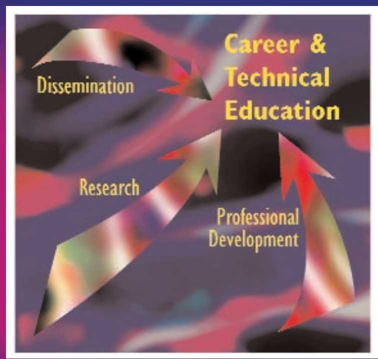

Career and Technical Education, Career Pathways, And Work-Based Learning: Changes in Participation 1997–1999

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ABSTRACT

We examined the extent to which high school students are choosing to participate in work-related education after a decade of education reform in the United States. Using data from the *National Longitudinal Survey of Youth 1997*, we first examined the characteristics of students enrolled in alternative curriculum concentrations: career and technical (CTE), academic, dual (combining academic and CTE), and general. We then examined the characteristics of students who enroll in career pathways, tech prep, or any work-based learning (WBL) activity (defined as cooperative education, job shadowing, mentoring, school-sponsored enterprise, and internship/apprenticeship).

Secondly, we analyzed socioeconomic, school experience, and CTE-related variables that could be predictors of participation in curriculum concentrations, career pathways, tech prep, and WBL activities; high school academic achievement; and risky behaviors. We concluded that CTE-related programs, supported by the school reforms, have helped in changing the coursetaking pattern of youth participating in those programs, and significantly contribute to students' high school achievement.

PRE-BACCALAUREATE WORKFORCE EDUCATION

The latter years of the 20th century were a time of school reform, particularly with regards to preparation for work. Many reforms were enacted to address concerns about perceived shortcomings of the U.S. education system and to ensure that students were being well prepared for educational and economic attainment. Three important federal laws were passed to improve workforce development opportunities for high school students: the Carl D. Perkins Vocational and Applied Technology Education Act in 1990, the School-to-Work Opportunities Act in 1994, and the Carl D. Perkins Vocational and Technical Education Act of 1998. All of this legislation focused on improving the academic and technical competence of students emerging from high school.

Despite federal efforts to engage more youth in workforce development, there is evidence that the proportion of high school students who are career and technical education (CTE) concentrators declined during the late 1980s and 1990s (Delci & Stern, 1999; Levesque et al., 2000). During this time, a new classification of student has arisen, called the *dual concentrator*—a student who takes both an academic and a CTE program in high school. This group has generated considerable interest among policy makers and practitioners. Some evidence suggests these students, unlike traditional CTE concentrators, perform as well on traditional measures of achievement as academic concentrators (Plank, 2001).

We researched the extent to which students are choosing to participate in the career and technical, and dual curriculum concentrations; in career pathway (CP), tech prep (TP), and specific work-based learning activities (WBL)—i.e., cooperative education, job shadowing, mentoring, school-based enterprise, and apprenticeship/internship—in the wake of more than a decade of education reform. We also examined whether tech prep and specific WBL activities have become infused in the schooling of adolescents and to what extent they transcend traditional curricular patterns.

Federal School Reform in the Last Decade

Three major pieces of federal legislation were part of the education reforms of the 1990s. Each affected high school students graduating in the latter part of the decade. Two were revisions of existing federal CTE education legislation. The third was an attempt to foster change within state education systems.

Perkins II

In the late 1980s, congressional concern about the economic competitiveness of the U.S. workforce led to the approval of the Carl D. Perkins Vocational and Applied Technology Education Act of 1990, or Perkins II. The strategy it embodied for improving the competitiveness of the labor force was to upgrade secondary and 2-year college education programs in order to more fully develop the academic and occupational skills of all segments of the population, so to better prepare them for the demands of work in a technologically advanced society. Hayward and Benson (1993) declared the Act the most significant policy shift in the history of federal involvement in vocational-technical education funding. For the first time in CTE legislation, Congress emphasized academic as well as occupational skill development. A second important change was the emphasis on all segments of the population—a shift recognizing the need for all students to prepare for the workforce of the future. Perkins II was the first of several legislative efforts to reconnect CTE education to academic education.

The Act included three unique components. First, Congress created a national program called Tech-Prep. In the mid-1980s, Parnell (1985), among others, argued that students were leaving high school unprepared for either work or further education, thus limiting their ability to succeed beyond secondary school. This lack of preparation was most acute in the areas of mathematics, science, technology, and communication skills (Craig, 1999). Parnell's proposed solution was a 4-year program of study that incorporated the last 2 years of high school with 2 years of post-high-school education and training. This "2 + 2" model became part of Perkins II. It targeted the middle range of high school students, and focused on preparing them for jobs requiring increasingly sophisticated technological skills. In this plan, students would build on a foundation of academics taught in applied settings (e.g., math, science, and communications) in high school, then continue on with a sequence of technical courses coordinated with postsecondary institutions.

The second thrust of the Perkins II CTE reform was curriculum integration. While the notion of curriculum integration goes back almost a full century to John Dewey (1916), it was not until the 1980s that cognitive scientists began to demonstrate empirically the power of this approach (see Lave, 1988; Resnick, 1987). During this same time, employers were beginning to voice concerns about academic deficiencies of their newly hired workers. The problem was most acute in high-performance workplaces. A broader audience was also raising concerns about the failure of the majority of secondary students to acquire transferable academic skills. Curriculum integration was seen as a possible answer (Hayward & Benson, 1993). While calling for curriculum integration, Perkins II failed to define it beyond a set of coherent course sequences designed to lead to student achievement of academic and CTE competencies.

The third unique component of Perkins II was its emphasis on accountability. Before Perkins II, little accountability was required of states beyond reporting enrollment numbers and policy compliance (Hoachlander, 1995). Now, states were told to develop performance measures, to determine standards for those measures, and to base student and program evaluations on those standards. The legislation identified six outcomes: enrollment, academic skills, occupational skills, school completion, job placement, and wages or job retention (Stecher, Farris, & Hamilton, 1998). Although these accountability measures were mandated in the legislation, states were slow to implement them.

The School-to-Work Opportunities Act

While it is now a cliché to say that we live in a global economy, this fact, with all of its attendant implications, has profoundly altered the nature of the skills sets required for success in today's workplace. Against a backdrop of concern over declining U.S. economic fortunes in the late 1980s came the School-to-Work Opportunities Act (STWOA). Passed in 1994, STWOA was designed to encourage states to create more coherent systems to bridge the gap between education and work for all students, not just the select few who aspired to a narrow range of professional careers that offered transparent pathways (Hamilton, 1990). Unlike Perkins II, which revamped existing CTE education programs, STWOA established a national framework for the development of new systems to help youth make the transition from school to the workplace by forming coalitions of postsecondary institutions, employers, labor organizations, government, community groups, parents, and students. Building on the belief that students learn best by doing and then applying what they learn in school to the workplace, STWOA funded school-employer partnerships to design and implement work-based learning programs as defined in the Act (Levesque et al., 2000). Although STWOA focused on systems development rather than program improvement, as with Perkins II, it also included specific language about attaining high academic as well as occupational standards. Although the STWOA sunset in October 2001, states may be continuing with School-to-Work activities because the federal funds were intended to be seed money (National School-to-Work Office, 2003).

Perkins III

Perkins III, or more formally the Carl D. Perkins Vocational and Technical Education Act Amendments of 1998 (Pub. L. No. 105-332), intended to place CTE in the broader frame of education reform. In doing so, it reversed the funding for targeted special populations, but offered states more flexibility to allow for experimentation and new program development. In addition, Perkins III fostered CTE by focusing federal investment on programs that (a) integrated academic and CTE education; (b) involved parents and employers; (c) provided strong connections between secondary and postsecondary education; (d) developed, improved, and expanded the use of technology; and, (e) provided professional development for teachers, counselors, and administrators (Bailey & Kienzl, 1999).

However, the most important change that came with Perkins III was an even further emphasis on accountability. Four core indicators of performance for federally funded secondary and postsecondary CTE programs were established: These included student achievement; credential acquisition; transition to and completion of postsecondary education or advanced training, the military, or employment; and nontraditional training and employment. Under Perkins III, states are required to identify measures to evaluate performance on those indicators, and to demonstrate annual student performance on those four indicators.

Student Participation in CTE and Today's High School

Adolescents enter high school with different levels of academic preparation, different home and neighborhood backgrounds, varying degrees of commitment to education, and a wide range of goals and aspirations for their post-high-school years. While federal legislation has sought to increase the availability of CTE for all students, high schools tend to have their own internal logic. Despite years of reform efforts, most high schools still have a recognized track or concentration for academically gifted students and a concentration for students thought to be headed for early entry into the labor market. The rest of the students are left to wander haphazardly through their high school years—a problem that has been recognized for more than a decade (Hallinan, 1994; Hughes, Bailey, & Mechur, 2001; Oakes, 1994; Oakes, Selvin, Karoly, & Guiton, 1992). These students represent a third, or general, concentration.

One result of the several CTE reform efforts is the emergence of a fourth concentration—in addition to the academic, CTE, and general concentrations—comprised of students who follow both a rigorous academic sequence of courses and a rigorous sequence of CTE courses. These *dual concentrators,* while small in numbers, may represent the culmination of the reform efforts by combining the two long-standing philosophical traditions and curricula prevalent in high schools since the early 1900s.

Which concentration or curriculum pattern a student follows depends on both individual choice and the sorting mechanisms of schools (Garet & DeLany, 1988). Curriculum concentrations reflect the balance of academic and CTE coursework according to preestablished criteria. The NCES uses the following classification: academic; vocational or CTE; both academic and CTE (dual); and none of the criteria, the latter being the general concentration (Alt & Bradby, 1999).

The 1998 High School Transcript Study Tabulations (Roey et al., 2001a) illustrated how high school students are sorted into curriculum concentrations. Transcript data used in this study show that 71.0% were enrolled in an academic concentration, 4.4% were enrolled in a CTE concentration, 19.3% were enrolled in a concentration that met both criteria (dual concentration), and 5.4% were not enrolled as academic, dual, nor CTE. This group is referred to as the General Concentrators (see Table 1).

