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# Public High School Graduates Who Participated in Vocational/Technical Education: 1982-1998

E.D. Tabs



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# Public High School Graduates Who Participated in Vocational/Technical Education: 1982-1998

E.D. Tabs

July 2003

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## Executive Summary

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This report examines patterns and trends in the vocational/technical coursetaking of public high school graduates between 1982 and 1998. It updates and expands upon trends that were published in the National Center for Education Statistics (NCES) report *Vocational Education in the United States: Toward the Year 2000* (Levesque et al. 2000). Specifically, the current report includes trends in the participation of graduates based on their special and protected population status, including race/ethnicity, sex, disability status, English proficiency, and several measures of student academic achievement, as well as school urbanicity and school poverty level. The report analyzes these trends by examining high school transcripts for the graduating classes of 1982, 1990, 1992, 1994, and 1998.<sup>1</sup> The analysis samples and variables used in the report are comparable across the survey years. The analysis focuses on public high school graduates who earned regular or honors diplomas.<sup>2</sup>

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<sup>1</sup>These transcript studies were conducted as part of the High School and Beyond Longitudinal Study of 1980 Sophomores, “High School Transcript Study” (HS&B-So:80/82) regarding 1982 graduates; the National Education Longitudinal Study of 1988 (NELS:88/92), “Second Follow-up, Transcript Survey, 1992” regarding 1992 graduates; and the High School Transcript Studies (HSTS) of 1990, 1994, and 1998 regarding 1990, 1994, and 1998 graduates, respectively.

<sup>2</sup>The HS&B and NELS studies excluded students with the most severe disabilities, where it was determined by school staff that these students were unable to complete the lengthy student questionnaires that were a part of these studies. In order to ensure comparability across the data sets, graduates with special education diplomas were excluded from the HSTS samples (Gifford et al. 1989; Tuma 1996). Thus, the samples used for this trend analysis were consistent with the population of public high graduates, including students with disabilities, who earned regular or honors diplomas in each of

Transcripts provide information on the courses that public high school graduates took in grades 9 through 12. For simplicity’s sake, the report refers to this information as “high school coursetaking.” With the exception of a few tables that examine coursetaking in each grade (9 through 12) separately, the report describes the cumulative coursework that graduates took in high school. The report is intended to accompany the NCES report *Trends in High School Vocational/Technical Coursetaking: 1982–1998* (Levesque 2003), which provides an in-depth examination of the vocational/technical coursetaking patterns of public high school graduates in general.

## Terms Used in the Report

### *The Vocational/Technical Curriculum*

The NCES Secondary School Taxonomy (SST) classifies high school vocational/technical education into three different curricula: specific labor market preparation, or “occupational education”; general labor market preparation; and family and consumer sciences education. Occupational education consists of courses that teach skills and knowledge required in a particular occupation or set of related occupations. General labor market preparation consists of courses that teach general employment skills that are not specific to one occupational area, such as basic typewriting/keyboarding, introductory technology education,

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the study years. In addition, there may be some minor coding differences between NELS and the other transcript data that may affect the data for 1992. See appendix C for more information.

and career preparation and general work experience courses. Family and consumer sciences education consists of courses intended to prepare students for family and consumer roles outside the paid labor market.<sup>3</sup> For purposes of this report, trends focus on vocational/technical coursetaking overall and on occupational coursetaking.

Although vocational/technical coursetaking is prevalent in high schools, students take varying amounts and types of these courses and take them for different purposes. This report emphasizes the coursetaking patterns of occupational concentrators because this group is a common focus of federal and state accountability and research efforts for vocational/technical education (U.S. Department of Education 2002; Silverberg et al. 2002). Occupational concentrators are graduates who earned 3.0 or more credits during high school in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, trade and industry, technology, food service and hospitality, child care and education, and personal and other services. In some cases, the report also examines trends in concentrating (earning 3.0 or more credits) in 18 narrow occupational program areas.<sup>4</sup>

### ***Key Population Variables***

The Carl D. Perkins Vocational and Applied Technology Education Amendments of 1998 (1998 Perkins Act) defines “special populations” as follows:

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<sup>3</sup>Home economics-related courses that prepare students for the paid labor market are included under occupational education.

<sup>4</sup>These include agriculture, business services, business management, marketing, health care, protective services, construction, mechanics and repair, print production, materials production, other precision production, transportation, computer technology, communications technology, other technology, food service and hospitality, child care and education, and personal and other services.

- individuals with disabilities;
- individuals from economically disadvantaged families, including foster children;
- individuals preparing for occupations that are nontraditional for their gender;
- single parents, including single pregnant women;
- displaced homemakers; and
- individuals with other barriers to educational achievement, including individuals with limited English proficiency.

The 1990 Perkins Act, which governed the second half of the period covered in this report (1990–1998), defined “special populations” fairly similarly, including individuals with handicaps, educationally and economically disadvantaged individuals (including foster children), individuals of limited English proficiency, individuals who participate in programs designed to eliminate sex bias, and individuals in correctional institutions.

In addition, the Office for Civil Rights (2001) in the U.S. Department of Education enforces federal statutes that prohibit discrimination in education programs and activities receiving federal financial assistance (such as Perkins Act funds) on the following bases: race, color, national origin, sex, disability, and age.

To the extent possible, this report provides information on trends in the vocational/technical coursetaking of these special and protected populations, as well as their peers who were not members of these groups. To do so, the report uses the following categories. Measures were selected based on federal definitions, previous related research, and data availability. Data were provided only for those years and surveys that contained comparable variables. For the sake of readability when summarizing findings, the report uses the

terms *disadvantaged* and *advantaged* to describe student groups on some of the key variables, as indicated below.<sup>5</sup>

*Race/ethnicity.* Includes the five categories of American Indian/Alaska Native; Asian/Pacific Islander; Hispanic; non-Hispanic Black; and non-Hispanic White. For simplicity's sake, the text refers to Black and White graduates, although students in both of these groups were also non-Hispanic.

*Sex.* Includes the two categories of male and female.

*Disability status (grade 12).* Includes students who were reported to have a disability and students who were reported to have no disability as of grade 12. It should be remembered, however, that graduates with the most severe disabilities were excluded from the analysis due to survey constraints. Consequently, the disability status variable identifies students with and without disabilities among the population of public high school graduates who earned regular or honors diplomas.<sup>6</sup> For purposes of this analysis, students with disabilities were considered to be “disadvantaged,” while students without disabilities were considered to be more “advantaged.”

*English proficiency (grade 12).* Includes the two categories of limited English proficiency and English proficient. It is important to note that this variable describes students' English language proficiency as of grade 12. For pur-

poses of this analysis, graduates who had limited English proficiency in grade 12 were considered to be “disadvantaged,” while graduates who were English proficient in grade 12 were considered to be more “advantaged.”

The report uses the following three measures of academic achievement.<sup>7</sup>

*Grade-point average (GPA).* Calculated from grades recorded in the transcript files, this variable has a range of 0.0 to 4.0. It was not possible in some of the surveys to calculate GPA for academic courses only (a preferable measure of academic achievement), so overall GPA was used. GPA was collapsed into the three categories: high GPA (greater than 3.5); mid-level GPA (2.0 to 3.5); and low GPA (less than 2.0). For purposes of this analysis, students with a GPA of less than 2.0 were considered to be “disadvantaged”; students with a GPA of 2.0 to 3.5 were considered to be “moderately advantaged”; and students with a GPA of greater than 3.5 were considered to be “highly advantaged.”

*Academic coursework completed.* This variable describes whether students completed all low or all high mathematics, science, and English courses, or some other combination of mathematics, science, and English courses (mid-level or mixed academic coursetaking). Low and high mathematics, science, and English courses are defined in the glossary (ap-

<sup>5</sup>In a few cases, *advantaged* students were further classified as *moderately advantaged* and *highly advantaged*. The race/ethnicity and sex categories were not classified according to advantage, because the Perkins legislation did not make this distinction for these variables.

<sup>6</sup>As of 1998, about 31 percent of students with disabilities held special education diplomas and were excluded from the study.

<sup>7</sup>The final federal regulations to the 1990 Perkins Act used grade-point average to define academically disadvantaged individuals. The other two measures were suggested by previous research on whether vocational education has been a “dumping ground” for low academically achieving students (Boesel et al. 1994). The 1998 Perkins Act offered no additional guidance for identifying students with barriers to educational achievement, other than limited English proficiency.

pendix B) and technical appendix (appendix C). For purposes of this analysis, students completing all low-level academic coursework were considered to be “disadvantaged”; students completing all high-level academic coursework were considered to be “highly advantaged”; and students completing mid-level or mixed academic coursework were considered to be “moderately advantaged.”

*Grade 9 mathematics.* This variable identifies the mathematics course a student took in grade 9. It includes the three categories of high-level grade 9 mathematics (geometry or higher), mid-level grade 9 mathematics (pre-algebra or algebra 1), and low-level mathematics (no mathematics or mathematics courses below pre-algebra). It provides a measure of academic achievement before most of graduates’ coursework in vocational/technical education was taken and is therefore less confounded than either GPA or academic coursework completed with that coursetaking. For purposes of this analysis, students who took low-level mathematics in grade 9 were considered to be “disadvantaged”; students who took mid-level grade 9 mathematics were considered to be “moderately advantaged”; and students who took high-level grade 9 mathematics were considered to be “highly advantaged.”

