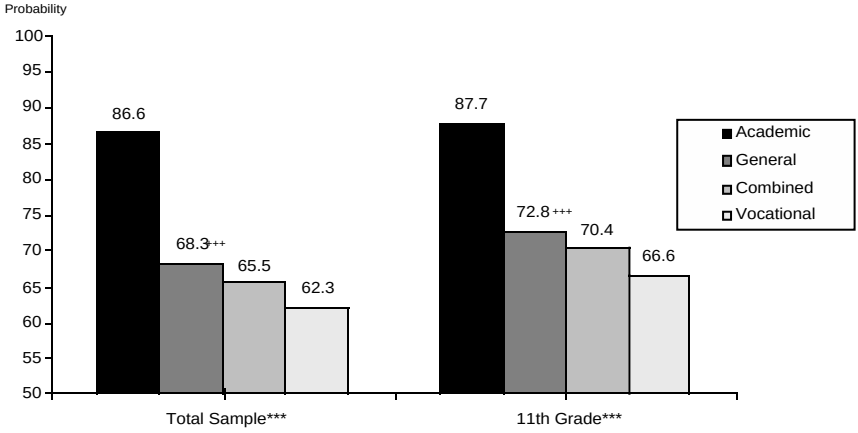


Note: Tests of significance are based on one-way analysis of variance. Asterisks denote significance of omnibus test for whether any difference exists among the four groups: * p < .05, ** p < .01, *** p < .001. Tests of significance of differences between pairs of categories are based on Tukey-Bonferroni post-hoc analysis. Plus signs above a bar indicate that the group denoted by that bar is significantly different from the group denoted by the adjacent bar to its left: + p < .05, ++ p < .01, +++ p < .001.

[1] The vocational mean is not significantly different from the combined program mean.

[2] The vocational mean is significantly different from the combined program mean at the .05 level, but the general program mean is not. Both the vocational and the general means are significantly different at the .05 level from the academic mean.

Figure 3
Mean Self-Assessed Probability of Earning a College Degree by the Age of 30, by Curricular Group



Note: Tests of significance are based on one-way analysis of variance. Asterisks denote significance of omnibus test for whether any difference exists among the four groups: * p < .05, ** p < .01, *** p < .001. Tests of significance of differences between pairs of categories are based on Tukey-Bonferroni post-hoc analysis. Plus signs above a bar indicate that the group denoted by that bar is significantly different from the group denoted by the adjacent bar to its left: + p < .05, ++ p < .01, +++ p < .001.

Table 9 shows regressions of students' high school and college expectations on demographic variables and curricular groups. Students who said they were in an academic program have higher expectations of finishing high school and completing a college degree. Hispanic students have lower expectations on both counts. Higher household income is positively associated with the expected probability of completing college. Controlling for demographics, students in the combined program have a significantly higher expected probability of completing high school compared to vocational students (t = 2.64), but the difference between these two groups in the expected probability of completing college is not statistically significant.

Table 9. Ordinary Least-Squares Regression Models Predicting the Self-Assessed Probability of 11th Grade Students Earning a High School Diploma by the Age of 20 and the Probability of Earning a College Degree by the Age of 30 (Standard errors are in parentheses.)

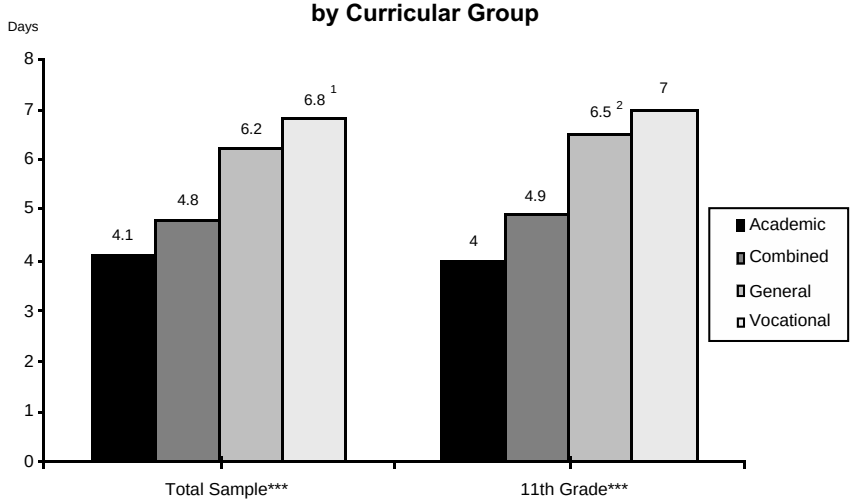
	Model I (N=866)[1]	Model II (N=856)[1]	Model III (N=866)[1]	Model IV (N=856)
Outcome Variable	High School	High School	College	College
Household Income		5.462E-06 (.000)		5.57E-05* (.000)
No Reported Income[2]		-.794 (.889)		4.696* (2.057)
Black Non-Hispanic		-.132 (1.151)		4.198 (2.662)
Hispanic All Race		-4.340** (1.262)		-.786 (2.925)
8th Grade GPA		-.328 (.573)		9.374*** (1.327)
Gender		-.276 (.810)		-4.283* (1.876)
Academic	3.535*** (.880)	2.756** (.892)	14.922*** (42.010)	9.464*** (2.065)
Vocational	-3.867* (1.830)	-2.522 (.892)	-6.220 (4.179)	-5.833 (4.086)
Combined	2.934~ (1.673)	2.304 (1.593)	-2.349 (3.821)	-3.694 (3.688)
Constant	95.958*** (1.724)	98.039*** (2.007)	72.786*** (1.403)	44.034*** (4.647)
R-Squared	.03	.041	.077	.157