Delci and Stern (1999) analyzed students' perspectives on their high school curriculum and came to very different conclusions regarding student sorting. Relying on students' self-classification and using a classification schema similar to that of Roey et al. (2001a; 2001b), Delci and Stern found that when students were asked to identify their curricular concentrations, 32.8% identified themselves as academic concentrators, 5.0% as CTE concentrators, 56.5% as general concentrators, and 5.7% as dual concentrators.

Delci and Stern (1999) found that these curricular concentrations are associated with distinct patterns in mathematics and science coursetaking. Students who classified themselves as academic concentrators took more algebra, geometry, and advanced algebra than other students. CTE students were the least likely to take these courses. Dual concentrators and general students were equally likely to have taken geometry and advanced algebra. Nonetheless, Delci and Stern reported that one out of five students in combined or dual academic and CTE programs, and one out of three in CTE programs had not taken algebra, geometry, or advanced algebra by 11th grade.

Students in the 11th-grade academic concentration were more likely to have taken science courses, including biology and chemistry, than students in the combined or dual concentration (Delci & Stern, 1999). Students in the CTE concentration reported taking more technical and applied science courses than students in other concentrations. In contrast, Roey et al. (2001a) found that CTE students in 1982, 1990, and 1994 were less likely than other groups of students to take science courses.

Coursetaking patterns are important because they are a better predictor of baccalaureate degree completion than either high school grade point average (GPA) or SAT/ACT test scores (National Science Board, 1999). Using transcript information, Plank (2001) analyzed curricular concentrations in the early 1990s and found significant associations between high school coursetaking patterns and test scores in reading, mathematics, science, and history, controlling for gender, race, ethnicity, socioeconomic status, and 8th-grade test scores. Specifically, academic concentrators in 1992 exhibited the highest achievement in each subject area, after background controls are taken into account. Following them by a small but statistically significant margin were dual concentrators. The third highest scoring group, students who fulfilled neither concentration (general concentrators), was followed by the CTE concentrators in achievement.

Both the Roey et al. (2001a) and Plank (2001) analyses were guided by the classification scheme described in the National Center for Education Statistics guidelines on course classification (Alt & Bradby, 1999; Bradby & Hoachlander, 1999). Delci & Stern (1999) and the current study were based on self-classification.

If the goal of school reform is, in part, to ensure that all students receive education that prepares them for post-high-school education and careers, then curricular concentrations and the associated coursetaking patterns are worthy of investigation. In the study we examined the extent to which such curricular patterns vary as a function of CTE participation in the late 1990s, vis-à-vis the successive waves of education reform legislation.

OBJECTIVES OF THE STUDY

Within the context of education reform, this study aims to deepen our understanding of the extent to which students are choosing to participate in curriculum concentrations, career pathway, tech prep, and specific WBL activities (i.e., cooperative education, job shadowing, mentoring, school-based enterprise, and internship/apprenticeship); the extent to which curriculum choices, career pathway, tech prep, and WBL activities have been integrated into the schooling of adolescents; and the extent to which curriculum concentration, career pathway, tech prep, and specific WBL activities transcend traditional curricular patterns. More specifically, this study addresses a series of questions asked to a nationally representative sample of adolescents aged 12 to 16 in 1996, several years after the passage of two important federal reform initiatives—Perkins II and STWOA; Perkins III had not yet been passed. From the adolescents' perspective, this study asks:

1. What do we know about student participation in curriculum concentrations, and career pathway, tech prep, and specific WBL activities?

    a. What are the characteristics of youth who participate in the curricular patterns described here as general concentrator, academic concentrator, CTE concentrator, and dual concentrator?

    b. What are the characteristics of youth who participate in career pathway, tech prep, and specific WBL activities?

    c. How do math, science, and CTE coursetaking differ among curricular concentrations?

    d. How has participation in CTE and WBL activities changed during the latter 1990s?

2. What is the relationship between curricular concentration and participation in career pathway, tech prep, and specific WBL activities?

3. How are socioeconomic status, demographics, and school experience characteristics related to curriculum concentration and career pathway, tech prep, and WBL activities?

4. How are curricular concentration and participation in career pathway, tech prep, and WBL activities related to student outcomes, including self-reports of high school GPA and risky behaviors?

DATA AND METHOD

We conducted our analyses using data from the National Longitudinal Survey of Youth 1997 (*NLSY97*). The National Longitudinal Survey of Youth 1997, described by the Bureau of Labor Statistics (2002a) as a database consisting of a nationally representative sample of approximately 9,000 youths who were 12 to 16 years old as of December 31, 1996, was designed to document the transition from school to work and into adulthood.

We primarily used data from the third round of interviews conducted in 1999 (Round 3) for these analyses. However, we also used data from the first and second rounds of interviews (Round 1 and Round 2), conducted in 1997 and 1998 respectively, in order to keep an appropriate frame for socioeconomic status or to complete our analyses. For analyses in Tables 1 through 9, we weighted the observations, following the Bureau of Labor Statistics (BLS) guidelines, to estimate population parameters (Bureau of Labor Statistics, 2002b, p. 38) and to control for the survey oversampling. The weighted sample enables estimation of the number of individuals represented by each respondent. For the correlational analyses in Tables 3, 4, 5, 8, and 9 in this study, we used Pearson chi-square statistics in all population estimates.

NLSY97 Round 3 data were collected in 1999–2000 from 8,209 youths, or 91.4% of the original sample (Bureau of Labor Statistics, 2002b, p. 24). As in the first two rounds, the survey was administered through personal interviews with the youths and gathered extensive information on their education and training, among other variables. Youths who had attended the 9th grade or higher were asked a number of questions about their participation in school programs, including what curriculum concentration they believed best described their high school experience and the extent to which they participated in career pathway, tech prep, and WBL activities.

To understand what the *NLSY97* data can tell us about the study questions, it is important to note that the sample members began graduating from high school in 1998. That is, their secondary schooling was influenced by Perkins II and STWOA. Perkins III (The Carl D. Perkins Vocational and Technical Education Act of 1998)—which further encouraged many of these same initiatives—had just been enacted at the time these data were collected, and for that reason its effects on these students' responses are yet to be seen. Thus, we think of this longitudinal data set as one that can give us insights into trends and relationships in the midst of an education reform era.

For this study, CTE is analyzed in its two different meanings. First, CTE corresponds to the *curricular program* students can be enrolled in while in high school. For this purpose, the analyses are based on their reported curriculum concentration at the time of the interview. Second, CTE is also referred to as a set of categories related to preparation for work—i.e., career pathway, tech prep, and the following work-based learning activities: cooperative education, job shadowing, mentoring, school-based enterprise, and internship/apprenticeship, as described below. We refer to the latter as *CTE-related activities*.

Our analyses are primarily conducted with a survey sub-group consisting of those respondents who reported to be in grades 9 through 12 during the interview for Round 3 and who were enrolled in high school at the time of the interview. One exception to this occurred with the regression model to predict high school grade point average (see Table 13), where we used data for all survey respondents.

Variables

The STWOA outlined three core sets of activities that would lead to the development of work-related learning opportunities in all states: school-based learning activities, work-based learning activities, and connecting activities. These activities were to build on promising existing programs such as tech prep, career academies, apprenticeship programs, cooperative education, and business partnerships. The following elements were defined in STWOA (National School-to-Work Office, 1996) and are key variables in our analyses:

- *Career pathway or career major* are coherent sequences of courses or fields of study that prepare a student for a first job. They feature many of the same elements as tech prep and youth apprenticeships (integrated curriculum, work-based learning, secondary–postsecondary linkages) but may also include linkages to 4-year colleges or universities. Pucel (2001) offered a slightly more expansive view that describes career majors as combinations of existing courses within a high school that focus on particular career clusters. Career major pathways have become a popular tool to help schools organize curriculum and faculty to create greater coherence in course offerings.

- *Tech prep* refers to programs that offer at least 4 years of sequential course work at the secondary and postsecondary levels to prepare students for technical careers. Tech prep programs typically begin in 11th grade and are designed to conclude with the award of an associate's degree or certificate after 2 years of postsecondary education or training. By design, tech prep is intended to build student competency in academic and technical subject matter.

- *Cooperative education* is a structured method of instruction whereby students alternate or coordinate their high school or postsecondary studies with a job in a field related to their academic or occupational objectives. Written training and evaluation plans guide the instruction, and students receive course credit for both their work and classroom experiences.

- *Job shadowing* is a career exploration activity for middle school and early high school students. Students follow an employee in a work setting for one or more days to learn about a particular occupation or industry.

- *Workplace mentoring* includes instruction in general workplace competencies, including development of positive work attitudes and employability skills. It includes broad instruction, to the extent practicable, in all aspects of the industry.

- *School-based enterprise*s are enterprises in which goods or services are produced by students as part of their school program. Stern, Stone, Hopkins, McMillion, and Crain (1994) refined this definition by focusing on production of goods and services for sale to or use by people other than the students involved.

- *Internships* are situations where students work for a specified period of time for an employer to learn about a particular industry or occupation. Workplace activities may include sample tasks across different business units or may focus on special projects or on a single occupation. Internships may or may not include financial compensation.

- *Apprenticeships* are of two types. *Registered apprenticeships* are relationships between an employer and employee during which the paid worker, or apprentice, learns an occupation in a structured program jointly sponsored by employers and labor unions. *Youth apprenticeships* are typically multiyear combinations of school- and work-based learning in a specific occupational cluster designed to lead directly into either a related postsecondary program or a registered apprenticeship. Unlike registered apprenticeships, youth apprenticeships may or may not include financial compensation.

Youths in this survey were asked, “What program or course of study are you / were you most recently enrolled in during high school?” concerning their curricular concentration. They identified themselves as general program (general concentration), college prep (academic concentration), CTE technical or business and career program (CTE concentration), or combined academic and CTE program (dual concentration). They were also asked to indicate whether they participated in a “career major program.” Separately, they were asked if they participated in tech prep or any of the WBL activities—cooperative education, job shadowing, mentoring, school-sponsored enterprise, and internship/apprenticeship, or if they did not participate in any of these programs at all. The responses gave us two important measures of high school experience: how the students defined their curriculum concentration; and whether they participated in career pathway, tech prep, or the specific WBL activities.