Although a student-level measure of socioeconomic status would have been preferable for this analysis, such a variable was not available from the 1990, 1994, and 1998 High School Transcript Studies (HSTS). Instead, the report uses the following two school-level variables as measures of economic status.<sup>8</sup>

*School urbanicity.* This variable describes the location of the school a graduate attended in the 12th grade and includes the three categories of urban, suburban, and rural. These categories are defined further in the glossary (appendix B) and technical appendix (appendix C).

*School poverty level.* This variable describes the proportion of students in the school a graduate attended in the 12th grade who participated in the National School Lunch Program (NSLP). It includes the categories of high poverty (greater than 50 percent in NSLP) and low poverty (5 percent or less in NSLP), with a middle group having greater than 5 to 50 percent of students in NSLP. This variable also includes a category for students whose schools did not report their participation in NSLP. For purposes of this analysis, students in high-poverty schools were considered to be “disadvantaged,” while students in low-poverty schools were considered to be “highly advantaged.” The middle group was considered to be of mixed advantage. The variable is defined further in the glossary (appendix B) and technical appendix (appendix C).

It should be remembered that there may be a fairly high correlation among some of these population variables. The report did not attempt to isolate the unique contribution of each factor to participation in vocational/technical education. Instead, the report describes bivariate relationships according to NCES standards for this type of analysis. See appendix C for additional informa-

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<sup>8</sup>Section 421 of the 1990 Perkins Act included information on students in rural and urban areas in its identification of eco-

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nomically disadvantaged students. The final regulations to the 1990 Perkins Act also included eligibility for the National School Lunch Program in the definition of this group. The 1998 Perkins Act provided no additional guidance on defining economically disadvantaged students.



tion on the technical methodology used in the report.

## **Vocational/Technical Coursetaking in 1998**

### ***Overall Patterns Among 1998 Graduates***

Although most 1998 public high school graduates took at least some vocational/technical and occupational coursework, graduates who were members of disadvantaged groups generally took more vocational/technical and occupational coursework and were more likely to concentrate in occupational education than their counterparts who were members of more advantaged groups. These differences were apparent with regard to disability status in grade 12, GPA, academic coursework completed, grade 9 mathematics, and school poverty. One exception was that students who had limited English proficiency in grade 12 generally took less vocational/technical and occupational coursework and were less likely to concentrate in occupational education than their English proficient peers.

In addition, male graduates took more vocational/technical and occupational coursework than female graduates, and students in rural schools took more such coursework than students in either urban or suburban schools. In contrast, Asians/Pacific Islanders generally took less vocational/technical and occupational coursework than graduates in other racial/ethnic groups, particularly Black and White graduates.

### ***Characteristics of Occupational Concentrators From the Class of 1998***

Although disadvantaged students were more likely to participate in vocational/technical educa-

tion in general, and to concentrate in occupational education in particular, these students represented a minority of all occupational concentrators. In fact, when students were classified into three groups (low-, moderate- or middle-, and high-advantage), the majority of occupational concentrators (about 60 percent or more) came from the middle groups. This pattern was apparent with regard to GPA, academic coursework completed, grade 9 mathematics, and school poverty. In each case, either occupational concentrators were more likely to be from the middle groups than was the 1998 public high school class as a whole, or no significant difference was detected in the proportion of occupational concentrators and all graduates who were from these groups. Moreover, no significant difference was detected in the proportion of occupational concentrators and all graduates who were from the lowest academic achievement groups. However, occupational concentrators were less likely than the 1998 graduating class as a whole to be from the highest academic achievement groups.

In the cases of disability status and English proficiency in grade 12, most occupational concentrators (more than 95 percent) came from advantaged (rather than disadvantaged) groups. While a larger proportion of occupational concentrators than the 1998 graduating class as a whole were disabled in grade 12, the proportion of occupational concentrators who had limited English proficiency in grade 12 was lower than that for all 1998 graduates.

The majority of occupational concentrators (more than 50 percent) were White and were male. In fact, occupational concentrators were more likely to be male than the 1998 graduating class as

a whole.<sup>9</sup> With regard to school urbanicity, no school type enrolled a majority of occupational concentrators. However, occupational concentrators were more likely to attend rural schools than urban schools.<sup>10</sup>

While academically disadvantaged graduates were more likely than their more advantaged peers to concentrate in occupational education generally, this pattern was reversed to some extent in certain occupational program areas. Notably, higher achieving students were somewhat more likely than their lower achieving peers to concentrate in communications technology.

### **Trends in Vocational/Technical Coursetaking: 1982 to 1998<sup>11</sup>**

The average number of credits graduates earned in vocational/technical education declined from 1982 to 1990, after which no significant changes were detected. One question of interest to policymakers is whether these declines occurred across the board or only among certain subgroups of students.

Most often, vocational/technical coursetaking declines occurred among groups earning numbers of vocational/technical credits that were not statistically different from the average for all 1982 graduates. In comparison, there were few significant changes detected in the average number of

vocational/technical credits earned by several groups that earned *above*-average numbers of vocational/technical credits in 1982. At the same time, there were no significant changes detected between 1982 and 1998 in the average number of vocational/technical credits earned by several groups that earned *below*-average numbers of vocational/technical credits in 1982 compared with all 1982 graduates.

As a consequence of these changes, there were few shifts among subgroups of graduates with regard to their relative vocational/technical coursetaking patterns over the period studied. That is, most groups that earned above-average numbers of vocational/technical credits in 1982 still earned above-average numbers of such credits as of 1998 (including low academic achievers and students attending rural schools). In addition, all groups that earned below-average numbers of vocational/technical credits in 1982 still earned below-average numbers of such credits as of 1998 (including Asians/Pacific Islanders and high academic achievers). Finally, despite the coursetaking declines noted above, most groups that earned numbers of vocational/technical credits in 1982 that were not statistically different from the average for all 1982 graduates were also in this middle coursetaking group as of 1998.

In contrast to declines in vocational/technical coursetaking, there was no statistically significant change between 1982 and 1998 in the average number of occupational credits that graduates earned in high school. However, trends varied somewhat among student groups. For example, students with disabilities as of grade 12 took the equivalent of about one additional full-year occupational course, while Hispanic graduates took about one-half fewer occupational courses, by the end of the period.

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<sup>9</sup>No significant difference was detected in the proportions of occupational concentrators and all 1998 graduates who were White.

<sup>10</sup>No significant difference was detected in the proportion of occupational concentrators who attended suburban schools and those who attended schools in other locales. In addition, no significant difference was detected between occupational concentrators and all 1998 graduates based on school urbanicity.

<sup>11</sup>Because data for 1982 were not available, trends between 1982 and 1998 could not be determined with regard to English proficiency in grade 12 and school poverty.

### ***Trends in Occupational Concentrating***

The percentage of public high school graduates who concentrated in occupational education declined from 33.7 percent in 1982 to 27.8 percent in 1990, after which no significant changes were detected. However, trends varied among student groups. Similar to the vocational/technical course-taking changes noted above, declines in occupational concentration rates occurred most often among groups with concentration rates in 1982 that were not statistically different from the average for all 1982 graduates. In addition, there were few significant changes detected between 1982 and 1998 in the concentration rates for several groups that exhibited *below*-average occupational concentration rates in 1982 compared with all 1982 graduates.

As a consequence of these changes, most subgroups of graduates kept their relative occupational concentration status over the period studied. That is, most groups that exhibited *above*-average occupational concentration rates in 1982 still concentrated in occupational education at above-average rates as of 1998 (including males and students completing all low academic coursework in high school). In addition, most groups that exhibited *below*-average occupational concentration rates in 1982 still concentrated in occupational education at below-average rates as of 1998 (including females and high academic achievers). Finally, most groups that exhibited occupational concentration rates in 1982 that were not statistically different from the average for all 1982 graduates were also in this middle occupational concentrating group as of 1998.

Trends in occupational concentrating also varied by program area. For example, while most student groups were more likely to concentrate in communications technology in 1998 than in 1982, no significant changes in concentration rates in

this program area were detected over this period among Blacks, Hispanics, students with disabilities as of grade 12, students taking low-level mathematics in grade 9, and students in urban schools. In addition, while no differences were detected between 1982 and 1998 in overall rates of concentrating in marketing, print production, and computer technology, these program areas attracted somewhat higher academically achieving students over the period.

### ***Gaps in Occupational Concentration Rates***

Occupational concentration rates in specific program areas often varied by student race/ethnicity, sex, and disability status. Most differences in occupational concentration rates among racial/ethnic groups in 1982 were no longer detected by 1998. In contrast, most 1982 differences between males and females persisted as of 1998. However, some of these gender gaps decreased, particularly in business services where male graduates increased their concentration rate over the period. With regard to disability status in grade 12, in no program areas were students with disabilities more likely to concentrate than students without disabilities in 1982.<sup>12</sup> However, by 1998, students with disabilities as of grade 12 were more likely than those without to concentrate in agriculture, construction, mechanics and repair, and materials production.

### ***Trends in the Characteristics of Occupational Concentrators***

Some changes in the characteristics of occupational concentrators were consistent with changes

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<sup>12</sup>In fact, students with disabilities were *less* likely than those without to concentrate in business services and in communications technology in 1982. However, these gaps were no longer detected as of 1998.

in the student body in general between 1982 and 1998. For example, both graduates in general and occupational concentrators in particular became more academically advantaged by 1998. However, the shift toward moderate academic achievement was greater for occupational concentrators than for the larger group of graduates.