[1] Using the normalized sampling weight results in a total N approximately equal to the unweighted sample size. ~ p < .1, * p < .05, ** p < .01, *** p < .001 based on a t-test.
[2] For students who did not report household income, we substituted the mean household income. The variable "No Reported Income" is coded 1 for those who did not report income (about 1/3 of all students) and 0 for those who did.

Differences in Lateness and Unexcused Absence

Two other variables that may provide some insight into the differences between students in the four curricular categories are the number of times a student is late without an excuse and the number of times a student was absent in the previous semester. More academically inclined students attend school more often than students who are less academically inclined. Figures 4 and 5 reveal that both academic and combined students report fewer absences and are late to school less often on average than students in the

Figure 4
Mean Self-Reported Days Absent, by Curricular Group

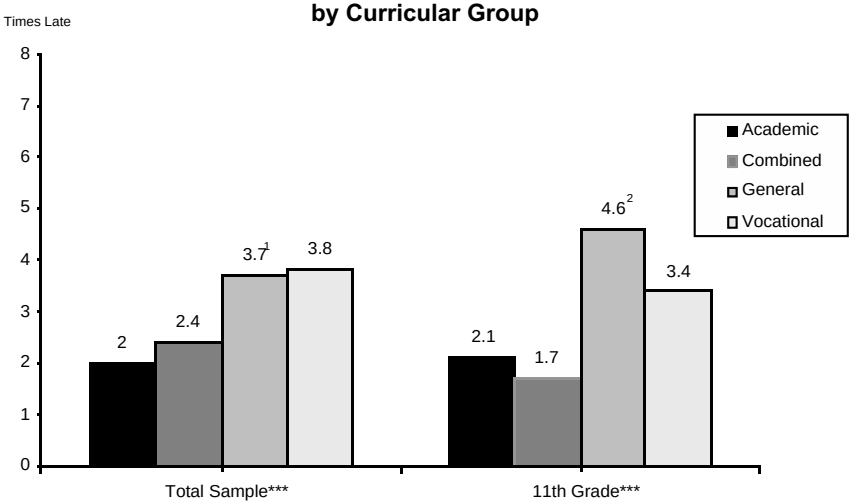


Note: Tests of significance are based on one-way analysis of variance. Asterisks denote significance of omnibus test for whether any difference exists among the four groups: * p < .05, ** p < .01, *** p < .001. Tests of significance of differences between pairs of categories are based on Tukey-Bonferroni post-hoc analysis.

[1] The vocational and general means are significantly different from the academic mean at the .001 level. The vocational mean is significantly different from the combined mean at the .05 level.

[2] The general mean is significantly different from the academic mean at the .001 level. The vocational mean is significantly different from the academic mean at the .05 level.

Figure 5
Mean Self-Reported Times Late to School, by Curricular Group



Note: Tests of significance are based on one-way analysis of variance. Asterisks denote significance of omnibus test for whether any difference exists among the four groups: * p < .05, ** p < .01, *** p < .001. Tests of significance of differences between pairs of categories are based on Tukey-Bonferroni post-hoc analysis.

[1] The vocational and general means are significantly different from the academic mean at the .05 level.

[2] The general mean is significantly different from the academic mean at the .001 level. The vocational mean is significantly different from the academic mean at the .05 level.

general and vocational programs. In the overall sample, the mean days absent for vocational students is significantly different from the mean for combined students. This is not true in the 11th grade sample. Also, vocational and combined students are not late to school at a significantly different rate.

Differential Participation in Career-Related Programs

The preceding analysis indicates that students who identify themselves as participants in a "combination academic and vocational program" closely resemble the student population as a whole in terms of household income and race/ethnicity; they are similar to students in the general program with respect to math and science course-taking, prior academic achievement, and future educational expectations; and they are similar to students following an academic curriculum in terms of lateness and unexcused absence. It still remains to be seen, however, whether students who say they are taking a combined curriculum actually do participate in the new kinds of vocational programs that became more prevalent in the 1990s.

The NLSY97 survey asked students about their participation in a specific set of career-related programs and activities. One of these, Tech Prep, was launched by the 1990 Perkins Act. Others—job shadowing, career mentoring, internship/apprenticeship, and career majors—were specifically encouraged by the 1994 School-to-Work Opportunities Act. Participation in one or more of these programs or activities, especially those that were boosted by 1990s legislation, can be considered a defining characteristic of "new vocational" students. Students were also questioned about school-sponsored enterprise and cooperative education, but these have both been around a long time as extensions of vocational courses and cannot really be considered indicators of new vocationalism.