Therefore, in the analysis of curricular concentrations, data are from one single variable in the survey where responses were mutually exclusive. Data for career pathway are from one variable. Data for tech prep, cooperative education, job shadowing, mentoring, school-based enterprise, internship/apprenticeship, and no participation are all from a single question where youth had the possibility of choosing more than one of those activities—or of choosing “none.” Career pathway and tech prep are not mutually exclusive, and WBL activities are usually embedded in both of them.

Data for every category were treated independently; that is, in the correlational analysis (see Tables 3, 4, 5, 7, 8, and 9) each of the categories (i.e., gender, age, race, ethnicity, etc.) was analyzed independently for each of the curriculum concentrations and the CTE-related activities.

Data Limitations and the Use of Interview Data

The use of an existing data set certainly poses some limitations, particularly since we used responses to questions that had already been designed. For instance, the *NLSY97* survey included as response options only a limited list of CTE courses—mostly in 2 out of the 10 most known occupational program areas described by Bradby and Hoachlander (1999), and Silverberg, Warner, Goodwin, and Fong (2002). Thus, no information is available from this survey about what courses youth may be taking in the occupational areas not included.

As in other studies using these types of data, variables are not uniform in the number of cases—i.e., there exists a different *n* for all variables. It is important to keep this in mind, especially when referring to the descriptive section and tables where we analyze relationships between those variables. When categories are studied in reference to curriculum concentration, or career pathway, tech prep, and specific WBL activities, the percentages provided refer to the distribution inside each concentration or CTE-related activity.

These analyses are based on data provided by youth through interviews. In our discussion of curriculum concentration, we noted differences between our findings and those from transcript-based studies such as Roey et al. (2001a), who imposed a concentration template on transcript data to do their analyses (see Table 1). Delci and Stern (1999) discussed at some length this difference between students' academic perceptions, even desires, expressed through self-classification and what official transcripts suggest as their academic trajectories. They concluded that each approach has certain analytic advantages and disadvantages, and each kind of measure has validity and provides different information.

The discrepancies between the findings of Plank (2001) and those of the current study may also be an artifact of transcript data (Plank) vs. self-classification. But if the presumption is that academic concentrations are designed to move students to college, then the self-classification data more closely reflect the actual percentages of students who pursue and complete post-high-school education. About 32% of the high school classes of 1996 and 1997 have completed a 4-year college degree or higher (U.S. Department of Commerce, 2001). This figure is closer to the *NLSY97* self-classification of academic concentration than to the Roey et al. (2001a) transcript analyses. Because students see themselves and identify themselves with one of those concentrations, we might reasonably conclude that self-classification of curriculum concentration provides a more reliable indicator of future college completion than transcripts analyses.

FINDINGS

Data from the *NLSY97* Round 3 of interviews are analyzed in reference to the two groups of CTE-related areas described above—curricular concentrations, and career pathway, tech prep, and specific WBL activities. First, we will analyze correlates on curriculum concentration, and on career pathway, tech prep, and specific work-based learning activities. Second, we will analyze regression models about the relationship on those two areas and other school experience.

Participation Patterns in Curriculum Concentrations

Data on curriculum concentration explores the composition and patterns of students reporting participation in one of the four following concentrations: general, academic, career and technical education (vocational), and dual. Although information on the CTE concentration will be examined in contrast to the three other concentrations, special attention will be given to the differences with the general concentration following the trend of other studies, in particular the most recent *National Assessment of Vocational Education* report (Silverberg et al., 2002).

An estimated 4.8% of the youth in the country identified themselves as CTE concentrators (see Table 2), a figure slightly higher than the 4.4% identified by Roey et al. (2001a) from transcript analysis, slightly lower than the 5.0% Delci and Stern (1999) identified, and far lower than current NCES reports of 25% based on transcripts for public high schools (Levesque, 2003). Those numbers are still lower than Plank's (2001) finding of more than 18% identified as CTE concentrators among the class of 1992. Youth identification as CTE concentrator slightly declined since the Round 2 of the *NLSY97* survey interviews and slightly increased from Round 1. In any event, those percentages stay in a low range. Data for general concentrators are down from Rounds 2 and 1. Data for dual concentrators show a rebound from Round 2, although in the 3 years they remain very similar and in the low range. *NLSY97* data for 1997–1999 show all concentrators remaining, with small differences, in the same range.

Descriptive Characteristics of Youth Participating in the Four Curriculum Concentrations—1999

We analyzed the demographic characteristics and socioeconomic status indicators of those students enrolled in the general, academic, CTE, and dual concentrations, and compared the composition of students in the CTE with the overall population and those enrolled in the general and academic concentrations (see Table 3). Data on gender and race and ethnicity come primarily from Round 1, whereas data on age are current. Race is a variable created from a question in the survey that has four defined categories, in addition to one category for mixed, one for an unspecified race, and one for refusal. For the analyses reported here, we have used only the first two and largest groups—white and black. Ethnicity is derived from a different question in the survey that asked whether the respondent were Hispanic or not.

For the purpose of comparing youth according to their socioeconomic status characteristics, we used data from the Round 1 of interviews for community location, geographic location, gross household income, and mother's and father's education because we wanted to obtain a more uniform picture about socioeconomic status at the start of the study—when all respondents were living with their families in their first location. Subsequent data for those categories may have changed over time as respondents left homes/communities and become more difficult to track and deal with (for example, gross household income, which is a type of information that has changed if the respondent has become 18 years old and/or independent). Data for concentration participation are from Round 3. Following the categorization in the National Center for Education Statistics (Wirt et al., 2002, p. 63), the gross household income data were categorized as follows:

Low:	$0 to $19,999
Low-Middle:	$20,000 to $34,999
Middle:	$35,000 to $54,999
Middle-High:	$55,000 to $74,999
High:	$75,000 or more

We found statistically significant demographic differences among students in the four curricular concentrations (see Table 3). Of interest here, we found that females were underrepresented in the CTE and dual concentrations. Blacks were overrepresented in CTE and dual concentrations, whereas Hispanics were underrepresented in CTE, dual, and academic, respectively.

Urban youth were disproportionately enrolled in the CTE and dual concentrations. Higher proportions of suburban youth were enrolled in the academic concentration, whereas rural youth followed a pattern more like urban youth, choosing the CTE and dual concentrations over the general and academic.

Curriculum concentrations in our sample displayed regional differences. CTE concentrators were overrepresented by students living in the South and Northeast. General concentration youth were more likely to live in the West or North Central regions of the country.

We found that CTE youth were disproportionately drawn from low and low-middle income families (see Table 3). This distribution may still relate to the perception that CTE youth will pursue a career right after school graduation, thus they enroll in a track that prepares them for the world of work. Youth coming from middle-income families are more uniformly distributed across all concentrations, except the CTE. On the other hand, nearly 50% of the academic concentrators reported to be from middle-high and high income families. These data suggest that class, as measured by family income, still remains a sorting mechanism in United States high schools.

Delci and Stern (1999) noted that students begin to identify with a curriculum concentration as they move from 9th to 11th grade. Our analyses show that students move into academic, CTE, and dual concentrations in increasing proportion as they move from 10th to 12th grade, but this is not the case of the general concentrators (see Table 4). It appears these students begin to migrate from the general toward a more definitive curriculum concentration as they move into 11th and 12th grades.

Data on 8th-grade GPA and curriculum participation is also revealing. Following Delci and Stern's (1999) GPA categorization, 8th-grade GPA was organized into three groups:

Low:	0–1.50
Medium:	1.51–2.50
High:	2.51 or higher

As shown in Table 4, more CTE concentrators (21%) reported low 8th-grade GPA than did youth in other concentrations. Not surprisingly, the largest group of students reporting the high level of 8th-grade GPA (As and/or Bs) are those in the academic concentration (77.7%).

One measure of academic rigor is coursetaking in math and science. We first analyzed coursetaking patterns by examining the number of courses taken and completed in high school in the period between the interviews for Round 2 and Round 3—interviews for Round 3 took place between October 1999 and April 2000 (Bureau of Labor Statistics, 2002b). The intended elapsed time between interviews is about one year because "the *NLSY97* is an annual survey" (Bureau of Labor Statistics, 2003). Therefore, these are the number of math, science, and CTE courses taken in that period—i.e., about a year, which includes the last academic year.

The second measure of coursetaking behavior is the types of math, science, and CTE courses taken. With both the math and science courses we attempted to look into a progression in the coursetaking behavior, since it is possible to follow a sequence of courses in those areas. That was not the case with CTE courses, which were more independent from one to another, and no sequence can be assumed or identified from the survey data.

Math Coursetaking

In our analysis of coursetaking behavior, we found statistically significant differences among youth in the four curriculum concentrations on measures of coursetaking behavior. Of particular interest is the comparison between two groups of students that resembled each other in several key characteristics: CTE and general, and academic and dual concentrators.

Our analyses show that CTE concentrators took more math than general concentrators. Although more CTE concentrators reported taking no math or only one math course, proportionately more CTE students reported taking two or more math courses during the preceding year. More academic than dual concentrators reported taking only one math course, and fewer reported taking two to three courses.

When we examined the kinds of math courses taken, proportionately more CTE concentrators took harder math courses than general concentrators (see Table 5). However, more CTE concentrators reported taking "no math." These data suggest that when CTE students took math, they took more difficult math than their general concentrator counterparts. We also found that more CTE concentrators took "other math" classes than did general concentrators, and the differences here are large (16.6% vs. 8.4%). This may reflect the implementation of such courses as applied math or tech prep math (contextual learning) described by Meyer (1999).

Although dual concentrators took more two to three math courses than academic concentrators, academic concentrators took more higher-level math. On the other hand, a higher proportion of dual concentrators reported taking general math, algebra I, geometry, or “other math” than did academic concentrators.

Science Coursetaking

Science coursetaking patterns are similar to math coursetaking, but more clearly so. A higher proportion of CTE concentrators than general concentrators reported taking no science. However, fewer CTE students than general concentrators reported taking only one science course, but more CTE students reported taking between two and four. We found that more dual concentrators reported taking two and three science classes than any of the other concentrators (see Table 4).

More CTE concentrators than general concentrators reported taking biology, chemistry, and physics. More general concentrators, however, took “other science” classes. More dual concentrators than academic concentrators reported taking biology and physics, and also more reported taking “other science” courses, although fewer reported taking chemistry. More youth in the dual concentration than in the academic concentration took no science (see Table 5).