## **Computer-Related Coursetaking**

The SST currently includes all computer-related courses (including those taught in mathematics and computer science departments) under the vocational/technical curriculum. The report focused on overall computer-related coursetaking for the period 1990 to 1998, as well as on coursetaking in the typewriting/keyboarding, computer-related business services, and computer technology areas.

### ***Computer-Related Coursetaking Among 1998 Graduates***

The 1998 public high school graduates took the equivalent of about one full-year computer-related course on average during high school. Graduates with disabilities as of grade 12 took *less* computer-related coursework overall than their 1998 counterparts without such disabilities. In addition, graduates in low-poverty schools took less computer-related coursework than their counterparts in higher poverty schools. In contrast, graduates who were moderate academic achievers, who attended rural schools, or who were Black took *more* computer-related coursework overall than their 1998 peers who were lower academic achievers, who attended urban or suburban schools, or who were Asian/Pacific Islander, respectively. Generally, there was mixed evidence about the relationship between student advantage and the amount of computer-related coursework taken by 1998 graduates.

## ***Trends in Computer-Related Coursetaking***

There were no significant changes in overall computer-related coursetaking between 1990 and 1998, although coursetaking declined in typewriting/keyboarding over the same period. In addition, trends varied somewhat among student groups. Compared to their 1990 peers, 1998 graduates who had disabilities in grade 12 or who were male took *more* computer-related coursework overall and in business services. In addition, 1998 graduates with disabilities in grade 12 took more computer technology coursework than their 1990 peers. In contrast, 1998 graduates who were female took *less* computer-related coursework overall than their 1990 peers.

## **Combining Vocational/Technical and Academic Coursetaking**

Several pieces of federal legislation in the 1990s focused attention on increasing the academic achievement of participants in vocational/technical education, including the Carl D. Perkins Vocational and Applied Technology Education Act Amendments of 1990 and 1998 and the School-to-Work Opportunities Act of 1994. Consequently, the report examined some of the ways that public high school graduates combined academic and vocational/technical education between 1982 and 1998, focusing primarily on the academic coursetaking of occupational concentrators.

### ***Core Academic Coursetaking Among 1998 Graduates***

For most identified student groups, 1998 graduates in general earned more credits in core academic subjects (English, mathematics, science, and social studies) than occupational concentra-

tors. However, there were no significant differences between occupational concentrators and the larger group of 1998 graduates in the numbers of core academic credits earned by the subsets of students who were from racial/ethnic minorities, who had disabilities as of grade 12, who completed either all low- or all high-level academic coursework in high school, who took high-level mathematics coursework in grade 9, or who attended urban or high-poverty schools.

Among the class of 1998, occupational concentrators who were members of more advantaged groups generally earned more core academic credits than occupational concentrators who were less advantaged. This was true with regard to disability status in grade 12, GPA, academic coursework completed, and grade 9 mathematics. However, no significant differences were detected among occupational concentrators with regard to school poverty level or school urbanicity. In addition, occupational concentrators who were Asian/Pacific Islander and were female earned more core academic credits than occupational concentrators who were members of other racial/ethnic groups and were male, respectively. All of these 1998 patterns for occupational concentrators held as well for the larger group of public high school graduates.

### ***Trends in Core Academic Coursetaking***

Both the larger group of 1998 public high school graduates and the subset of these graduates who were occupational concentrators earned more core academic credits than their 1982 counterparts, regardless of their special or protected population status. For every identified student group, there was no significant difference in the rates of increase over the period in the number of core academic credits earned by all graduates compared with occupational concentrators.

Among both the larger group of public high school graduates and the subset of these graduates who were occupational concentrators, increases between 1982 and 1998 in core academic credits earned were smaller for students with disabilities in grade 12, American Indians/Alaska Natives, and males than for students without disabilities in grade 12, Hispanics, and females, respectively.

### **Conclusion**

Various federal legislation is concerned with the participation of special and protected populations in education programs. This report examined the participation of public high school graduates in vocational/technical education between 1982 and 1998, focusing on the participation of graduates based on their special and protected population status.

Trends in participation for most subgroups reflected overall trends for graduates. Generally, graduates took fewer vocational courses between 1982 and 1998, although their occupational coursetaking was relatively steady. The percentage of graduates concentrating in occupational education (earning 3.0 or more credits in one of the 10 broad occupational program areas cited in the report) also declined over the period.

A few groups of graduates exhibited exceptions to these general trends, however. In particular, graduates with disabilities as of grade 12 took more vocational and occupational coursework by the end of the period studied. In addition, Asians/Pacific Islanders and high academic achievers earned numbers of vocational credits and exhibited occupational concentration rates at the end of the period that were not statistically different from corresponding figures for 1982. Thus, these latter groups did not exhibit the usual declines. Both Asians/Pacific Islanders and high

academic achievers participated in vocational/technical education at below-average rates at the beginning of the period.

As of 1998, there were differences in participation in vocational/technical education on all of the variables examined in the report: race/ethnicity, sex, disability status, English proficiency, academic achievement, and school urbanicity and poverty level. In particular, groups exhibiting relatively high levels of participation in vocational/technical education in comparison with their peers included males, graduates with disabilities as of grade 12, low academic achievers, and graduates in rural and in high-poverty schools. In contrast, females, Asians/Pacific Islanders, and graduates who had limited English proficiency as of grade 12 exhibited relatively low levels of such participation.

With regard to computer-related coursetaking, groups exhibiting relatively low levels of participation in comparison with their 1998 peers included students with disabilities as of grade 12, low academic achievers, Asians/Pacific Islanders, and students in low-poverty and in urban and

suburban schools. Among these groups, 1998 graduates who had disabilities as of grade 12 and graduates who were low academic achievers also earned fewer core academic credits than their more advantaged counterparts. However, 1998 graduates who were Asian/Pacific Islander as well as female graduates earned relatively large numbers of core academic credits in comparison with their peers. All of these core academic coursetaking patterns also held for the subset of graduates who were occupational concentrators.

On measures that classified students into three levels of advantage (low-, moderate- or middle-, and high-advantage), most occupational concentrators were from the middle groups. In some cases, occupational concentrators were more likely to be from the middle groups than was the 1998 public high school class as a whole. Although no significant difference was detected in the proportion of occupational concentrators and all graduates who were from the lowest academic achievement groups, occupational concentrators were less likely than the 1998 graduating class as a whole to be from the highest academic achievement groups.

## Foreword

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In 1987, the National Center for Education Statistics (NCES) instituted a new approach to collecting and reporting data on vocational education. Under the new approach, vocational education data are collected primarily through general purpose surveys—including high school transcript studies—rather than separate vocational education questionnaires or studies. This arrangement allows NCES to situate vocational education activities within the broader education context. In 1998, a Technical Review Panel was formed to provide NCES with regular input on its Data on Vocational Education (DOVE ) program, including surveys and reports.

This report updates and expands upon trends in vocational/technical coursetaking that were published in the NCES report *Vocational Education in the United States: Toward the Year 2000* (Levesque et al. 2000). Specifically, the current report examines patterns and trends in the vocational/technical coursetaking of public high school graduates between 1982 and 1998, based on their special and protected population status. This report is intended to accompany the NCES report *Trends in High School Vocational/Technical Coursetaking: 1982–1998* (Levesque 2003), which provides an in-depth examination of the vocational/technical coursetaking trends of public high school graduates in general.

Information on NCES' DOVE program and publications may be found at the following web site: <http://nces.ed.gov/surveys/dove>. Your comments about NCES vocational education publications are welcome and may be sent to Lisa Hudson, NCES, 1990 K Street NW, Suite 900, Washington, DC 20006 or [lisa.hudson@ed.gov](mailto:lisa.hudson@ed.gov).

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# I. Introduction

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## Purpose of the Report

The Carl D. Perkins Vocational and Applied Technology Education Amendments of 1998 (1998 Perkins Act) requires that the National Center for Education Statistics (NCES) collect and report information on vocational/technical education as part of its assessments. This report updates and expands upon trends in vocational/technical coursetaking that were published in the NCES report *Vocational Education in the United States: Toward the Year 2000* (Levesque et al. 2000). Specifically, the current report examines patterns and trends in the vocational/technical coursetaking of public high school graduates between 1982 and 1998, based on their special and protected population status. This report is intended to accompany the NCES report *Trends in High School Vocational/Technical Coursetaking: 1982–1998* (Levesque 2003), which provides an in-depth examination of the vocational/technical coursetaking trends of public high school graduates in general.

The 1998 Perkins Act defines “special populations” as follows:

- individuals with disabilities;
- individuals from economically disadvantaged families, including foster children;
- individuals preparing for occupations that are nontraditional for their gender;
- single parents, including single pregnant women;
- displaced homemakers; and
- individuals with other barriers to educational achievement, including individuals with limited English proficiency.

The 1990 Perkins Act, which governed the second half of the period covered in this report (1990–1998), defined “special populations” fairly similarly, including individuals with handicaps, educationally and economically disadvantaged individuals (including foster children), individuals of limited English proficiency, individuals who participate in programs designed to eliminate sex bias, and individuals in correctional institutions.

In addition, federal statutes protect against discrimination in education programs and activities receiving federal financial assistance (such as Perkins Act funds) on the basis of race, color, national origin, sex, disability, and age (Office for Civil Rights 2001). For purposes of this report, “protected populations” include American Indians/Alaska Natives, Asians/Pacific Islanders, Hispanics, and non-Hispanic Blacks; females; and students with disabilities. To the extent possible, this report provides information on trends in the vocational/technical coursetaking of these special and protected populations, as well as their peers who were not members of these groups.