Tables 10a and 10b show that students who say they are pursuing a combined academic/vocational curriculum also report relatively high rates of participation in these vocational programs and activities. Among the four curricular categories, those in the combined group had the highest or second-highest rate of participation in almost every career-related program or activity. The only two exceptions were in the 11th grade sample, in which the combined group ranked third in extent of participation in school-sponsored enterprise (a traditional feature of vocational education) and career mentoring (a new feature). Students in the traditional vocational category, as expected, reported the highest rates of participation in several programs or activities. Students who said they were in the general program indicated the least overall participation in career-related programs and activities: two-thirds of this group said they had not participated in any

Table 10a. Percentage of Students in Each Curricular Category Who Participated in Career-Related Programs and Activities[1]

	School-Sponsored Enterprise		Job Shadowing		Career Mentoring		No Career Activities[2]	
	All***	11th	All**	11th	All**	11th	All***	11th**
General	7.3	9.5	11.1	13.5	3.5	5.8	73.5	66.7
Academic	10.0	10.8	14.9	16.7	5.6	7.8	68.1	62.8
Vocational	13.1	16.2	11.4	12.7	4.6	2.2	44.8	50.2
Combined	14.7	10.1	14.2	17.0	6.4	5.1	52.2	45.2
Column Totals	7.6	10.5	12.5	15.1	4.4	6.4	69.1	62.6

[1] ~ p < .1, * p < .05, ** p < .01, *** p < .001 based on the Pearson Chi Square Statistic for the unweighted cell distribution
[2] "No Career Activities" means the student did not participate in school-sponsored enterprise, job shadowing, career mentoring, internship/apprenticeship, Tech Prep, or co-op.

Table 10b. Percentage of Students in Each Curricular Category Who Participated in Career-Related Programs and Activities (cont.)[1]

	Internship/ Apprenticeship		Tech Prep		Co-op		Career Major		Currently in Career Major[2]	
	All***	11th~	All***	11th**	All***	11th***	All***	11th***	All***	11th***
General	3.7	5.8	5.8	6.1	5.2	6.7	15.8	20.2	28.5	40.5
Academic	3.4	5.6	6.6	7.8	5.0	6.5	16.4	17.0	34.2	44.1
Vocational	10.9	13.8	27.1	26.6	17.2	22.2	45.1	48.5	74.2	90.2
Combined	9.5	16.2	14.7	15.3	23.1	26.2	31.2	41.0	48.4	60.4
Column Totals	4.3	6.9	7.6	8.6	6.8	8.8	18.3	21.9	37.8	50.5

[1] ~ p < .1, * p < .05, ** p < .01, *** p < .001 based on the Pearson Chi Square Statistic for the unweighted cell distribution
[2] Percentage of those who said they had participated in a Career Major program

such programs or activities by 11th grade, compared to less than half of the students in the combined category.[4]

[4] In a few instances, Tables 10a and 10b indicate that participation is higher in the total sample than in the 11th grade sample. We are not sure why. One hypothesis is that, as these programs have become more prevalent in the 1990s (see Visher et al., 1998), students in the lower grades may have had more opportunity to participate than students in the upper grades had in 1997.

Trends Over Time

We have discovered that students who said they were pursuing a combined academic/vocational curriculum in the NLSY97 survey bear a close resemblance to the student population as a whole in terms of household income and race/ethnicity. We have also found that this group of students reported high rates of participation in career-related programs and activities, including some that became more prevalent in the 1990s. We now seek to put these findings in the perspective of recent history. Were vocational programs in 1997 attracting a larger and more representative cross-section of students than in the 1980s and early 1990s?

To answer this question, we compare data from the NLSY97 survey with findings from several earlier sources (see Levesque et al., 1999): the study of the 1982 graduates from the High School and Beyond (HSB) survey, including their completed transcripts; the High School Transcript Studies (HSTS) of national samples of high school graduates from 1990 and 1994; and the study of 1992 graduates from the National Educational Longitudinal Study of 1988 (NELS), including their completed transcripts.[5] Although the NLSY97 information we are analyzing is the best available at this time, it is possible to make only approximate comparisons with earlier data for the following reasons:

- The samples in the earlier studies are high school graduates with complete transcripts. The NLSY97 students were still in high school at the time of the survey. To maximize comparability, our analysis of trends uses only the 11th grade sample from NLSY97.
- The earlier surveys collected transcript information, which is used here to group students into curricular categories. The NLSY97 analysis relies on student self-identification of curricular program.
- The surveys used slightly different measures for grade point average, days absent, and educational aspirations.

Despite these limitations, we made the best comparison we could by classifying students from the three earlier surveys into four categories, using the same definitions as Levesque et al. (1999):

1. *Vocational*. Vocational concentrators completed 3.0 or more credits in a single occupational program area. This group is compared to the NLSY97 students who said they were in a "vocational technical or business and career" program.

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[5] Sally Librera of MPR Associates performed the analysis of these three datasets for this paper.