CTE Coursetaking

Our examination of CTE coursetaking patterns yielded surprising results. While more CTE concentrators reported taking one CTE course than any other concentrator, we found that dual concentrators took more CTE courses than CTE concentrators.

But more surprisingly, more than a quarter of both CTE and dual concentrators (i.e., those required to take CTE courses) reported taking no CTE courses. This may relate to the fact that the type of CTE courses included in the *NLSY97* survey that youth were asked about was limited to only 2 of the 10 NCES-defined occupational program areas (Bradby & Hoachlander, 1999; Silverberg et al., 2002).

The NCES reports that CTE majors have increased their math and science coursetaking by an average of one credit between 1982 and 1998—an increase larger than the coursetaking reported for all students including academic concentrators (Levesque, 2003, p. 87). Our analyses showed that when compared to a similar group—i.e., the general concentrators—CTE students have increased their math and science coursetaking beyond the general concentrators.

Our analyses of coursetaking patterns in the late 1990s suggest that the reforms of the 1990s, Perkins II, and the STWOA that encouraged more math and science for CTE students may be having an impact on the coursetaking behavior of CTE and dual concentrators.

Participation Patterns in Career Pathway, Tech Prep, and Specific WBL Activities

We now explore the composition and patterns of students reporting participation in one or more of the following CTE-related activities: career pathway, tech prep, and the specific work-based learning activities—cooperative education, job shadowing, mentoring, school-sponsored enterprise, and apprenticeship/internship.

To analyze the distribution of the participation in the CTE-related activities during Round 3 and compare it with the two previous rounds, we estimated the national population parameters of youth in grades 9 through 12 that may be participating in these activities (Bureau of Labor Statistics, 2002b, p. 38). Over the course of the *NLSY97* three rounds of interviews, data show a small but consistent decline in the proportion of youth, grades 9–12, who reported participation in these activities (Table 6).

The major changes in these estimates appeared to take place in the participation in a career pathway—down 1.9 percentage points from Round 2 and 2.8% from Round 1—as well as in tech prep, school-sponsored enterprise, and job shadowing (see Table 6). Youth reporting participation in school-sponsored enterprise activities declined 1.6% since Round 2 and, significantly, 5.4% from Round 1. The number of youth enrolled in tech prep declined, too, by 1.2% down to 7.5% in 1999 from 8.7% in 1997. The declining pattern goes across all grades, with the exception of participation in cooperative education in 12th grade, which increased in Round 3 from the two previous years (see Table 7). As participation numbers decrease for any of those activities, the opposite holds for nonparticipation. Nonparticipation rates increased during the 3 years of data collection—increasing from 68.7% in Round 1 to 75.0% in Round 3 (Table 6).

Coursetaking and Post-High-School Expectations

Youth engaged in career pathway, tech prep, and WBL activities reported taking more math and science courses than the general student population in grades 9 through 12 who were enrolled at the time of the interview (see Table 9). A similar pattern emerges with our analysis of CTE coursetaking.

Despite the apparent advantage in math and science coursetaking, youth in all but job shadowing and mentoring had lower college completion expectations than the general student population in grades 9 through 12 who were enrolled at the time of the interview. One explanation may be that youth who engage in work-oriented programs may develop more realistic expectations regarding the utility of or suitability of college in relation to their post-high-school plans. As Rosenbaum (2002) observed, nearly all youth in high school reported they plan to go to college. Yet, current data from the NCES and elsewhere indicate that only 41.3% of high-school graduates age 30–34 actually have college degrees (National Center for Education Statistics, 2000).

Predicting Curriculum Concentration and Participation in CTE-Related Activities

For the analysis of the demographic and socioeconomic status of students according to curriculum concentration and for those enrolled in a career pathway, tech prep, and specific WBL activities, we used the same set of variables with the same specifications.

The following discussion is in two parts. The first set of analyses build predictive models that identify which variables best describe youth in each of the four unique curriculum concentrations, as well as participation in career pathway (CP), tech prep (TP), and specific WBL activities. Our basic argument is that curriculum choice and participation in a career pathway, tech prep, and specific WBL activities are a function of gender, race/ethnicity, socioeconomic status, geographic location, and academic ability.

The second set of analyses examines outcomes using the same model. We extend this basic model to examine outcomes such as self-report of high school GPA, as well as propensity to engage in risky behaviors with the addition to the model of curriculum concentration and participation in CTE-related activities.

Analytic Approach

The models we used to predict curriculum concentration, and CP, tech prep, and specific WBL participation, and engagement in risky behavior all involve a nominal, dichotomous dependent variable and multiple independent variables. We used logistic regression to estimate the probability that an individual with a given set of characteristics participates in a particular curriculum concentration or CP, TP, and/or WBL activities, or risky behavior. This approach allowed us to isolate the independent relationship of a particular characteristic (e.g., gender) to participation rates, while holding constant the relationship of the dependent variable to other characteristics (see Joyce & Neumark, 2001).

We present odds ratios that indicate how likely youth with a particular characteristic are to participate in a curricular concentration, CP, tech prep, or WBL activities, or risky behavior, relative to other youth. For dichotomous independent variables, the odds ratio is "a measure of association [that] approximates how much more likely (or unlikely) it is for the outcome to be present among those with $x = 1$ than among those with $x = 0$ [where x is the independent variable]" (Hosmer & Lemeshow, 1989, p. 41). In the case of continuous variables, the odds ratio indicates the change in the ratio for one unit increase in the independent variable (Hosmer & Lemeshow, 1989; Joyce & Neumark, 2001).

Models involving individual reports of high school GPA used a different, continuous dependent variable. In this case, we used a limited as well as a full model. For the former, we looked only into the impact of the enrollment in curriculum concentrations, and participation in CP, TP, and specific WBL activities on high school GPA. For the full model, we used the same set of independent variables used for the logistic regression models. For these two models, we used linear regression analysis and reported beta coefficients for the variables included.

Dummy indicator variables were used to code socioeconomic characteristic; the measures of curriculum concentration; CP, tech prep, and/or WBL participation; and risky behavior. Table coefficients for the variable sets are interpreted in comparison to the omitted group, whenever applicable. Variables were (omitted category in parentheses): gender (female); race (white); urban and suburban (rural); and general, CTE, and dual concentrations (academic). Similarly, for career pathway participants, the omitted variable was those who did not participate in a career pathway; for tech prep participants, those that did not participate in TP; for remaining WBL activities participants, those not in any of those activities; and for nonparticipants in either CP, tech prep, or any of the specific WBL, the omitted or comparison group was those students who did participate in CP, tech prep, or any WBL activities. In addition, we included three continuous variables: household income, and 8th-grade GPA, and number of math, science, and CTE courses taken (see Table A2).

For the analyses performed in this section, household income was ranked according to the Wirt et al. (2002) income categorization. Data for valid missing cases only were substituted with the income mean (Downey & King, 1998; Roth, 1994; Switzer, Roth, & Switzer, 1998).

Predicting Curriculum Participation

Our analyses show that youth who self-identified as a CTE concentrator were 1.7 times as likely to be black than white, less likely to come from affluent households, were 0.6 times as likely to live in suburban than rural areas, and were about 2/3 as likely to report high 8th-grade GPA. In this, CTE concentrators most closely resemble general concentrators on low GPA and household income. However, general concentrators were 0.8 times as likely to be black than white (i.e., they were more white than black) and were 3/4 as likely to take more science courses (see Table 10).

Youth who self-identified as dual concentrators were 1.4 times as likely to be male and 1.5 times as likely to be black. Also, they do not differ from other youth on 8th-grade GPA. They were 1.29 times as likely to take more CTE courses than other youth. Compared with non-academic concentrators, academic concentrators came from higher income households, were 1.4 times as likely to be suburban, and were 2.8 times as likely to have higher 8th-grade GPAs.

Predicting Participation in Career Pathway, Tech Prep, and Any WBL Activities

Our analysis of participation in one of the three main areas of CTE-related activities (career pathway, tech prep, and WBL activities as a general category), or no participation in tech prep or any of the WBL activities (also a generic category) shows interesting findings. The race variable was statistically significant in the four models examined in Table 11, as were enrollment in the CTE and dual concentrations (compared to enrollment in the academic concentration), and the CTE coursetaking variable. The following is a summary of characteristics reported by participating youth or nonparticipating youth in a career pathway, tech prep, or WBL (see Table 11).

Career pathway. Youth who reported participation in a career pathway were 1.6 times as likely to be black than white. Compared to academic concentration youth, career pathway youth were nearly four times as likely to be CTE concentrators, and nearly twice as likely to be dual concentrators. General concentrators were 0.6 times as likely as academic concentrators to report participation in a career pathway.

Youth in a career pathway were 1.17 times as likely to take more science coursework, and were 1.25 times as likely to take more CTE coursework than their non-pathway counterparts. There were no differences in math coursetaking behavior.

Tech prep. Tech prep youth were about 1.5 times as likely to be black than white. They were 1/2 and about 2/3 as likely to live in an urban or suburban community, respectively. Not surprisingly, they were 4.1 and 2.6 times as likely to be either a CTE or dual concentrator than were academic concentrators, and were 1.15 times as likely to report taking more CTE courses.

Work-based learning. Youth who report participating in any one or more of the identified WBL activities (coop, job shadowing, mentoring, school enterprise, or internship/apprenticeship) were over 3/4 as likely male than female, and more likely to be black than white. Compared to academic concentrators, these youth were significantly less likely to be general concentrators, and more likely to be CTE or dual concentrators. They reported taking significantly more math and CTE coursework than the general population of students.

Nonparticipants. Youth who did not participate in tech prep or WBL were 1.2 times as likely to be male and about 3/4 to be white. They were 1.3 times as likely to live in a suburban than a rural community. They were 1.2 times as likely to be a general concentrator than an academic concentrator, and about 4/5 to take more CTE courses than other students.

Predicting Participation in Specific WBL Activities

In our examination of the models related to the five specific work-based learning activities (cooperative education, job shadowing, mentoring, school-based enterprise, and internship/apprenticeship [see Table 12]) we did not find any single variable that was statistically significant across all models. However, we did find some similarities with the models described in Table 11 in the behavior of some independent variables when predicting participation in those specific WBL activities. Youth who were more likely to participate in coop, SBE, and internships were also more likely to self-identify as a CTE or dual concentrator. Youth who were more likely to participate in job shadowing and mentoring did not identify with any curriculum concentration. This suggests that these WBL activities have found greater acceptance as useful pedagogies beyond the CTE-based classroom.