## **Description of the Data**

This report analyzes trends in vocational/technical coursetaking by examining high school transcripts for the graduating classes of 1982, 1990, 1992, 1994, and 1998.<sup>1</sup> The analysis samples and variables used in the report are comparable across the survey years. The analysis focuses on public high school graduates who earned regular or honors diplomas.<sup>2</sup> A detailed description of the data surveys and the rules for including students in the analysis population are provided in appendix C.

Transcripts provide information on the courses that public high school graduates took in grades 9 through 12. For simplicity’s sake, the report refers to this information as “high school coursetaking.” With the exception of tables 7–10, which examine coursetaking in each grade (9 through 12) separately, the report describes the cumulative coursework that graduates took in high school.

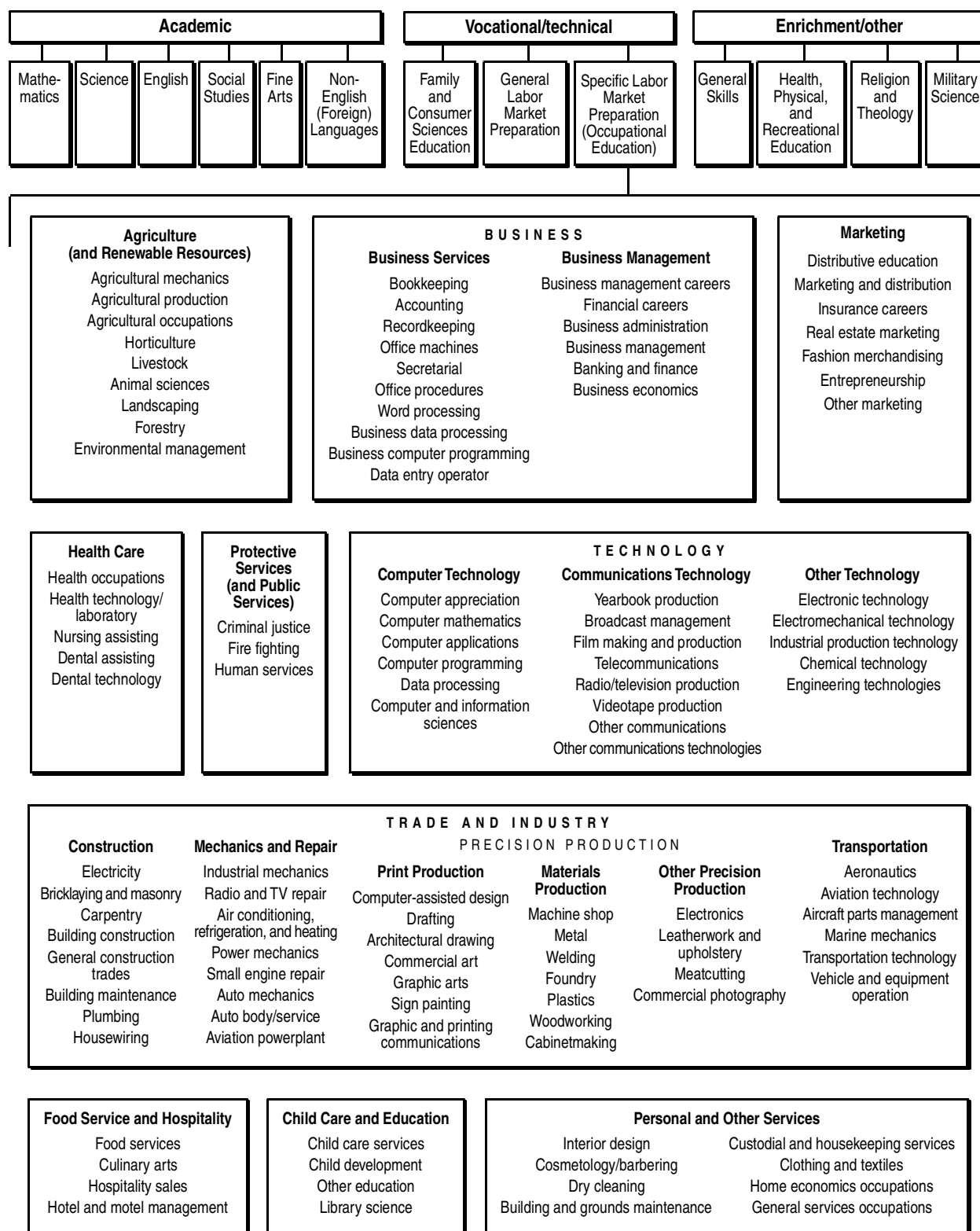
Researchers assigned codes to each course on a transcript according to the Classification of Secondary School Courses (CSSC) (Westat 1992). This report then used the Secondary School Taxonomy (SST) to classify these codes into broader course groupings (Bradby and Hoachlander 1999). As figure 1 shows, the SST classifies high school courses into three main curricular areas (academic, vocational/technical, and enrichment/other) and their subareas. The same course

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<sup>1</sup>These transcript studies were conducted as part of the High School and Beyond Longitudinal Study of 1980 Sophomores, “High School Transcript Study” (HS&B-So:80/82) regarding 1982 graduates; the National Education Longitudinal Study of 1988 (NELS:88/92), “Second Follow-up, Transcript Survey, 1992” regarding 1992 graduates; and the High School Transcript Studies (HSTS) of 1990, 1994, and 1998 regarding 1990, 1994, and 1998 graduates, respectively.

<sup>2</sup>The HS&B and NELS studies excluded students with the most severe disabilities, where it was determined by school staff that these students were unable to complete the lengthy student questionnaires that were a part of these studies. In order to ensure comparability across the data sets, graduates with special education diplomas were excluded from the HSTS samples (Gifford et al. 1989; Tuma 1996). Thus, the samples used for this trend analysis were consistent with the population of public high graduates, including students with disabilities, who earned regular or honors diplomas in each of the study years. This restriction is consistent with NCES reports on high school vocational/technical coursetaking published over the last decade and is consistent with NCES procedures for transcript studies (Alt and Bradby 1999). In addition, there may be some minor coding differences between NELS and the other transcript data that may affect the data for 1992. See appendix C for more information.

Figure 1.—Secondary School Taxonomy



SOURCE: Adapted from Bradby, D. and Hoachlander, E.G. (1999). 1998 Revision of the Secondary School Taxonomy (NCES 1999-06). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.

classification was applied to each of the five data surveys used in the analysis so that coursetaking was defined consistently over time.

In addition to the name of a course, the transcripts also provide the number of credits a student earned for each course. Credits have been standardized across the survey years, so that 1.0 credit is equivalent to completing a course that meets one period per day for an entire school year. This is equivalent to a standard Carnegie unit. However, for simplicity's sake, the report refers to credits rather than Carnegie units.

## **Terms Used in the Report**

### ***The Vocational/Technical Curriculum***

High school vocational/technical education encompasses three different curricula: specific labor market preparation, or “occupational education”; general labor market preparation; and family and consumer sciences education (figure 1).<sup>3</sup> Occupational education consists of courses that teach skills and knowledge required in a particular occupation or set of related occupations. For example, health care programs may prepare students specifically for dental assisting or nursing assisting, or more broadly for general health occupations. Although, traditionally, the main purpose of occupational education was to prepare students for entering specific occupations, occupational education may also prepare students for entering a related vocational/technical program in college. Based on SST classifications, occupational education in this report consists of the 10 broad and 18 narrow program areas shown in figure 1.

General labor market preparation consists of courses that teach general employment skills that are not specific to one occupational area, such as basic typewriting/keyboarding, introductory technology education, and career preparation and general work experience courses. Family and consumer sciences education consists of courses intended to prepare students for family and consumer roles outside the paid labor market.<sup>4</sup>

For purposes of this report, trends focus on vocational/technical coursetaking overall and on occupational coursetaking. Among 1998 public high school graduates, 96.5 percent earned at least some credits in vocational/technical education in high school (table 1). In addition, 90.7 percent of 1998 graduates earned some credits in occupational education (table 2).

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<sup>3</sup>For simplicity's sake, this report uses the term *occupational education* in place of *specific labor market preparation*.

<sup>4</sup>Home economics-related courses that prepare students for the paid labor market are included under occupational education, in the child care and education, food service and hospitality, and personal and other services program areas.



Although vocational/technical coursetaking is prevalent in high schools, students take varying amounts and types of these courses and take them for different purposes. It is therefore important to examine a range of measures when analyzing participation. The measures examined in this report follow in ascending order of restrictiveness. There is considerable overlap among the measures, as indicated below.

- Graduates earning greater than 0.0 credits in vocational/technical education. All of the following groups of students are subsets of this group.
- Graduates earning greater than 0.0 credits in occupational education. This measure is a subset of the previous measure.
- Graduates earning 3.0 or more credits in vocational/technical education. All of the following groups of students are subsets of this group.
- Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area. This measure is a subset of the previous measure.
- Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 1. These students are referred to in this report as *occupational concentrators*.<sup>5</sup> This measure is a subset of the previous measure. In some cases, the report also examines trends in concentrating (earning 3.0 or more credits) in the 18 narrow occupational program areas in figure 1.
- Graduates earning 3.0 or more credits in one or more of the 10 broad occupational program areas in figure 1, with at least 1.0 credit in second- or higher-level courses or cooperative education courses.<sup>6</sup> These students are referred to in this report as *advanced occupational concentrators*; they are included in tables but are not discussed in the text.