2. *Academic*. College prep graduates completed at least 4.0 credits in English; 3.0 credits in math at the Algebra I level or higher; 2.0 credits in Biology, Chemistry, or Physics; 2.0 credits in social studies, including at least 1.0 credit in U.S. or World History; and 2.0 credits in a single foreign language. This group is compared to the NLSY97 students who said they were in a "college preparatory, academic, or specialized academic" curriculum.
3. *Combined*. Some graduates in the earlier surveys had transcripts that satisfied both conditions (1) and (2). They are compared to the NLSY97 students who said they were in a "combination academic and vocational program."
4. *General*. This group satisfied neither condition (1) nor (2). They are compared to NLSY97 students who said they were in a "general program." (pp. 30-31)

Figure 6 shows the trends in the percentages of students in these four categories, using the NLSY97 and three of the earlier surveys (HSB, and HSTS 1990 and 1994). Academic enrollments have steadily grown and purely vocational enrollments have steadily declined, but the percentage combining academic and vocational also has grown. The largest group is still in the general category, the size of which had diminished but appears to have leveled out. However, for the reasons we have explained, we should not try to make a precise determination of whether the change in the general category from the 1994 transcript study to the NLSY97 is plus, minus, or zero. The overall trends support the hypothesis that an increasing focus on college preparation and high academic standards since the early 1980s have led to more students participating in the academic program.[6] The rise in participation in the combined program is also consistent with changes in vocational education policy.

Table 11 shows the change in participation in the four curricular programs by household income status from 1982 to 1997. Within each income category, the number of students classified as academic increased, the number classified as vocational decreased, and the number classified as combined academic/vocational increased. The number of students classified in the general category decreased except among students from low-income

[6] The dramatic rise in participation in the academic program may be explained in part by the different methods of measurement. Note that Arum and Shavit (1995) found that student self-assessment of curricular program was positively biased. Some students classified themselves as "academic" when their course-taking identified them as "general." However, many researchers have noted an increase in academic course-taking throughout the 1980s and 1990s. This trend may explain why more students view themselves as being in the academic program. For an insightful discussion of these trends, see Angus and Mirel (1999).

Figure 6
Change in Program Participation Over Time

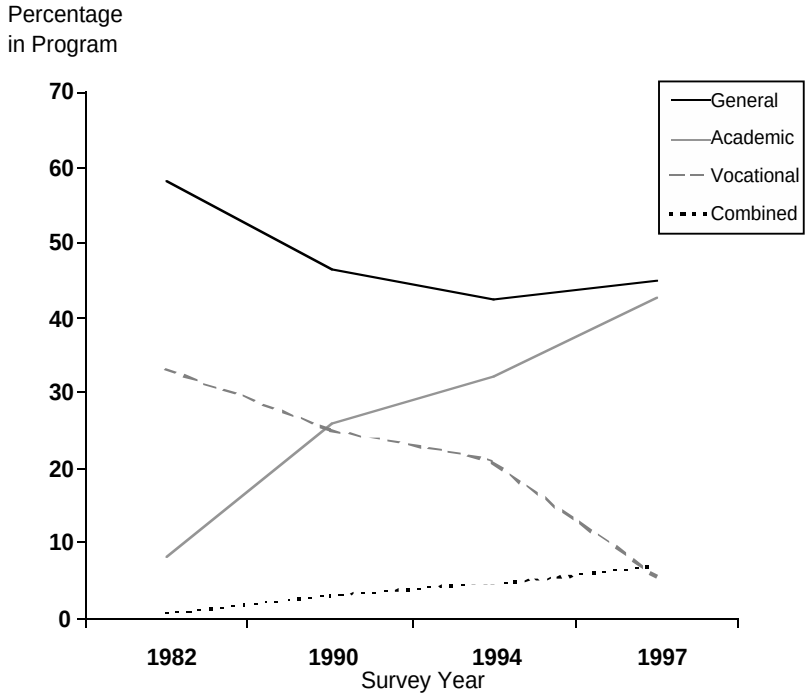


Table 11. Percentage of Students in Each Curricular Category, within Income Groups, 1982 and 1997[1]

	General	Academic	Vocational	Combined
Low Income				
1982	56.58	6.67	36.23	.53
1997	58.30	24.80	10.90	6.00
Middle Income				
1982	60.59	10.20	28.49	.72
1997	48.30	41.40	3.50	6.80
High Income				
1982	66.02	13.63	19.80	.55
1997	33.70	57.80	2.40	6.10
Total				
1982	58.22	8.13	33.08	0.56
1997	45.00	42.40	5.70	6.90
Change	-13.22	+34.27	-27.38	+6.34

[1] For the 1982 sample, the income breakdown is as follows: low income = less than $8000 to 24,999, middle income = $25,000 to 49,999, and high income = $50,000 and above.

households. In both 1982 and 1994, there is relatively little difference among income groups in the proportion of students in the combined category.

Using the same four surveys as Figure 6, Figures 7 and 8 depict trends in the percentages of students taking Algebra I and Biology, respectively. Both show marked changes between 1994 and 1997. In Figure 7, the four trend lines maintain their relative positions in the three earlier surveys, with students in the combined category most likely to have taken Algebra I and vocational students least likely. However, the NLSY97 seems to show a sudden increase in the percentages of academic and general students who took Algebra I, cutting across the line for students in the combined category. Figure 8 shows a similar reversal, with the trend line for the combined category suddenly dipping below the other three. Most likely, these patterns reflect the change in the definition of the combined category: the transcript-based definition in the three earlier surveys guaranteed that nearly all students in this category would have taken Algebra I and Biology, but the NLSY97 definition did not impose this restriction. Again, we must recall that NLSY97 students who said they were in a combined program are not necessarily participating in a deliberately structured sequence.