Youth who participated in cooperative education were more likely to be black than white. They were more likely to be either a CTE or dual concentrator than an academic concentrator. Finally, they were more likely to take more math and CTE classes than the general student population in grades 9 through 12, and to be enrolled at the time of the interview. The math finding is surprising, but perhaps is evidence of the impact of Perkins and STWOA legislation.

Job shadowing participants were characterized only by a likelihood to take more CTE courses. Despite this, they do not identify as CTE or dual concentrators. Students who indicated they were in mentoring programs were 1.5 times as likely to be black or Hispanic, and to be enrolled in more CTE courses than students who did not participate in mentoring.

Youth in school-based enterprises were more likely to take more CTE courses than those who did not participate in school enterprises. They were more likely CTE or dual concentrators than academic concentrators. They were 0.6 times as likely to be males than females.

Finally, youth who reported participation in internships were 1.7 times as likely to be dual concentrators than academic, and 0.6 times as likely to be general concentrators than academic. These youth were twice as likely to live in urban than rural communities.

As interesting as the significant predictors were of participation in specific kinds of WBL, it is also intriguing to note what are not significant predictors. With the exception of school enterprise, there were no gender differences among the various forms of WBL: Males and females have the same probability of participation.

We do not find youth from less affluent households more likely to participate in specific forms of WBL. Nor do we find academic performance a predictor of participation.

While, overall, race is a significant factor in predicting WBL participation, it seems to be limited to cooperative education and mentoring programs. With the exception of internships/apprenticeships, WBL participation appears to be evenly distributed across types of communities.

Predicting Student Outcomes—1999

We examined the relationship between youths' background characteristics, curriculum concentration, and participation in CTE-related activities, with two student outcomes: high school GPA and engaging in risky behaviors.

High School GPA

We analyzed two models to predict students' high school GPA, for which we used linear regression (see Table 13). The first, a limited model, examined the relationship of academic concentration (three variables) and CTE-related activities (four variables) with the cumulative high school GPA of each high school graduate. Six variables out of the seven present in the model showed a relationship with high school GPA—the exception being tech prep. The second, a full model, included background characteristics and 8th-grade GPA. In the full model, curriculum concentration remains a significant predictor of high school GPA, although its relative importance in the model diminished with the inclusion of 8th-grade GPA, gender, race, and household income variables. In the full model, the dual concentration contribution is ranked similarly as in Plank's (2001) findings about student achievement—that is, second after purely academic concentrators. However, unlike Plank's findings, CTE contribution in this study seems to be stronger than the general concentration contribution, and the difference between them is smaller in this study than in Plank's.

Compared to youth in the academic concentration, youth in the general concentration reported the greatest difference in GPA, followed by CTE and dual concentrators. The reported difference between CTE and general concentrators may be a function of the greater amount of math and science coursework taken by CTE concentrators. Youth in career pathway reported higher GPAs than those who were not. Males, blacks, and Hispanics reported lower GPAs than females, whites, and non-Hispanics. Youth from lower income households also reported lower high school GPAs.

Risky Behaviors

We investigated the relationship between curriculum concentration and participation in career pathway, tech prep, and specific WBL, with student reports of risky behaviors (defined for the purposes of this study as having engaged in sex, smoking, drinking, and marijuana use).

In all four risky behaviors, CTE concentrators were not different from academic students. Dual concentrators were more likely to smoke and use marijuana than were academic concentrators. General concentrators were more likely than academic concentrators to engage in sex, smoking, and marijuana use.

Youth who participated in tech prep were no more likely to participate in risky behaviors than were the general student population in grades 9 through 12 who were enrolled at the time of the interview. This same pattern was true for those who did not participate in any CTE-related activities.

Career pathway youth were 1.3 as likely to use marijuana than were those not in a career pathway. Youth who participated in any specific WBL were 1.5 and 1.3 times as likely to smoke and drink, respectively, than those who did not. These data are consistent with Greenberger and Steinberg's (1986) assertion that working youth were more likely to engage in adult-like behavior.

We also found that low GPA is associated with each of the risky behaviors identified in this study. Gender, race, and ethnic predictors are shown in Table 14 for each of the risky behaviors.

DISCUSSION

This study was designed to respond to three questions: What do we know about student participation in alternative curriculum concentrations, career pathway, tech prep, and WBL activities? What is the relationship between students' curricular concentration and their participation in career pathway, tech prep, and specific WBL programs? And what is the relationship between curricular concentration, career pathway, tech prep, and WBL, high school GPA, and risky behavior? More broadly, we were interested in understanding if a decade of legislated CTE reform was having an effect on CTE participants' coursetaking behavior.

The database used to investigate these questions is a work in progress. The youngest of the *NLSY97* participants are only now completing high school, so a more complete understanding of the questions posed for this study will be available in subsequent analyses. However, given these and other limitations of the data, we can begin to draw tentative conclusions about the condition of CTE as a result of the school reforms in the 1990s.

These data suggest that the proportion of youth who identified as CTE concentrators has remained at the same level during the decade of the 1990s (with very little variation in 1998) while those who identify as dual concentrators has risen slightly. This is consistent with the NCES report *Trends in high school vocational/technical coursetaking: 1982–1998* (Levesque, 2003).

Racial differences exist among the curriculum concentrators in American high schools. CTE and dual concentrators were more likely to be black. CTE concentrators came from lower income households and had a lower 8th-grade GPA. This may suggest racial and class distinctions in how high schools counsel, encourage, or track youth into curricular alternatives. The use of vocational education as a tracking system is a concept that has been described previously (Oakes, Gamaron, & Page, 1992). However, this sorting may actually benefit black youth, given the math and science coursetaking patterns we discussed earlier.

One of the most intriguing findings relates to coursetaking patterns. We showed evidence that the emphasis on math and science in Perkins II, STWOA, and Perkins III, may be having an impact on CTE and dual concentrators. Youth who identified as CTE concentrators reported taking more math and science classes—and certainly, more CTE—in high school than did general concentrators. For those CTE students who did take math, science, and CTE, more reported taking harder courses than did their general concentration counterparts. Dual concentrators also reported taking more math than their academic counterparts, although the math appears to have been of a lower level or perhaps a different type.

All of the CTE-related activities (career pathway, tech prep, cooperative education, job shadowing, mentoring, school-sponsored enterprise, and internship/apprenticeship) showed a steady decline in 1999. And school-sponsored enterprise showed a more dramatic drop—of about 5% since 1997.

Being enrolled in the CTE or dual concentration is a good predictor of participating in career pathway, in tech prep, or in any specific WBL activity. As in the case of curriculum concentration, coursetaking patterns were also related to participating in a career pathway, tech prep, or any WBL activity. Two of the more interesting relationships uncovered in these data were between math coursetaking and participation in WBL activities, and science coursetaking and career pathway. Youth who took more math were more likely to participate in WBL activities, and those who took more science were more likely to participate in a career pathway. We have no explanation for the former, but suggest the latter may reflect the increasing emphasis on science and technology in many career pathways.

Career pathways, an innovation fostered by the STWOA, is associated with a number of positive outcomes. It has a significant impact in high school achievement, and students in career pathway took more science and CTE classes.

Although these are preliminary conclusions, they highlight the relationship between CTE-based school reform efforts and changes in student identification with curriculum concentrations, their participation in CTE-related activities and, ultimately, with their educational outcomes. As many of the youth are still in school at the time of this analysis, future research should continue to monitor the impact of the Perkins and other reform efforts.

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Table 1
Percentage of Students by Curriculum Concentration, as Reported in Four Studies

Study	Data Source	CTE Concentrators (%)	Dual Concentrators (%)	Academic Concentrators (%)	General Concentrators (%)
Plank (2001)	*NELS: 88** transcripts	18.3	6.9	40.1	34.7
Roey et al. (2001a)	1998 transcript study	4.4	19.3	71.0	5.4
Delci & Stern (1999)	*NLSY97* Round 1 self-classification	5.0	5.7	32.8	56.5
Present study	*NLSY97* Round 3 self-classification	4.8	5.8	35.5	52.8

* National Education Longitudinal Study of 1988

Table 2
Percentages and Weighted n *for Curriculum Participation: General, Academic, CTE, and Dual Concentrations,* NLSY97*, Rounds 1–3*

		Round 1 (1997)		Round 2 (1998)		Round 3 (1999)	
Concentration	Description	Percentage	Weighted *n*	Percentage	Weighted *n*	Percentage	Weighted *n*
General	General program	53.8	5,107,758	56.0	7,397,628	52.8	6,407,217
Academic	College preparatory, academic, or specialized academic program	34.6	3,282,796	32.9	3,777.562	35.5	4,311,538
CTE	CTE, business, and career program	4.7	448,085	4.4	775,491	4.8	585,373
Dual	Combina-tion academic and CTE program	5.5	524,694	5.3	692,584	5.8	702,046
Total		98.6*	9,494,284	98.6*	13,964,687	98.9*	12,137,383
n		4,323		6,039		5,218	

* The remaining cases did not report participation in these concentrations.
Note. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview.