In addition to tracking the percentages of public high school graduates satisfying the participation measures mentioned above, the report also examines the average number of credits earned by graduates in vocational/technical and occupational education. Although all of the above measures are discussed in this report or referred to in the tables, the report emphasizes the coursetaking

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<sup>5</sup>This classification was also used in Levesque et al. (2000), in which students were referred to as “vocational” concentrators. In the few cases where students earned 3.0 or more credits in more than one of the 10 program areas, they were assigned to the program area in which they earned the most credits.

<sup>6</sup>The SST divides the occupational courses in each program area into four categories: first-level, second- or higher-level, cooperative education, and specialty courses. The first three categories generally represent sequential coursetaking.

patterns of occupational concentrators because this group is a common focus of federal and state accountability and research efforts for vocational/technical education (U.S. Department of Education 2002; Silverberg et al. 2002).<sup>7</sup>

### ***Classification of Computer-Related Courses***

As part of its stated purpose, the 1998 Perkins Act promotes developing the technical skills of students in vocational/technical programs. While students develop technical skills—and use various technologies—throughout the vocational/technical curriculum, it is not usually possible to determine from transcript records the specific kinds of technical skills developed or technology and equipment used in a particular course. However, as one measure of exposure to technical skills, this report examines participation in courses whose *primary objective* is to teach students computer-related skills and knowledge, referred to here as computer-related courses.

The NCES standard procedures for transcript studies currently include all computer-related courses (including those taught in mathematics and computer science departments) under the vocational/technical curriculum (Alt and Bradby 1999). Although some of these courses are included in general labor market preparation (under typewriting/keyboarding and under technology education), most computer-related courses are included in occupational education. Most of these courses are included under the business services and computer technology program areas, while some are included under the agriculture, business management, and drafting/graphics program areas. Figure 2 summarizes the classification of all computer-related courses in the SST. Only a subset of courses in technology education, agriculture, business management, business services, and drafting/graphics areas were classified as computer related.<sup>8</sup> In contrast, virtually all courses in typewriting/keyboarding and computer technology were so classified.

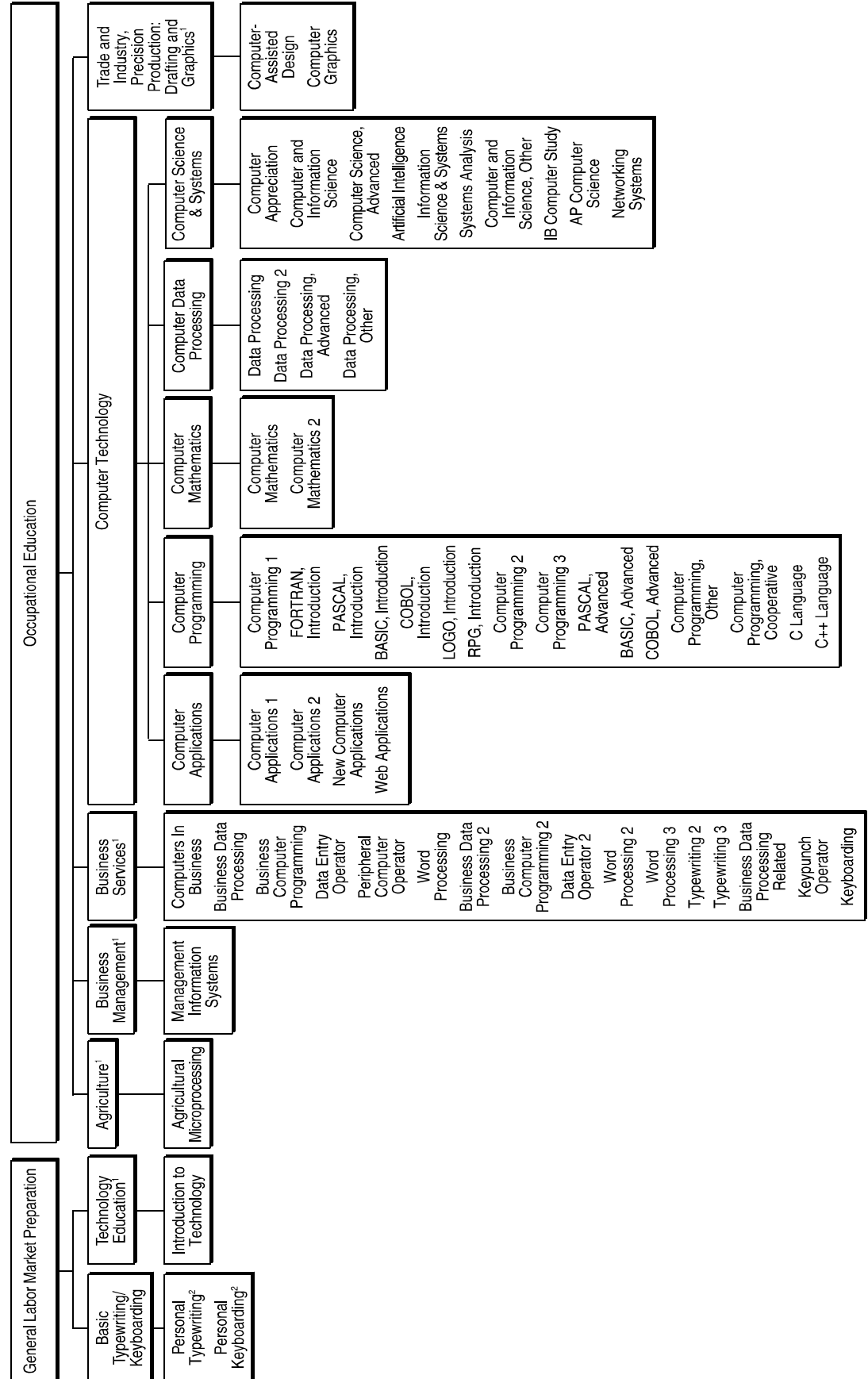
There was one main exception to this classification scheme. According to recommendations made by experts during the revision of the SST, all typewriting/keyboarding courses in 1982 were assumed *not* to be computer related (Alt and Bradby 1999). In contrast, in 1990 and subsequent years, all of these courses were classified as computer related because it is not usually possible to determine from transcript records what kind of equipment—whether a standard electric typewriter, an electric typewriter with computerized memory, or a computer—was used in a typewriting/keyboarding course. This decision may have resulted in an undercount of computer-related coursetaking in 1982 and an overcount in the 1990s, particularly in the early 1990s. The

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<sup>7</sup>The U.S. Department of Education (2002) and Silverberg (2002) refer to this group as “vocational” concentrators.

<sup>8</sup>In all years studied, there was no detectable computer-related coursetaking in agriculture and business management. Therefore, these program areas were dropped from the analysis of computer-related coursetaking.

Figure 2.—Classification of computer-related courses in the Secondary School Taxonomy



<sup>1</sup>Only a subset of courses in these areas were considered computer related.

<sup>2</sup>According to expert recommendation, these courses were not counted as computer related in 1982. In contrast, they were assumed to be computer related in 1990 and subsequent years.

SOURCE: Adapted from Bradby, D. and Hoachlander, E.G. (1999), 1998 Revision of the Secondary School Taxonomy (NCES 1999-06). U.S. Department of Education, Washington, DC: National Center for Education Statistics Working Paper.

magnitude of these potential miscounts is not known. Because it is difficult to determine the computer-related nature of typewriting/keyboarding courses and because the level of computer-related coursetaking overall was very low in 1982, this report focuses on trends in computer-related coursetaking for the years 1990 to 1998. See Levesque (2003) for a more detailed description of the computer-related course classification used in this report.

### ***Key Population Variables***

This report uses the following variables and categories to provide information on as many of the above-identified special and protected populations as possible, as well as on their peers who were not members of these groups. Measures were selected based on federal definitions, previous related research, and data availability. Data were analyzed only for those years and surveys that contained comparable variables. For the sake of readability when summarizing findings, the report uses the terms *disadvantaged* and *advantaged* to describe student groups on some of the key variables, as indicated below.<sup>9</sup> Appendix C provides additional information on how these variables were constructed.

*Race/ethnicity.* Includes the five categories of American Indian/Alaska Native;<sup>10</sup> Asian/Pacific Islander; Hispanic; non-Hispanic Black; and non-Hispanic White. For simplicity's sake, the text refers to Black and White graduates, although students in both of these groups were also non-Hispanic.

*Sex.* Includes the two categories of male and female.

*Disability status (grade 12).* Includes students who were reported to have a disability and students who were reported to have no disability as of grade 12. It should be remembered, however, that graduates with the most severe disabilities were excluded from the analysis due to survey constraints. Consequently, the disability status variable identifies students with and without disabilities among the population of public high school graduates who earned regular or honors diplomas.<sup>11</sup> For purposes of this analysis, students with disabilities were considered to be “disadvantaged,” while students without disabilities were considered to be more “advantaged.”

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<sup>9</sup>In a few cases, *advantaged* students were further classified as *moderately advantaged* and *highly advantaged*. The race/ethnicity and sex categories were not classified according to advantage, because the Perkins legislation did not make this distinction for these variables.

<sup>10</sup>Small sample sizes for American Indian/Alaska Native graduates (between 84 and 200 students versus 300 or more students in other racial/ethnic groups in each of the five years studied) resulted in relatively large standard errors and relatively unreliable estimates for this group. As a result, many large apparent differences between American Indian/Alaska Native graduates and other racial/ethnic groups were not statistically significant.