Figure 7
Change Over Time in Percentage Taking Algebra, by Curricular Group

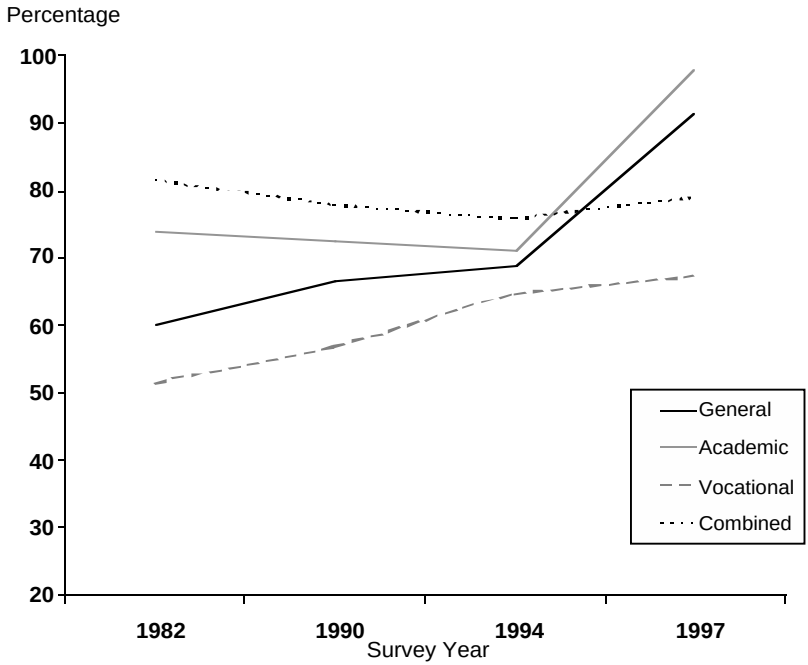
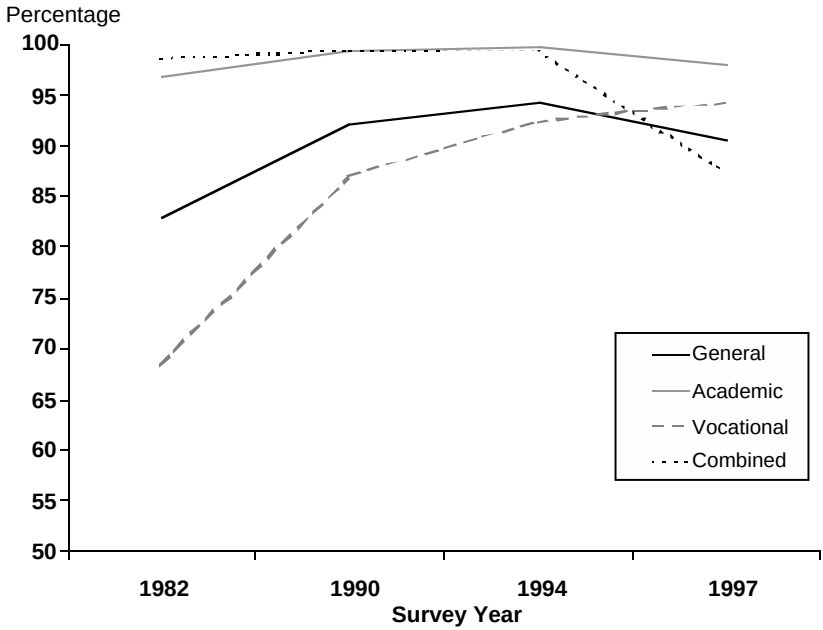


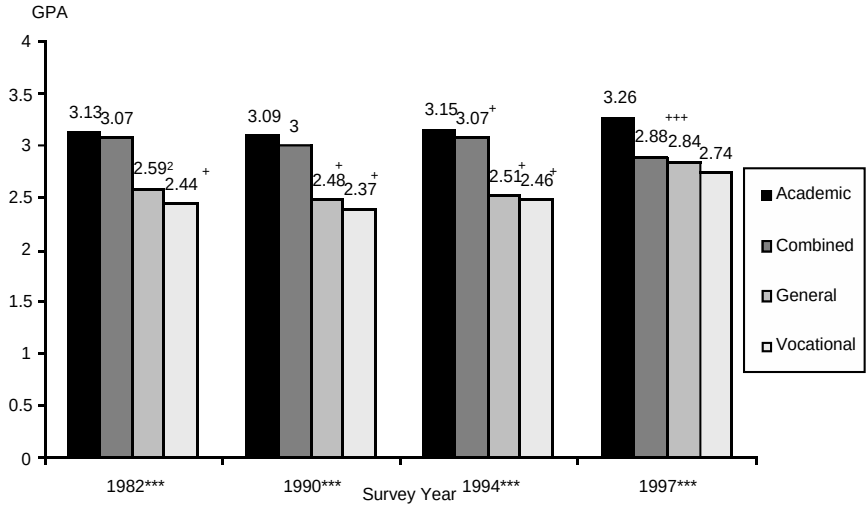
Figure 8
Change Over Time in Percentage Taking Biology, by Curricular Group