Table 3
Summary Table of Chi-Square Analyses of Participation in Curriculum Concentration by Demographic and Socioeconomic Status Indicators, NLSY97*, Round 3 (Percentages)*

		Curriculum Concentration			
Variable	All	General	Academic	CTE	Dual
Gender*					
Female	48.1	46.6	53.6	39.5	36.5
Male	51.9	53.4	46.4	60.5	63.5
Age*					
13	0.0	0.0	0.0	0.0	0.0
14	2.0	2.4	2.0	0.0	0.9
15	29.1	31.6	27.4	16.5	26.1
16	28.2	27.8	29.7	28.6	26.9
17	28.2	25.6	30.8	33.8	32.1
18	10.5	10.2	9.4	18.0	12.3
19	1.9	2.4	0.6	3.2	1.7
Race*					
White	72.9	72.5	76.9	61.9	64.7
Black	16.0	15.8	13.0	28.1	24.4
Ethnicity*					
Hispanic	12.5	14.1	10.4	10.9	11.2
Community location*					
Urban	25.2	26.2	21.0	32.1	32.2
Suburban	54.4	52.3	61.4	44.4	43.6
Rural	19.8	20.9	17.2	22.1	23.7
Geographic location*					
North-east	18.1	16.0	19.3	26.1	22.3
North-central	25.9	28.1	24.3	20.3	24.2
South	34.2	30.0	38.2	43.4	34.7
West	21.8	25.9	18.1	10.2	18.8

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Table 3 (continued)

		Curriculum Concentration			
Variable	All	General	Academic	CTE	Dual
Gross household income*					
Low	19.7	23.1	12.0	32.0	21.3
Low-middle	17.1	18.9	12.9	21.6	19.9
Middle	26.1	26.7	25.6	22.7	28.4
Middle-high	16.9	14.8	20.5	15.0	15.1
High	20.3	16.5	29.0	8.7	15.3
Mother's education*					
None	7.8	9.1	4.5	13.5	9.4
1st–8th grade	19.5	19.8	17.8	26.3	22.9
9th–11th grade	14.8	15.0	14.4	16.4	12.2
12th grade	38.3	38.3	38.7	33.7	39.4
Some college	9.5	9.4	9.9	7.4	9.2
College degree	7.5	6.2	11.1	2.0	4.7
Some grad	0.8	0.9	0.9	0.0	0.5
Graduate degree	1.8	1.3	2.6	0.6	1.7
Father's education*					
None	13.3	14.7	9.5	19.8	14.4
1st–8th grade	22.7	23.1	21.2	28.6	23.6
9th–11th grade	11.1	10.7	10.8	13.2	15.4
12th grade	30.5	31.8	30.0	24.2	29.5
Some college	9.0	7.7	11.4	6.5	9.1
College degree	7.9	7.3	9.7	7.1	4.2
Some grad	0.9	0.9	1.0	0.6	0.5
Graduate degree	4.6	4.0	6.4	0.0	3.4

*Statistically significant at $p < 0.05$.
Note. The "All" column reflects the composition of all currently enrolled students in grades 9 through 12 for each category. Percentages for concentrations are a distribution within each concentration. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview. Each of the categories (gender, age, race, ethnicity, etc.) was analyzed independently for each of the curriculum concentrations.

Table 4
Summary Table of Chi-Square Analyses of Participation in Curriculum Concentration by Youth-School Characteristics, NLSY97*, Round 3 (Percentages)*

		Curriculum Concentration			
Variable	All	General	Academic	CTE	Dual
Grade*					
9	13.7	17.8	7.5	6.7	9.7
10	31.0	32.5	29.9	26.7	29.9
11	27.8	25.3	31.8	31.6	29.4
12	27.3	24.2	30.7	35.1	30.9
8th grade GPA*					
Low (Cs and/or Ds)	10.2	13.2	3.3	21.0	13.1
Medium (Bs and/or Cs)	33.1	40.5	19.0	45.1	41.7
High (As and/or Bs)	56.7	46.2	77.7	33.9	45.1
Number of high school math courses taken & completed since date of last interview*					
0	7.3	8.8	3.9	10.6	8.3
1	66.6	67.4	67.5	61.4	57.8
2	17.8	17.0	18.2	18.5	22.6
3	5.2	4.8	5.8	5.2	6.4
4	2.4	1.4	3.5	3.7	3.0
5	0.6	0.4	0.6	0.7	1.8
6	0.2	0.1	0.4	0.0	0.0
7	0.0	0.0	0.1	0.0	0.0
8	0.0	0.0	0.0	0.0	0.1
9	0.0	0.0	0.1	0.0	0.0
Number of high school science courses taken & completed since date of last interview*					
0	14.0	17.3	7.8	20.3	13.3
1	71.1	70.0	75.2	63.3	65.2
2	12.6	11.2	13.9	13.3	18.1
3	1.9	1.3	2.6	2.7	2.8
4	0.4	0.2	0.5	0.4	0.5

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Table 4 (continued)

Variable	All	General	Academic	CTE	Dual
		Curriculum Concentration			
Number of high school CTE courses taken & completed since date of last interview*					
0	39.5	37.3	45.5	30.0	29.8
1	39.7	41.5	36.0	47.1	38.1
2	14.1	14.4	12.8	16.0	19.5
3	4.8	4.9	4.1	5.5	8.5
4	1.5	1.6	1.5	1.2	1.9
5	0.3	0.3	0.1	0.1	1.1
6	0.1	0.0	0.1	0.0	1.1
Expectations of obtaining a college degree by age 30*					
None	7.3	9.3	1.8	10.4	7.8
Low	8.9	8.4	5.2	22.2	12.2
Moderate	18.8	22.8	7.7	26.0	21.5
High	65.0	59.5	85.3	41.4	58.4

* Statistically significant at $p < 0.05$.
Note. The "All" column reflects the composition of all currently enrolled students in grades 9 through 12 for each category. Percentages for concentrations are a distribution within each concentration. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview. Each of the categories (gender, age, race, ethnicity, etc.) was analyzed independently for each of the curriculum concentrations.

Table 5
Summary Table of Chi-Square Analyses of Participation in Math, Science, and Other CTE Subjects, NLSY97*, Round 3 (Percentages)*

		Curriculum Concentration			
Variable	All	General	Academic	CTE	Dual
Math					
General, basic, or vocational math*	20.9	25.6	13.3	21.7	20.9
Algebra I or elementary algebra*	42.9	46.4	38.3	38.8	45.6
Geometry*	25.4	21.0	31.6	22.4	33.1
Algebra II or intermediate algebra*	21.4	15.5	30.1	22.9	22.5
Trigonometry*	6.0	3.3	10.7	3.5	5.5
Pre-calculus or advanced algebra*	4.7	2.3	9.0	3.2	2.2
Calculus*	0.8	0.4	1.5	0.5	0.7
Other advanced math*	2.0	1.7	2.5	2.6	2.0
Other math class*	7.7	8.4	4.7	16.6	11.6
No math*	7.2	8.7	3.9	10.6	8.3
Science					
Biology*	39.6	37.0	41.8	43.3	48.1
Chemistry*	18.9	12.8	28.7	13.3	20.7
Physics*	8.1	6.5	9.7	8.4	10.3
Other science class*	37.1	40.9	32.5	34.6	33.1
No science*	14.1	17.3	8.0	20.4	13.3
Other CTE Subjects					
General introd course in computer literacy*	16.8	17.0	16.3	14.9	19.7
Word Processing*	19.8	19.9	18.9	20.6	25.6
Computer Programming*	9.0	8.6	8.4	10.5	15.5
Other computer courses*	16.0	14.3	17.3	17.6	22.6
Shop/Industrial Arts*	14.3	16.3	8.4	25.6	22.6
Home Economics*	14.7	16.9	11.2	11.9	16.3
No CTE*	39.6	37.5	45.7	30.0	29.8

* Statistically significant at $p < 0.05$.
Note. The "All" column reflects the composition of all students enrolled in grades 9 through 12 for each category. Percentages for concentrations are a distribution for each course within the corresponding concentration only. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview. Each of the courses was analyzed independently for each of the curriculum concentrations.

Table 6
Percentages and Weighted n *for Participation in Career Pathways, Tech Prep and Specific WBL activities,* NLSY97*, Rounds 1–3*

Programs	Round 1 (1997) Percentage Weighted *n*	Round 2 (1998) Percentage Weighted *n*	Round 3 (1999) Percentage Weighted *n*
Career major/Pathway	18.2 1,727,957	17.3 2,431,487	15.4 1,874,983
Weighted total	9,497,533	14,093,519	12,197,583
CTE			
Tech Prep	8.7* 240,555	8.6* 558,433	7.5* 504,175
Specific WBL Activities:			
Coop ed.	8.3* 227,858*	8.1* 525,117*	7.9* 529,520 *
Job shadowing	12.6 1,195,430	11.2 1,583,584	10.1 1,227,243
Mentoring	4.8 451,369	4.6 642,064	3.4 409,953
School-based enterprise	9.2 876,097	5.4 754,501	3.8 467,396
Internship/Apprenticeship	5.6* 154,728*	5.7* 372,725*	5.2* 346,254 *
No tech prep or specific WBL activities	68.7 6,520,470	72.9 10,278,944	75.0 9,152,394
n	4,324	6,104	5,244
Weighted total	9,497,533	14,093,519	12,197,583

* Percentages obtained from those enrolled in the 11th and 12th grades only.
Note. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview.

Table 7
Students' Reports of Participation in Tech Prep and Specific WBL Activities by Grade: NLSY97*, Rounds 1, 2, and 3 (Percentages)*

Round/ Grade	Tech prep	Cooperative education	Job shadowing	Mentoring	School-based enterprise	Internship/ Apprenticeship	No tech prep/WBL
Round 1							
9th	6.9	6.4	12.3	4.3	8.6	4.0	69.3
10th	7.5	5.9	11.5	4.2	8.6	3.4	71.0
11th	8.5	8.3	14.2	6.1	10.3	5.1	64.6
12th	9.7	8.1	15.2	5.6	12.5	7.5	65.6
Round 2							
9th	3.9	3.8	10.3	3.8	4.8	2.3	77.7
10th	5.3	5.2	11.2	4.4	6.3	2.5	74.7
11th	7.7	6.8	9.6	4.6	4.3	4.5	73.0
12th	9.6	9.5	14.3	5.6	5.9	7.2	65.0
Round 3							
9th	3.6	3.0	7.3	1.4	3.9	1.9	82.6
10th	5.2	3.1	8.5	2.7	4.0	2.0	78.9
11th	6.8	5.5	10.6	3.4	3.4	3.6	74.5
12th	8.3	10.4	12.7	5.1	4.1	6.8	67.4

Note. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview. Each of the grades was analyzed independently for each of the CTE-related activities.