<sup>11</sup>As of 1998, about 31 percent of students with disabilities held special education diplomas and were excluded from the study.

*English proficiency (grade 12).* Includes the two categories of limited English proficiency and English proficient. It is important to note that this variable describes students' English language proficiency as of grade 12. For purposes of this analysis, graduates who had limited English proficiency in grade 12 were considered to be "disadvantaged," while graduates who were English proficient in grade 12 were considered to be more "advantaged."

The report uses the following three measures of academic achievement. The final federal regulations to the 1990 Perkins Act used grade-point average to define academically disadvantaged individuals.<sup>12</sup> The other two measures were suggested by previous research on whether vocational education has been a "dumping ground" for low academically achieving students (Boesel et al. 1994).

*Grade-point average (GPA).* Calculated from grades recorded in the transcript files, this variable has a possible range of 0.0 to 4.0. It was not possible in some of the surveys to calculate GPA for academic courses only (a preferable measure of academic achievement), so overall GPA was used. GPA was collapsed into the three categories: high GPA (greater than 3.5); mid-level GPA (2.0 to 3.5); and low GPA (less than 2.0). For purposes of this analysis, students with a GPA of less than 2.0 were considered to be "disadvantaged"; students with a GPA of 2.0 to 3.5 were considered to be "moderately advantaged"; and students with a GPA of greater than 3.5 were considered to be "highly advantaged."

*Academic coursework completed.* This variable describes whether students completed all low or all high mathematics, science, and English courses, or some other combination of mathematics, science, and English courses (mid-level or mixed academic coursetaking). Low and high mathematics, science, and English courses are defined in the glossary (appendix B) and technical appendix (appendix C). For purposes of this analysis, students completing all low-level academic coursework were considered to be "disadvantaged"; students completing all high-level academic coursework were considered to be "highly advantaged"; and students completing some other combination of academic coursework were considered to be "moderately advantaged."

*Grade 9 mathematics.* This variable identifies the mathematics course a student took in grade 9. It includes the three categories of high-level grade 9 mathematics (geometry or higher), mid-level grade 9 mathematics (pre-algebra or algebra 1), and low-level mathematics (no mathematics or mathematics courses below algebra 1). It provides a measure of academic achievement before most of graduates' coursework in vocational/technical education

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<sup>12</sup>The 1998 Perkins Act offered no additional guidance for identifying students with barriers to educational achievement, other than limited English proficiency.

was taken<sup>13</sup> and is therefore less confounded than either GPA or academic coursework completed with that coursetaking. For purposes of this analysis, students who took low-level mathematics in grade 9 were considered to be “disadvantaged”; students who took mid-level grade 9 mathematics were considered to be “moderately advantaged”; and students who took high-level grade 9 mathematics were considered to be “highly advantaged.”

Although a student-level measure of socioeconomic status would have been preferable for this analysis, such a variable was not available from the 1990, 1994, and 1998 High School Transcript Studies (HSTS). Instead, the report uses the following two school-level variables as measures of economic status.<sup>14</sup>

*School urbanicity.* This variable describes the location of the school a graduate attended in the 12th grade and includes the three categories of urban, suburban, and rural. These categories are defined further in the glossary (appendix B) and technical appendix (appendix C).

*School poverty level.* This variable describes the proportion of students in the school a graduate attended in the 12th grade who participated in the National School Lunch Program (NSLP). It includes the categories of high poverty (greater than 50 percent in NSLP) and low poverty (5 percent or less in NSLP), with a middle group having greater than 5 to 50 percent of students in NSLP. This variable also includes a category for students whose schools did not report their participation in NSLP.<sup>15</sup> For purposes of this analysis, students in high-poverty schools were considered to be “disadvantaged,” while students in low-poverty schools were considered to be “highly advantaged.” The middle group was considered to be of mixed advantage. Students who did not have school-reported NSLP information were not classified according to advantage on this variable. The variable is defined further in the glossary (appendix B) and technical appendix (appendix C).

It should be remembered that there may be a fairly high correspondence among some of these variables, for example, between school poverty level and grade 9 mathematics taken. This report did not attempt to isolate the unique contribution of each factor to participation in vocational/technical education. Rather, the report describes bivariate relationships according to NCES

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<sup>13</sup>The 1998 public high school graduates earned about 21 percent of their total vocational/technical credits and 16 percent of their total occupational credits in grade 9.

<sup>14</sup>Section 421 of the 1990 Perkins Act included information on students in rural and urban areas in its identification of economically disadvantaged students. The final regulations to the 1990 Perkins Act also included eligibility for the National School Lunch Program in the definition of this group. The 1998 Perkins Act provided no additional guidance on defining economically disadvantaged students.

<sup>15</sup>A substantial proportion (14 to 17 percent) of students did not have school-reported information on their school’s participation in the NSLP. Consequently, a “not reported” category was included for this variable.

standards for this type of analysis. See appendix C for additional information on technical procedures followed in the report.

## **Overall Trends**

Patterns and trends in who participates in vocational/technical education must be examined in the context of general trends in vocational/technical coursetaking. This section summarizes key trends that were detailed in Levesque (2003). During the period examined in this report, students changed both the amount and nature of their high school coursetaking. In particular, between 1982 and 1998, public high school graduates increased their total and their academic coursetaking while they decreased their vocational/technical coursetaking, although most declines occurred by the early 1990s. The primary change in vocational/technical coursetaking was not in the proportion of high school students participating in vocational/technical education but in the amount of vocational/technical education they took. That is, the breadth of vocational/technical coursetaking declined slightly, while the depth of this coursetaking declined more steeply. In contrast to vocational/technical coursetaking overall, occupational coursetaking was relatively steady, with the average number of occupational credits that 1998 graduates earned in high school not statistically different from the average number earned by 1982 graduates. Consequently, occupational coursetaking became a more prominent part of vocational/technical coursetaking over the period studied. However, graduates were less likely to concentrate in occupational education (earn 3.0 or more credits in one of the 10 broad occupational program areas in figure 1) over this period. Many of these coursetaking changes coincided with changes in education policies emphasizing academic achievement (National Commission on Excellence in Education 1983; the 1990 and 1998 Perkins Acts; and the School-to-Work Opportunities Act of 1994) and in the labor market demand for specific occupations (Levesque et al. 2000; Hurst and Hudson 2000).

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## II. Selected Findings

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### Patterns of Vocational/Technical Coursetaking in 1998

This section of the report summarizes the vocational/technical and occupational coursetaking of the 1998 public high school graduates. Although most of these graduates took at least some vocational/technical and occupational coursework, graduates who were members of disadvantaged groups generally took more such coursework and were more likely to concentrate in occupational education than their counterparts who were members of more advantaged groups. However, the majority of occupational concentrators came from moderately advantaged groups, rather than from disadvantaged or highly advantaged groups.

#### *Overall Vocational/Technical Coursetaking Among 1998 Graduates*

- Although there were some differences among student groups who were members of the class of 1998 in the extent of their vocational/technical coursetaking, more than 90 percent of each identified student group took some vocational/technical coursework in high school, regardless of their special or protected population status (table 1).<sup>16</sup>
- The 1998 graduates earned more than 2.6 vocational/technical credits on average—equivalent to taking more than two and a half full-year vocational/technical courses, regardless of their special or protected population status (table 3).<sup>17</sup>
- Generally, disadvantaged students were more likely to earn 3.0 or more vocational/technical credits in high school than more advantaged students (table 11), and they earned a larger number of vocational/technical credits on average than their more advantaged peers (table 3). These differences in the depth of vocational/technical coursetaking were apparent with regard to disability status in grade 12, GPA, academic coursework completed, grade 9 mathematics, and school poverty.<sup>18</sup> For example, 83.0

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<sup>16</sup>The 92.2 percent of 1998 graduates who completed all high-level academic coursework in high school was not statistically different from 90.0 percent.

<sup>17</sup>The 2.82 vocational/technical credits that 1998 graduates with a high GPA (greater than 3.5) was not statistically different from 2.6 credits.

<sup>18</sup>Students in high- and middle-poverty schools both earned more vocational/technical credits on average than students in low-poverty schools, but the difference between the average number of vocational/technical credits earned by students in high- and middle-poverty schools was not statistically significant (table 3).

percent of 1998 public high school graduates with disabilities in grade 12 versus 60.9 percent of 1998 graduates without such disabilities earned 3.0 or more vocational/technical credits in high school, a difference of about 22 percentage points (table 11). Similarly, graduates with disabilities in grade 12 earned about one and a half times the average number of vocational/technical credits that graduates without such disabilities earned (5.85 credits versus 3.94 credits) (table 3).

- The only disadvantaged student group that did not take significantly more vocational/technical coursework than their more advantaged peers were graduates who had limited English proficiency in grade 12. No significant difference was detected between graduates who had limited English proficiency in grade 12 and their English proficient peers in the likelihood of earning 3.0 or more vocational/technical credits in high school (52.2 percent versus 61.6 percent) (table 11). In addition, graduates who had limited English proficiency in grade 12 earned fewer vocational/technical credits on average than their English proficient peers (3.19 credits versus 4.00 credits) (table 3).
- Among 1998 graduates, males took more vocational/technical courses than females, and students in rural schools took more vocational/technical courses than students in either urban or suburban schools (tables 3 and 11). In contrast, Asians/Pacific Islanders were less likely than Black graduates to earn 3.0 or more vocational/technical credits (table 11), and they earned fewer vocational/technical credits on average than graduates in any other racial/ethnic group (table 3). No other differences among racial/ethnic groups in tables 3 and 11 were statistically significant.