The abrupt increase in the numbers of academic and general students who reported having taken Algebra I in 1997 is also attributable to a difference between the surveys in the way the question was asked. The earlier studies are based on transcripts for high school, which usually begins in 9th grade, and sometimes in 10th grade. In contrast, the NLSY97 asked students whether they had taken Algebra I at any time since 7th grade. Since some students take Algebra I before they enter high school, this would explain the higher percentage of NLSY97 students who are shown as having taken Algebra I. Apparently, the effect of this difference in measurement procedure was larger for students in the academic and general categories, implying that NLSY97 students in the vocational and combined categories were less likely to take Algebra I before entering high school.

Still using the same four surveys, Figure 9 provides further evidence about the comparability of curricular categories. In the three earlier surveys, GPA was computed from completed high school transcripts, but the NLSY97 GPA was computed from students' self-reports about 8th grade. Nevertheless, there is some consistency: In all four surveys, students in the combined category have a higher GPA than students in the vocational and general programs; however, in the NLSY97 sample, the mean GPA for

Figure 9
Mean GPA by Curricular Group, in Various Years



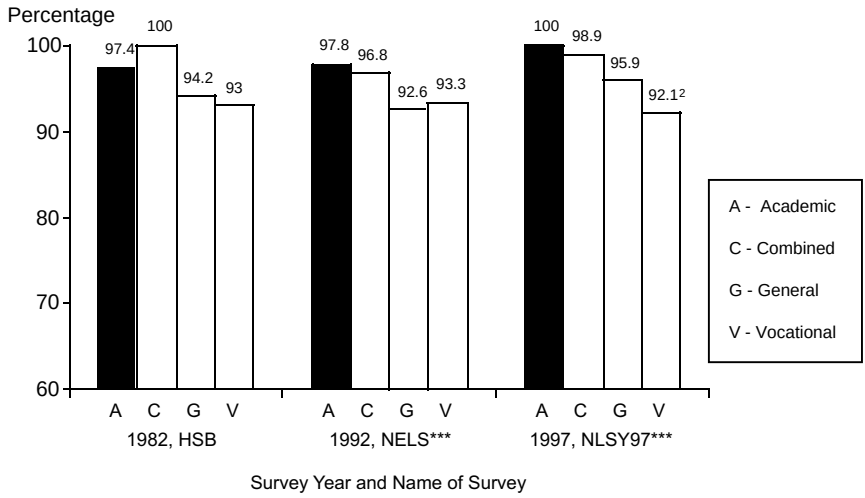
Note: Tests of significance are based on one-way analysis of variance. Asterisks denote significance of omnibus test for whether any difference exists among the four groups: * p < .05, ** p < .01, *** p < .001. Tests of significance of differences between pairs of categories are based on Tukey-Bonferroni post-hoc analysis. Plus signs above a bar indicate that the group denoted by that bar is significantly different from the group denoted by the adjacent bar to its left: + p < .05, ++ p < .01, +++ p < .001.
[1] In 1997, GPA is based on grades students said they received in 8th grade. In all other years, GPA is based on four-year high school transcripts.
[2] The general mean is significantly different from the academic mean but not the combined mean.

students in the combined category is closer to general and vocational students than to academic students. In terms of academic performance measured by GPA, the combined category in 1997 is not as distinguished as the combined category defined in the earlier surveys (e.g., compare 1990 and 1994 with 1997), but it is still above average.

Additional information about comparability comes from questions on educational expectations. The HSB and NELS asked high school seniors to name the highest level of education they expected to complete. We can compare different curricular groups in terms of the percentage who thought they would complete high school. We can make a similar comparison in 1997 in terms of the average self-reported probability of completing high school by age 20[7] (see Figure 10). Results are in Figure 10. Academic and combined students consistently expressed more confidence about completing high school than general and vocational students. In particular, the expected likelihood of completing high school for students in the combined category exceeded that of regular vocational students by several

[7] Unfortunately, we cannot perform a similar analysis of the probability of completing a four-year college because the NLSY97 question about probability of completing college did not distinguish between two- and four-year colleges.

Figure 10
Percentages of Students Expecting to Graduate from High School, by Curricular Group, in Various[1] Years