Table 8
Summary Table of Chi-Square Analysis of Students Participation in CTE-Related Activities by Demographic and Socioeconomic Status Indicators, NLSY97*, Round 3 (Percentages)*

Variable	All	CTE-Related Activity: Career pathway	Tech prep	Cooperative education	Job shadowing	Mentoring	School-based enterprise	Internship/ Apprenticeship
Total percentage reporting participation		15.4	6.2	5.7	10.1	3.4	3.8	3.7
Gender								
Female	48.1	49.2*	44.4*	48.6*	52.7*	57.6*	62.2*	47.3*
Male	51.9	50.8	55.6	51.4	47.3	42.4	37.8	52.7
Age								
13	0.0 *	0.0 *	0.0*	0.0*	0.0*	0.0*	0.0*	0.0*
14	2.0	1.3	1.4	1.7	1.1	1.3	1.5	1.8
15	29.1	19.8	19.8	10.6	22.6	16.0	30.2	14.6
16	28.2	27.7	26.5	22.1	29.4	29.0	25.5	20.8
17	28.2	32.2	34.8	40.8	33.5	33.5	32.4	40.8
18	10.5	15.7	15.8	22.2	11.7	18.3	7.8	19.4
19	1.9	3.3	1.7	2.6	1.8	1.9	2.6	2.6
Race								
White	72.9	64.7*	68.1*	64.6*	72.6*	63.5*	65.3*	68.7*
Black	16.0	24.0	22.3	24.6	16.9	23.8	21.6	20.7
Ethnicity								
Hispanic	12.5	12.3*	12.3*	13.6*	10.0*	14.5*	14.6*	13.8*
Community location								
Urban	25.2	29.0*	21.6*	27.7*	25.8*	30.1*	29.1*	14.5*
Suburban	54.4	50.9	52.5	51.7	50.7	43.1	48.8	52.0
Rural	19.8	19.0	25.2	20.2	22.3	26.4	21.5	33.3
Geographic Location								
North-east	18.1	23.7*	17.6*	21.5*	17.5*	19.9*	21.1*	22.5*
North-central	25.9	24.7	20.9	26.2	32.2	29.2	27.8	26.2
South	34.2	31.6	43.7	35.7	28.2	25.3	25.5	29.9
West	21.8	20.0	17.8	16.6	22.1	25.6	25.6	21.4

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Table 8 (continued)

Variable	All	Career pathway	Tech prep	Cooperative education	Job shadowing	Mentoring	School-based enterprise	Internship/ Apprenticeship
		CTE-Related Activity						
Total percentage reporting participation		15.4	6.2	5.7	10.1	3.4	3.8	3.7
Gross household income								
Low	19.7	21.2*	22.8*	26.0*	17.7*	15.2*	19.4*	16.9*
Low-middle	17.1	20.2	19.5	18.6	17.4	21.2	18.9	22.7
Middle	26.1	22.8	23.3	21.9	25.0	27.1	23.7	22.5
Middle-high	16.9	16.4	18.0	19.5	17.1	17.9	20.8	19.8
High	20.3	19.4	16.4	14.0	22.7	18.5	17.2	18.1
Mother's education								
None	7.8	9.3*	7.5 *	9.5*	6.8*	7.2*	8.6*	5.4*
1st–8th grade	19.5	21.4	23.9	22.9	19.0	23.7	22.2	18.9
9th–11th grade	14.8	17.3	18.3	14.7	14.0	14.3	11.1	20.3
12th grade	38.3	35.9	39.3	39.5	38.3	37.6	41.8	37.2
Some college	9.5	9.2	8.2	8.6	10.8	7.5	10.4	8.9
College degree	7.5	4.5	1.5	3.9	7.5	6.0	3.9	8.0
Some graduate	0.8	0.6	0.0	0.5	1.1	0.0	0.7	0.8
Graduate degree	1.8	1.7	1.3	0.5	2.4	3.7	1.3	0.5
Father's education								
None	13.3	15.3*	16.6*	14.8*	12.5*	15.8*	14.5*	14.6*
1st–8th grade	22.7	23.6	27.8	23.6	23.6	22.0	20.2	22.6
9th–11th grade	11.1	15.9	14.1	16.3	12.1	14.6	14.5	20.3
12th grade	30.5	27.4	29.8	30.5	30.3	29.4	31.5	24.2
Some college	9.0	7.3	5.2	5.8	8.2	3.4	4.2	6.1
College degree	7.9	5.3	3.3	6.8	6.8	9.2	10.4	8.6
Some graduate	0.9	1.5	0.5	0.5	1.2	0.9	2.6	0.7
Graduate degree	4.6	3.6	2.8	1.7	5.2	4.6	2.2	2.8

*Statistically significant $p < 0.05$. The asterisk denotes significance for the activity in the entire category, not specifically for the first item.

Note. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview. Each of the categories (gender, race, ethnicity, etc.) was analyzed independently for each of the CTE-related activities.

Table 9
Summary Table of Chi-Square Analysis of Students Participating in CTE-Related Activities by Youth-School Characteristics, NLSY97*, Round 3 (Percentages)*

		CTE-Related Activity						
Variable	All	Career pathway	Tech prep	Cooperative education	Job shadowing	Mentoring	School-based enterprise	Internship/ Apprenticeship
Total percentage reporting participation		15.4	6.2	5.7	10.1	3.4	3.8	3.7
Grade								
9	13.7	7.5*	7.9*	7.3*	10.0*	5.7*	13.9*	7.2*
10	31.0	25.6	25.8	16.8	26.3	25.3	32.5	16.4
11	27.8	31.1	30.0	26.5	29.2	27.6	24.6	26.4
12	27.3	35.6	36.3	49.5	34.5	41.2	29.1	49.5
8th-grade GPA								
Low (Cs and/or Ds)	10.2	10.9*	11.8*	9.3*	9.4*	13.1*	9.9*	13.4*
Medium (Bs and/or Cs)	33.1	37.3	39.4	45.0	33.7	33.7	34.2	36.4
High (As and/or Bs)	56.7	51.8	48.8	45.7	56.8	53.2	55.9	50.2
Number of high school math courses taken & completed since date of last interview								
0	7.3	7.4*	9.5*	8.6*	6.2*	5.4*	7.9*	6.6*
1	66.6	60.8	62.5	52.4	60.3	63.2	64.9	56.4
2	17.8	19.4	16.1	23.7	23.0	19.9	16.4	23.5
3	5.2	7.6	6.7	10.1	5.6	7.1	6.6	7.7
4	2.4	2.9	3.4	3.5	2.8	3.4	3.5	3.9
5	0.6	1.1	0.6	1.3	1.3	0.9	0.6	0.7
6	0.2	0.6	1.1	0.5	0.5	0.0	0.0	1.3
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0
9	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0

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Table 9 (continued)

		CTE-Related Activity						
Variable	All	Career pathway	Tech prep	Cooperative education	Job shadowing	Mentoring	School-based enterprise	Internship/ Apprenticeship
Total percentage reporting participation		15.4	6.2	5.7	10.1	3.4	3.8	3.7
Number of high school science courses taken & completed since date of last interview								
0	14.0	12.4*	11.7*	17.5*	12.0	10.2*	15.8*	14.6*
1	71.1	68.0	71.1	60.4	66.6	69.7	68.8	61.9
2	12.6	16.5	14.5	18.1	18.2	18.4	13.5	18.8
3	1.9	2.6	1.9	3.0	2.8	1.7	2.0	4.0
4	0.4	0.5	0.8	1.0	0.5	0.0	0.0	0.7
Number of high school CTE courses taken & completed since date of last interview								
0	39.5	30.2*	30.8*	29.5*	30.6	32.1*	32.9*	34.2*
1	39.7	41.3	42.0	36.8	41.0	37.9	30.7	39.2
2	14.1	17.6	15.8	16.7	16.7	13.0	21.2	15.0
3	4.8	7.5	6.8	11.1	8.2	11.4	10.7	8.1
4	1.5	2.5	3.2	3.6	2.2	4.5	3.6	1.1
5	0.3	0.6	0.8	1.5	1.1	1.0	0.9	1.7
6	0.1	0.4	0.6	0.8	0.3	0.0	0.0	0.7
Expectations of obtaining a college degree by age 30								
None	7.3	8.7*	4.4*	12.8*	6.7	3.7*	10.8*	9.1*
Low	8.9	13.6	17.5	15.2	8.7	2.8	11.3	16.6
Moderate	18.8	23.7	25.4	24.4	19.0	15.1	31.7	18.2
High	65.0	54.0	52.7	47.5	65.6	78.4	46.1	56.2

* Statistically significant $p < 0.05$. The asterisk denotes significance for the activity in the entire category, not specifically for the first item.

Note. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview. Each of the categories (gender, race, ethnicity, etc.) was analyzed independently for each of the CTE-related activities.

Table 10
Logistic Regression Probabilities for Curriculum Concentration Participation,
NLSY97*, Round 3*

Independent variable	Dependent variable: Curriculum concentration			
	General	Academic	CTE	Dual
	Odds ratio			
Gender	0.988	0.903	1.080	1.440*
Black	0.798*	0.928	1.718*	1.533*
Hispanic	1.174	0.935	0.786	0.782
Household income	0.995*	1.007*	0.989*	0.996
Urban	1.055	0.893	0.971	1.125
Suburban	0.895	1.378*	0.599*	0.869
8th-grade GPA	0.537*	2.793*	0.625*	0.905
# math courses	0.930	1.019	1.169	1.070
# science courses	0.774*	1.375*	0.939	1.079
# CTE courses	1.042	0.850*	1.123	1.290*
N	4573	4573	4573	4573
-2 Log likelihood	5995.67	5159.09	1828.43	2088.82

* Statistically significant at $p < 0.05$.
Note. General, Academic, CTE, and Dual models are significant at $p < 0.05$. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview.

Table 11
Logistic Regression Probabilities for Participation in CTE-Related Activities, NLSY97*, Round 3*

Independent variable	Dependent variable: Career pathway, Tech prep, Any WBL, and No tech prep / No WBL			
	Career pathway	Tech prep	Any specific WBL	No tech prep / No WBL
	Odds ratio			
Gender	0.967	1.195	0.767*	1.229*
Black	1.556*	1.462*	1.272*	0.740*
Hispanic	1.158	0.935	1.036	0.958
Household income	1.000	1.001	1.000	1.000
Urban	1.130	0.524*	1.175	1.052
Suburban	1.051	0.674*	0.891	1.315*
General	0.588*	0.740	0.844*	1.223*
CTE	3.890*	4.146*	2.326*	0.344*
Dual	1.762*	2.620*	1.892*	0.461*
8th-grade GPA	0.936	0.937	0.962	1.062
# math courses	1.046	0.975	1.108*	0.926
# science courses	1.167*	1.163	1.043	0.921
# CTE courses	1.251*	1.157*	1.270*	0.789*
N	4551	4551	4551	4551
-2 Log likelihood	3755.93	2038.66	4655.65	5008.20

* Statistically significant at $p < 0.05$
Note. Career Pathway, Tech Prep, Any Specific WBL Activities, and No Tech Prep/No WBL models are significant at $p < 0.05$. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview.