### ***Occupational Coursetaking Among 1998 Graduates***

Most 1998 public high school graduates (90.7 percent) earned at least some credits in occupational education in high school (table 2). The occupational coursetaking patterns of the various student groups examined in this report were similar to the vocational/technical coursetaking patterns described above.

- Although there were some differences among student groups who were members of the class of 1998, more than 80 percent of each identified student group took some occupational coursework, regardless of their special or protected population status (table 2).<sup>19</sup>

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<sup>19</sup>The 83.3 percent of 1998 graduates who completed all high-level academic coursework in high school was not statistically different from 80.0 percent.

- The 1998 graduates earned at least 2.0 occupational credits on average—equivalent to taking two or more full-year occupational courses, regardless of their special or protected population status (table 4).<sup>20</sup>
- As with vocational/technical coursetaking, disadvantaged students were generally more likely to earn 3.0 or more occupational credits in high school than more advantaged students (table 12), and they earned more occupational credits on average than their more advantaged peers (table 4). These differences in the depth of occupational course-taking were apparent with regard to disability status in grade 12, GPA, academic coursework completed, grade 9 mathematics,<sup>21</sup> and school poverty. For example, public high school graduates in high-poverty schools (as well as those in middle-poverty schools) were more likely to earn 3.0 or more occupational credits than graduates in low-poverty schools (53.9 percent and 45.8 percent, respectively, versus 30.0 percent) (table 12), and they earned more occupational credits on average than their peers in low-poverty schools (3.30 credits and 2.97 credits, respectively, versus 2.22 credits) (table 4).<sup>22</sup>
- The only disadvantaged student group that did not take more occupational coursework than their more advantaged peers were graduates who had limited English proficiency in grade 12. These graduates were less likely than their English proficient peers to earn 3.0 or more occupational credits (27.2 percent versus 44.0 percent) (table 12), and they earned fewer occupational credits on average (1.99 credits versus 2.88 credits) (table 4).
- Among 1998 graduates, males took more occupational courses than females, and students in rural schools took more occupational courses than students in either urban or suburban schools (tables 12 and 4). Asians/Pacific Islanders were less likely than graduates in most other racial/ethnic groups to earn 3.0 or more occupational credits<sup>23</sup> (table 12), and they earned fewer occupational credits on average than graduates in any other racial/ethnic group (table 4).

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<sup>20</sup>The 1.99 occupational credits earned by 1998 graduates who had limited English proficiency in grade 12, the 2.02 occupational credits earned by 1998 graduates with a high GPA (greater than 3.5), and the 2.22 occupational credits earned by 1998 graduates in low-poverty schools were not statistically different from 2.00 credits.

<sup>21</sup>Graduates who took low-level mathematics in grade 9 were more likely to earn 3.0 or more occupational credits than graduates who took high-level grade 9 mathematics, and they earned more occupational credits on average than their high-achieving peers in grade 9. However, the difference between graduates who took mid-level grade 9 mathematics and their lower achieving peers in grade 9 was not statistically significant.

<sup>22</sup>Differences between graduates in high- and middle-poverty schools were not statistically significant.

<sup>23</sup>The one exception was that the difference between Asians/Pacific Islanders and American Indians/Alaska Natives in the percentage of graduates earning 3.0 or more occupational credits was not statistically significant.

### ***1998 Graduates and Concentrating in Occupational Education***

One-quarter (25.0 percent) of all 1998 public high school graduates concentrated in occupational education (earned 3.0 or more credits in one of the 10 broad occupational program areas in figure 1) (table 13). In general, patterns of concentrating in occupational education were similar to the occupational coursetaking patterns noted above.

- Disadvantaged students who were members of the 1998 graduating class were generally more likely to concentrate in occupational education than more advantaged students (table 13). These differences were apparent with regard to disability status in grade 12, GPA, academic coursework completed, grade 9 mathematics, and school poverty.<sup>24</sup> The only disadvantaged student group that was not more likely to concentrate in occupational education than their more advantaged peers were graduates who had limited English proficiency in grade 12. These graduates were less likely than their English proficient peers to complete an occupational concentration (8.7 percent versus 25.1 percent).
- Among 1998 graduates, males were more likely to concentrate in occupational education than females, and students in rural schools were more likely than students in urban and suburban schools to do so (table 13). In contrast, Asians/Pacific Islanders were less likely than Black or White graduates to complete an occupational concentration.

However, patterns varied somewhat by specific occupational program area. For example, while academically disadvantaged graduates were more likely than their more advantaged peers to concentrate in occupational education generally, this pattern was sometimes reversed in certain occupational program areas, notably communications technology. Specific exceptions to overall patterns for the class of 1998 include the following:

- The 1998 public high school graduates with a mid-range GPA (2.0 to 3.5) were more likely than graduates with a low GPA (less than 2.0) to concentrate in agriculture (2.7 percent versus 1.1 percent) (table 16). In addition, graduates with a high GPA (greater than 3.5) were more likely than graduates with a low GPA to concentrate in the broad technology program area (table 31), and these graduates with a high GPA were more

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<sup>24</sup>Graduates who took low-level mathematics in grade 9 were more likely to concentrate in occupational education than graduates who took high-level mathematics in grade 9. However, the difference between graduates who took mid-level mathematics in grade 9 and their lower achieving peers was not statistically significant. Graduates in high-poverty schools (as well as those in middle-poverty schools) were more likely than graduates in low-poverty schools to concentrate in occupational education. However, differences between graduates in high- and middle-poverty schools were not statistically significant.

likely than graduates with a mid-range GPA to concentrate in communications technology (table 33).<sup>25</sup>

- The 1998 graduates who completed all high-level academic coursework in high school were more likely than their peers who completed mid-level or mixed academic coursework to concentrate in communications technology (table 33).<sup>26</sup> Similarly, graduates who took high-level mathematics courses in grade 9 were more likely than their peers who took low-level mathematics in this grade to concentrate in this occupational program area (table 33).
- Those 1998 graduates who were in high-poverty schools (with greater than 50 percent of students participating in NSLP) were less likely than their peers in middle-poverty schools (with 5 to 50 percent of students in NSLP) to concentrate in food service and hospitality programs (table 35).
- Those 1998 graduates who were in rural schools were less likely than their peers in urban schools to concentrate in marketing (table 20).
- While male graduates from the class of 1998 were more likely than their female peers to concentrate in occupational education generally, males were less likely than females to concentrate specifically in business services (table 18), health care (table 21), child care and education (table 36), and personal and other services (table 37).
- Black graduates who were members of the class of 1998 were less likely than their White peers to concentrate in agriculture (table 16), in the broad trade and industry program area (table 23), and particularly in materials production (table 28).<sup>27</sup> American Indian/Alaska Native graduates were less likely than Black graduates to concentrate in business services (table 18). In addition, Hispanic graduates were less likely than Black graduates to concentrate in the construction trades (table 24).

### ***Characteristics of Occupational Concentrators From the Class of 1998***

While disadvantaged students who were members of the class of 1998 were more likely than their more advantaged peers to participate in vocational/technical education in general, and to concentrate in occupational education in particular, these disadvantaged students represented a minority of all occupational concentrators. In fact, when students were classified into three groups (low-, moderate- or middle-, and high-advantage), the majority of occupational concentra-

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<sup>25</sup>There were too few 1998 graduates with a low GPA who concentrated in communications technology to produce a reliable estimate for this group.

<sup>26</sup>There were too few 1998 graduates completing all low-level academic coursework who concentrated in communications technology to produce a reliable estimate for this group.

<sup>27</sup>Black graduates were also less likely than Hispanic graduates to concentrate in materials production programs.

tors (about 60 percent or more) came from the middle groups. In each case, either occupational concentrators were more likely to be from these middle groups than was the 1998 public high school class as a whole, or no significant difference was detected in the proportion of occupational concentrators and all graduates who were from these groups. This section compares the percentage distributions for all graduates (table 38) and for occupational concentrators (table 39) as of 1998.

- Disadvantaged students represented a minority of all occupational concentrators. About 5 percent or less of occupational concentrators who were members of the class of 1998 were disabled in grade 12, had limited English proficiency in grade 12, or completed all low-level academic coursework in high school (table 39). In addition, about 10 percent of occupational concentrators had a low GPA (less than 2.0) or attended high-poverty schools, and about 20 percent of occupational concentrators took low-level mathematics courses in grade 9.
- Although disadvantaged students were a minority of all occupational concentrators, a larger proportion of occupational concentrators than the 1998 graduating class as a whole were disabled in grade 12 (4.2 percent versus 2.8 percent) (tables 39 and 38, respectively). However, the proportion of occupational concentrators who had limited English proficiency in grade 12 was lower than that for all 1998 graduates (0.2 percent versus 0.7 percent).
- On measures that classified students into three groups (low-, moderate- or middle-, and high-advantage), most occupational concentrators (about 60 percent or more) were from the middle groups (table 39). In each case, the proportion of occupational concentrators who were from these middle groups was either greater than or not statistically different from the corresponding proportions for the 1998 class as a whole. Specifically, 79.5 percent of occupational concentrators versus 75.5 percent of all 1998 graduates had mid-level GPAs (2.0 to 3.5) and 87.8 percent of occupational concentrators versus 82.8 percent of all graduates completed mid-level or mixed academic coursework in high school (tables 39 and 38, respectively). The percentages of occupational concentrators who took mid-level mathematics courses in grade 9 or who attended middle-poverty schools were not statistically different from the corresponding percentages of all graduates who were from these groups.
- In comparison to the 1998 graduating class as a whole, occupational concentrators were less likely to be from the highest academic achievement groups. Specifically, occupational concentrators were less likely than all graduates to have a high GPA (10.5 percent versus 17.4 percent), to complete all high-level academic coursework (8.5 per-

cent versus 14.9 percent), or to take high-level mathematics courses in grade 9 (14.3 percent versus 20.4 percent) (tables 39 and 38, respectively). However no significant difference was detected in the percentage of occupational concentrators and all graduates who attended low-poverty schools.