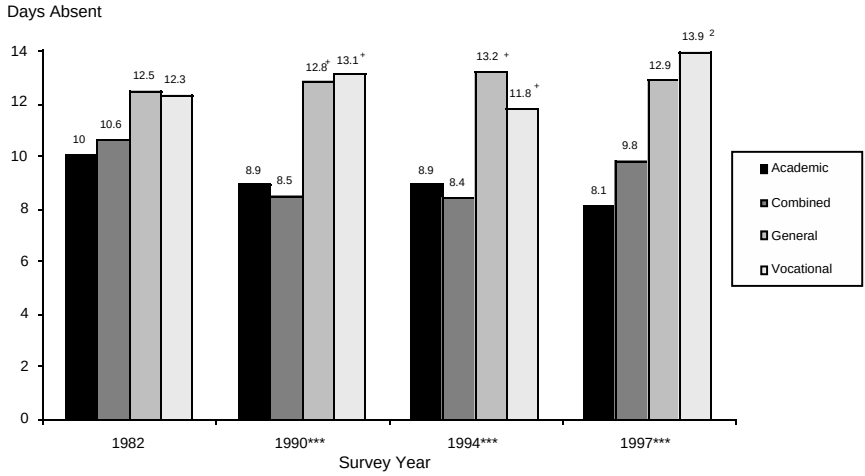


Note: Tests of significance among groups are based on a one-way analysis of variance for 1997, and on chi-square statistics for the two prior years. *** p < .001. For 1997, tests of significance of differences between pairs of categories are based on Tukey-Bonferroni post-hoc analysis.
[1] In 1997, numbers shown are mean estimated probabilities reported by students. In previous years, numbers are percentages of students who said they expected to graduate.
[2] The vocational mean is significantly different from the combined program mean at the .05 level, but the general program mean is not. Both the vocational and the general means are significantly different at the .05 level from the academic mean.

percentage points in all three surveys. Post-hoc analysis of the 1997 results finds that the differences are statistically significant.

Finally, we compare the average number of unexcused absences. In the HSB and HSTS surveys, this is the number for senior year, according to students' transcripts. In the NLSY97, students were asked how many unexcused absences they had in the previous semester; we multiplied the numbers by two to get an estimate for the whole year. In all four surveys, students in the combined and academic categories miss fewer days than general and vocational students do. Students in the combined category are closer to academic students than to the other two groups; in 1990 and 1994, the differences between the combined group and the vocational and general groups are statistically significant. Evidently, combined and academic students are more likely to attend school on a regular basis than are general and vocational students.

Figure 11
Mean Days Absent by Curricular Group, in Various Years[1]



Note: Tests of significance are based on one-way analysis of variance. Asterisks denote significance of omnibus test for whether any difference exists among the four groups: * p < .05, ** p < .01, *** p < .001. Tests of significance of differences between pairs of categories are based on Tukey-Bonferroni post-hoc analysis. Plus signs above a bar indicate that the group denoted by that bar is significantly different from the group denoted by the adjacent bar to its left: + p < .05, ++ p < .01, +++ p < .001.

[1] In 1997, the numbers are self-reported days absent in the previous semester. The number was multiplied by two to make it comparable to the other surveys. In previous years, numbers are days absent in 12th grade according to transcripts.

[2] The general mean is significantly different from the academic mean at the .001 level. The vocational mean is significantly different from the academic mean at the .05 level.

Conclusions

This first look at student data from NLSY97 reveals that students who say they are combining academic and vocational studies in high school bear a stronger resemblance to the total population in terms of household income and race/ethnicity than do students who identify themselves as following a vocational program only. In fact, students in this combined category are also closer to the overall student population in income and racial or ethnic identification than are students in the other two curricular categories: academic and general. Although girls comprise a relatively large proportion of the students who say they are combining academic and vocational studies, the socioeconomic composition of this group appears to represent a true cross-section of the 1997 high school population.

Without transcript data, which NLSY97 has not yet collected, we can form only an approximate idea of the kinds of courses students were taking or had taken, based on the answers they gave to NLSY97 interviewers. Students who identified themselves as participants in a combined academic/vocational program were not as likely as students in a purely academic program to say they had taken Algebra, Geometry, Biology, or Chemistry. Instead, the proportions of students in the combined curricular category who reported taking these classes were closer to those in the general and vocational groups. Since students in the combined category were not necessarily participating in a structured sequence of academic and vocational classes, it is not possible to tell from the NLSY97 data whether high schools that offer such structured sequences are including any of these particular courses in math or science.

Students who said they were combining academic and vocational studies did report relatively high rates of participation in career-related programs and activities, especially job shadowing, internship/apprenticeship, and cooperative education. They can be considered "new vocational" students in the sense that they are relatively likely to be participating in certain activities and programs, such as Tech Prep, which are clearly innovations of the 1990s.

Students who identify themselves with a combined academic/vocational program can also be considered "new vocational" because some of their behavior and expectations in school are different from those of students who identify themselves with a vocational program only. Students in the combined category expressed greater confidence about completing high school, and were less likely to be absent from school, compared to students in the vocational group.

These differences in school-related expectations and behavior between combined and vocational students also appear in previous surveys from the 1980s and early 1990s. This gives added credence to the findings from

NLSY97, despite the fact that the procedure for classifying students in the previous surveys was different than in NLSY97. In the previous surveys, students were classified as combined academic/vocational only if their transcripts revealed that they had completed a long list of academic courses. We could not replicate that procedure in NLSY97 because transcript information is not yet available.

Nevertheless, when the proportion of students classified as combined academic/vocational in NLSY97 is compared with proportions from previous surveys, the 1997 data seem to support a steadily rising trend. The number of students who are combining academic and vocational studies in high school appears to be growing. Public policies and private initiatives in the 1990s created new programs and activities that make it easier for students to combine these two sides of the curriculum, and the NLSY97 data confirm that students who say they are pursuing a combined program of study are relatively more likely to participate in these activities. Compared to students who say they are in a vocational program, students following a combined academic/vocational course of study are closer to the overall student population in socioeconomic composition, and they report more positive behavior and expectations for themselves in school. It could fairly be said that new vocational programs, by combining academic and vocational studies, are bringing career and technical studies into the mainstream of the high school curriculum and engaging a broader cross-section of the student population.