Table 12
Logistic Regression Probabilities for Participation in Specific WBL Activities, NLSY97, *Round 3*

Independent variable	Dependent variable: Participation in specific WBL activities				
	Cooperative education	Job shadowing	Mentoring	School-based enterprise	Internship/ Apprenticeship
	Odds ratio				
Gender	0.966	0.824	0.741	0.560*	0.988
Black	1.435*	0.929	1.540*	1.339	1.095
Hispanic	1.252	0.797	1.537*	1.319	0.897
Household income	0.998	1.001	0.999	1.003	0.997
Urban	1.010	1.013	0.973	1.320	2.074*
Suburban	0.900	0.824	0.718	0.861	1.409
General	0.747	0.861	0.836	0.888	0.595*
CTE	3.860*	1.257	1.230	1.909*	1.382
Dual	3.894*	1.093	0.796	1.708*	1.718*

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Table 12 (continued)

Independent variable	Cooperative education	Job shadowing	Mentoring	School-based enterprise	Internship/ Apprenticeship
	Dependent variable: Participation in specific WBL activities				
	Odds ratio				
8th-grade GPA	0.916	0.966	0.981	1.058	0.825
# math courses	1.203*	1.038	0.939	1.020	1.129
# science courses	0.943	1.139	1.143	0.879	1.209
# CTE courses	1.357*	1.295*	1.383*	1.456*	1.128
N	4551	4551	4551	4551	4551
-2 Log likelihood	1976.22	2902.85	1483.01	1543.47	1479.44

* Significant at $p < 0.05$.
Note. Coop Ed, Job Shadowing, Mentoring, School Enterprise, and Internship/Apprenticeship models are significant at $p < 0.05$. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview.

Table 13
OLS Regression Beta Weights of Effects of Last Reported Curriculum Concentration and CTE-Related Activities Participation on Students' High School Grade Point Average, NLSY97, *Round 3*

Independent variable	Limited model β	Full model β
Gender		-0.088*
Black		-0.108*
Hispanic		-0.054*
Household income		0.053*
Urban		-0.042
Suburban		-0.020
General concentration**	-0.308*	-0.165*
CTE concentration**	-0.188*	-0.095*
Dual concentration**	-0.125*	-0.066*
Career pathway**	0.106*	0.079*
Tech prep**	0.006	0.021
Any specific WBL activity**	0.056*	0.015
No career pathway/No tech prep/No WBL**	0.083*	0.056
8th-grade GPA		0.401*
N	3058	2589
Adjusted R^2	0.09	0.28

* Significant at $p < 0.05$.
** Last reported while in high school.
Note. Limited and Full models are significant at $p < 0.05$. Analysis in this model used all cases in sample.

Table 14
Logistic Regression Probabilities of Students' Risky Behaviors, NLSY97*, Round 3*

Independent variable	Dependent variable: Risky behaviors			
	Sex	Smoking	Drinking	Marijuana
	Odds ratio			
Gender	0.963	0.824*	0.866*	1.062
Black	1.712*	0.345*	0.372*	0.512*
Hispanic	1.007	0.539*	0.747*	0.717*
Household income	0.998	1.000	1.002*	1.001
Urban	0.861	0.928	0.866	1.062
Suburban	0.789*	0.948	0.840*	1.104
General concentration	1.461*	1.466*	1.065	1.458*
CTE concentration	1.330	1.242	0.795	0.852
Dual concentration	1.225	1.619*	1.100	1.438*
Career pathway	1.075	1.118	1.162	1.340*
Tech prep	1.133	1.288	1.049	0.930
Any specific WBL	1.254	1.461*	1.307*	1.255
No career pathway/No tech prep/No WBL	0.895	1.323	1.086	1.151
8th-grade GPA	0.647*	0.657*	0.826*	0.651*
N	3158	4552	4552	4552
-2 Log likelihood	3999.59	5417.97	6069.52	4384.28

* Significant at $p < 0.05$.
Note. Sex, Smoking, Drinking, and Marijuana models are significant at $p < 0.05$. Analysis is performed for those students in grades 9–12 enrolled at the time of the interview.

APPENDIX

TECHNICAL NOTES

Data

Source

Data for the analyses come from the *National Longitudinal Survey of Youth 1997*. The study focuses on data from the Round 3 of interviews, although some information from Round 1 and Round 2 was used as well—particularly those related to demographics and socioeconomic status.

Sample Size and Type

The total number of cases included in the sample is 8,209 youths, equivalent to 91.4% of the original number of respondents in the survey (n = 8,984).

The survey is composed of two sub-samples—the Cross-Sectional, and the Supplemental. The first is the cross-sectional sample "of 6,748 respondents, which is designed to be representative of people living in the United States during the initial survey round" (Bureau of Labor Statistics, 2002b, p. 6); the second is the supplemental sample "of 2,236 respondents, which is designed to oversample Hispanic and black people living in the United States" (p. 6). To control for the oversampling, we used a sample weight provided each year with the survey data. We used the sample weight for the correlational analyses included in the study, thus allowing for population estimates.

Analyses

For most of the study, in particular for the correlational and part of the predicting analyses, we restricted our cases to those youth who were in grades 9 through 12, and who were enrolled at the time of the interview. For other analyses, specifically the predicting model in Table 13, we used all cases included in Round 3.

We used two types of analyses—correlational and predicting. For the first type, Chi-square statistics was used. In that case, all variables included in the analyses were treated independently in relation to both the four curriculum concentrations and the CTE-related activities. Tables in the study report a summary of that information. For the second type of analysis or predicting models, we used binary logistic regression, in which case odds ratios were reported; and we also used an OLS regression model—to predict high school GPA, reported in Table 13, in which case beta weights were reported.

Variables in the Analyses

Our analyses are based on three major sets of variables. The first one refers to those school programs or courses of study respondents were enrolled in while in school. We have labeled these "curriculum concentrations," following Levesque et al. (2000). A second group of variables include those core activities that would lead to the development of work-related learning opportunities. They are the career pathways, tech prep, and specific WBL activities variables. The latter includes: cooperative education, job shadowing, mentoring, school-based enterprise, and internship/apprenticeship. The third set is composed of those demographic, socioeconomic, and school variables that were used to estimate the individual's participation in curriculum concentrations and career pathways, tech prep, and specific WBL activities.

Variables were also transformed so as to ensure a proper analysis. In some cases, variables were "extracted" from the data set variables and reduced to those of interest for this study; for example, the "program of study" variable in the survey data set included the four curriculum concentrations and additional options, but only the information for the four curriculum concentrations was used and recoded. In addition, some variables were transformed into dichotomous variables, where 1 = the condition that applied, and 0 = otherwise. For example, once the information for the four curriculum concentrations was extracted, the individual concentrations were transformed into individual variables—thus, the resulting variables were general, academic, CTE, and dual concentrations, where "1" represented the concentration when the value was true, and "0" otherwise. Transformation of selected variables are described in Table A1.

Several variables were also combined to make the study possible or to allow for a better analysis. For example, variables indicating the type of courses taken since date of last interview were added so we could obtain the total number of courses in the math, science, and CTE areas; and we combined the different choices respondents had when examining the types of WBL activities—thus resulting in variables such as "any specific WBL."

For the predicting analyses, variables were studied against the omitted variables. Omitted variables are described in Table A2.

Table A1
Variable Transformation—Selected Variables

Variable in Survey Data Set	Variable in Current Study
- Highest grade completed - Highest grade attended as of date of interview 1999 - Highest grade completed as of June 30, 1999 - Current enrollment status	Students in grades 9 through 12 and enrolled at time of interview
Program of study	Program of study, recoded, where 1 = general concentration; 2 = academic concentration; 3 = CTE concentration; and 4 = dual concentration From recoded Program of study: - General concentration, where 1 = general concentration and 0 = otherwise - Academic concentration, where 1 = academic concentration and 0 = otherwise - CTE concentration, where 1 = CTE concentration and 0 = otherwise - Dual concentration, where 1 = dual concentration and 0 = otherwise
Career major/pathway	Career major/pathway, where 1 = true and 0 = otherwise
Tech prep	Tech prep, where 1 = true and 0 = otherwise
Cooperative education	Cooperative education, where 1 = true and 0 = otherwise
Job shadowing	Job shadowing, where 1 = true and 0 = otherwise
Mentoring	Mentoring, where 1 = true and 0 = otherwise
School-based enterprise	School-based enterprise, where 1 = true and 0 = otherwise
Internship/Apprenticeship	Internship/Apprenticeship, where 1 = true and 0 = otherwise

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Table A1 (continued)

Variable in Survey Data Set	Variable in Current Study
No specific STW activity	No specific STW activity, where 1 = true and 0 = otherwise
Math, science, and CTE courses	Each course was assigned a value of "1" when the student took that class, and "0" otherwise
Math, science, and CTE courses	- Number of math courses taken were added for each respondent if taken since date of last interview - Number of science courses taken were added for each respondent if taken since date of last interview - Number of CTE courses taken were added for each respondent if taken since date of last interview
Race	Transformed into: - Black, where 1 = black, and 0 = otherwise - White, where 1 = white, and 0 = otherwise
Ethnicity	Hispanic = 1, others = 0

Table A2
Predicting Analyses—Variables and Omitted Variables

Variable		
	Active Variable	Omitted Variable
Gender	Male	Female
Race	Black	White
Ethnicity	Hispanic	Non-Hispanic
Community location	Urban	Rural
	Suburban	Rural
Curriculum concentration	General	Academic
	CTE	Academic
	Dual	Academic
CTE-related activity	Career pathway	No career pathway
	Tech prep	No tech prep
	Any specific WBL activity	No WBL activity
	No career pathway / No tech prep / No WBL	Participation in any of them