Is this good? Given the expense of vocational programs, some policymakers and analysts might prefer that these extra resources be spent on needy, disadvantaged, and low-achieving students. On the other hand, such targeting creates the danger of stigmatizing vocational education as a program for unsuccessful students. A full discussion of these issues is beyond the scope of this paper, but it is clear that judgments about the trends revealed in the NLSY97 data depend on beliefs about the basic purposes of vocational education in high schools.

References

Altonji, J. G. (1995). The effects of high school curriculum on education and labor market outcomes. *Journal of Human Resources*, *30*(3), 409-439.

Angus, D., & Mirel, J. (1999). *The failed promise of the American high school: 1890-1995*. New York: Teachers College Press.

Arum, R., & Shavit, Y. (1995). Secondary vocational education and the transition from school to work. *Sociology of Education*, *68*, 187-204.

Benson, C. S. (1997). New vocationalism in the United States: Potential problems and outlook. *Economics of Education Review*, *16*(3), 201-212.

Bishop, J. (1989). Occupational training in high school: When does it pay off? *Economics of Education Review*, *8*(1), 1-15.

Boesel, D., & Fredland, E. (1999). *College for all? Is there too much emphasis on getting a 4-year college degree?* Washington, DC: National Library of Education, U.S. Department of Education, Office of Educational Research and Improvement.

Boesel, D., Hudson, L., Deich, S., & Masten, C. (1994). *National Assessment of Vocational Education, Final report to Congress. Volume II: Participation in and quality of vocational education*. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

Bottoms, G., & Presson, A. (1995). Improving high schools for career-bound youth. In W. N. Grubb (Ed.), *Education through occupations in American high schools. Volume 2: The challenges of implementing curriculum integration* (pp. 35-54). New York: Teachers College Press.

Center for Human Resource Research. (1998). *NLSY97 users' guide*. Columbus: Center for Human Resource Research, Ohio State University.

Counts, G. S. (1922). *The selective character of American secondary education* (Supplementary Educational Monographs, No. 19). Chicago: University of Chicago.

Gamoran, A. (1987, July). The stratification of high school learning opportunities. *Sociology of Education*, *60*, 135-155.

Gamoran, A., & Mare, R. D. (1989). Secondary school tracking and educational inequality: Compensation, reinforcement, or neutrality? *American Journal of Sociology*, *94*(5), 1146-1183.

Goldin, C., & Katz, L. F. (1999). *The returns to skill across the twentieth century United States* (May 16 draft). Cambridge, MA: Harvard University, Department of Economics.

Hudis, P. M., & Visher, M. G. (1999). *Aiming high: Strategies to promote high standards* (March draft). Berkeley, CA: MPR Associates.

Kang, S., & Bishop, J. (1989). Vocational and academic education in high school: Complements or substitutes? *Economics of Education Review*, *8*(2), 133-148.

Levesque, K., Lauen, D., Teitelbaum, P., Alt, M., Librera, S., & Nelson, D. (1999). *Vocational education in the United States: Toward the year 2000* (June draft). Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Lucas, S. R., & Gamoran, A. (1993). *Race and track assignment: A reconsideration with course-based indicators of track locations*. Working Paper, University of Wisconsin–Madison.

Muraskin, L. D. (1993). *Secondary vocational education: Availability, coursetaking, and outcomes*. Rockville, MD: Westat, Inc.

Rees, D. I., Argys, L. M., & Brewer, D. J. (1996). Tracking in the United States: Descriptive statistics from NELS. *Economics of Education Review*, *15*(1), 83-89.

Rosenbaum, J. E. (1980). Track misperceptions and frustrated college plans: An analysis of the effects of tracks and track perceptions in the National Longitudinal Survey. *Sociology of Education*, *49*, 512-525.

Stern, D., Dayton, C., & Raby, M. (1998). *Career academies and high school reform*. Berkeley: Career Academy Support Network, University of California, Berkeley. Available online: <casn.berkeley.edu>.

Stern, D., Finkelstein, N., Stone, J. R., III, Latting, J., & Dornsife, C. (1995). *School to work: Research on programs in the United States.* Washington, DC, and London: Taylor and Francis, Falmer Press.

Urquiola, M., Stern, D., Horn, I., Dornsife, C., Chi, B., Williams, L., Merritt, D., Hughes, K., & Bailey, T. (1997). *School to work, college and career: A review of policy, practice, and results 1993-1997* (MDS-1144). Berkeley: National Center for Research in Vocational Education, University of California, Berkeley.

Vanfossen, B. E., Jones, J. D., & Spade, J. Z. (1987, April). Curriculum tracking and status maintenance. *Sociology of Education*, *60*, 104-122.

Visher, M. G., Lauen, D., Merola, L., & Medrich, E. (1998). *School-to-work in the 1990s: A look at programs and practices in American high schools*. Washington, DC: U.S. Department of Education.