- In addition, no significant difference was detected in the proportion of occupational concentrators and all graduates who were from low-advantaged groups on measures that classified students into three groups (including GPA, academic coursework completed in high school, grade 9 mathematics, and school poverty level) (tables 39 and 38, respectively).
- A higher percentage of occupational concentrators who were members of the class of 1998 completed all high-level academic coursework than completed all low-level academic coursework in high school (8.5 percent versus 3.7 percent) (table 39). On the other hand, no significant differences were detected in the percentages of occupational concentrators who were in the most advantaged and most disadvantaged categories with regard to GPA (10.5 percent versus 10.0 percent) and school poverty (10.2 percent versus 10.7 percent). With regard to grade 9 mathematics, the percentage of occupational concentrators in the lowest achievement group was greater than the percentage in the highest achievement group (20.2 percent versus 14.3 percent) (table 39).<sup>28</sup>
- The majority of occupational concentrators were White and were male (table 39). In fact, occupational concentrators were more likely to be male than the 1998 graduating class as a whole (58.6 percent versus 47.8 percent) (tables 39 and 38, respectively).<sup>29</sup> With regard to school urbanicity, no school type enrolled a majority of occupational concentrators (table 39). However, occupational concentrators were more likely to attend rural schools than urban schools (40.1 percent versus 26.2 percent).<sup>30</sup> No significant difference was detected between occupational concentrators and all 1998 graduates based on school urbanicity (tables 39 and 38, respectively).

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<sup>28</sup>As explained in the Introduction, grade 9 mathematics is a better measure of prior academic achievement than either GPA or academic coursework completed, which measure cumulative high school achievement.

<sup>29</sup>No significant difference was detected in the percentage of occupational concentrators and all graduates who were White.

<sup>30</sup>No significant differences were detected in the percentage of occupational concentrators who attended suburban schools and those who attended schools in other locales.

## **Trends in Vocational/Technical Coursetaking: 1982 to 1998<sup>31</sup>**

### ***Trends in Overall Vocational/Technical Coursetaking***

Between 1982 and 1998, the primary change in vocational/technical coursetaking was in the amount of vocational/technical education that students took rather than in the proportion of students participating in vocational/technical education. The average number of credits graduates earned in vocational/technical education declined from 1982 to 1990, after which no significant changes were detected. However, during the 1990s, vocational/technical credits continued to represent a declining share of the total high school credits that graduates earned. This relative decline was due to the fact that public high school graduates earned on average more academic credits and—to a lesser extent—more enrichment/other credits over this decade (Levesque 2003). Nonetheless, vocational/technical coursetaking remained a substantial part of each student group's coursetaking. Some exceptions to these overall trends are listed below.

- Almost all public high school graduates (more than 90 percent) took some vocational/technical coursework in high school, regardless of their special or protected population status (table 1). This was true for each graduating class studied between 1982 and 1998.<sup>32</sup>
- Between 1982 and 1998, each identified student group earned more than 2.0 vocational/technical credits on average—equivalent to more than two full-year vocational/technical courses (table 3).<sup>33</sup> This level of coursetaking exceeded most state graduation requirements for vocational/technical education over the same period.<sup>34</sup> In addition, more than 25 percent of each identified student group earned 3.0 or more vocational/technical credits over the period studied (table 11).<sup>35</sup>
- The average number of credits that public high school graduates earned in vocational/technical education decreased from 4.68 credits for 1982 graduates to 4.19 credits for 1990 graduates, after which the number of vocational/technical credits graduates

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<sup>31</sup>Because data for 1982 were not available, trends between 1982 and 1998 could not be determined with regard to English proficiency in grade 12 and school poverty.

<sup>32</sup>The 91.7 percent of 1994 graduates who completed all high-level academic coursework in high school and the 92.2 percent of 1998 graduates who completed such coursework were not statistically different from 90 percent. In addition, the difference between the 100 percent of 1982 graduates who completed all low-level academic coursework in high school and 90 percent could not be tested, because the corresponding 1982 standard error was 0.00.

<sup>33</sup> The 2.14 vocational/technical credits earned by 1994 graduates who completed all high-level academic coursework in high school were not statistically different from 2.0 credits.

<sup>34</sup>In 1998, five states required 2.0 or more credits of vocational/technical education for students to graduate, including computer education requirements. This number of states was smaller in earlier years. See Education Commission of the States (1990) and Snyder and Hoffman (2001), table 154.

<sup>35</sup>The 29.5 percent of 1990 graduates who completed all high-level academic coursework in high school was not statistically different from 25.0 percent.



earned was about 4.00 credits on average (table 3). However, trends varied among the different student groups. Some exceptions to the overall trend included students who were disabled in grade 12 (who increased the number of vocational/technical credits they earned between 1982 and 1998);<sup>36</sup> and there was no significant difference between 1982 and 1998 in the average number of vocational/technical credits earned by Asians/Pacific Islanders, Blacks, and students in rural schools (table 3).

- In addition, while some moderate academic achievers (including graduates with a GPA of 2.0 to 3.5 and graduates who completed mid-level or mixed academic coursework in high school) earned fewer vocational/technical credits over the period studied, the vocational/technical coursetaking of both their higher and lower achieving peers did not change significantly between 1982 and 1998 (table 3). In comparison, low-level mathematics coursetakers in grade 9 earned fewer vocational/technical credits between 1982 and 1998, while there was no significant difference over the same period in the numbers of vocational/technical credits earned by graduates who took high- and mid-level mathematics in grade 9.

One question of interest to policymakers is whether vocational/technical coursetaking declines occurred across the board or only among certain subgroups of students. Most often, vocational/technical coursetaking declines occurred among groups earning numbers of vocational/technical credits that were not statistically different from the average for all 1982 graduates.<sup>37</sup> In comparison, there were few significant changes detected in the average number of vocational/technical credits earned by several groups that earned *above*-average numbers of vocational/technical credits in 1982.<sup>38</sup> At the same time, there were no significant changes detected between 1982 and 1998 in the average number of vocational/technical credits earned by several

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<sup>36</sup>Most of this increase occurred between 1982 and 1990, after which there were no significant changes in the numbers of vocational/technical credits earned by disabled students.

<sup>37</sup>Groups that earned numbers of vocational/technical credits that were not statistically different from the average for all 1982 graduates and who exhibited declines in these credits as of 1998 included American Indians/Alaska Natives and Whites; both males and females; students with no reported disabilities in grade 12; students earning mid-level GPAs; students completing mid-level or mixed academic coursework in high school; and students attending urban or suburban schools. Exceptions to this pattern included Blacks and students taking mid-level mathematics in grade 9 (both who earned numbers of vocational/technical credits as of 1998 that were not statistically different from those earned by their 1982 peers who were members of these groups), as well as students with disabilities in grade 12 (who earned a larger number of vocational/technical credits as of 1998 in comparison with their 1982 peers).

<sup>38</sup>Groups that earned above-average numbers of vocational/technical credits in 1982 and that did not exhibit significant declines as of 1998 included students earning low GPAs; students completing all low-level academic coursework in high school; and students attending rural schools. Exceptions to this pattern included Hispanics and students taking low-level mathematics in grade 9, both who earned a smaller number of vocational/technical credits as of 1998 in comparison with their 1982 peers.

groups that earned *below*-average numbers of vocational/technical credits in 1982 compared with all 1982 graduates.<sup>39</sup>

As a consequence of these changes, there were few shifts among subgroups of graduates with regard to their relative vocational/technical coursetaking patterns over the period studied. That is, most groups that earned above-average numbers of vocational/technical credits in 1982 still earned above-average numbers of such credits as of 1998 (including low academic achievers and students attending rural schools). In addition, all groups that earned below-average numbers of vocational/technical credits in 1982 still earned below-average numbers of such credits as of 1998 (including Asians/Pacific Islanders and high academic achievers). Finally, despite the coursetaking declines noted above, most groups that earned numbers of vocational/technical credits in 1982 that were not statistically different from the average for all 1982 graduates were also in this middle coursetaking group as of 1998.

However, there were two exceptions to this overall pattern. Hispanic graduates, who earned *above*-average numbers of vocational/technical credits in 1982 compared with all 1982 graduates and who earned fewer such credits over the period studied, earned numbers of vocational/technical credits as of 1998 that were not statistically different from the average for all 1998 graduates. In comparison, students with disabilities as of grade 12 (who earned numbers of vocational/technical credits in 1982 that were not statistically different from the average for all 1982 graduates and who earned more such credits over the period studied) earned *above*-average numbers of vocational/technical credits as of 1998 compared with all 1998 graduates.

- The share of total high school credits earned by graduates that were vocational/technical credits declined from 21.8 percent for 1982 graduates to 15.9 percent for 1998 graduates (table 5). This trend was evident for most graduates regardless of their special or protected population status. Exceptions included Asians/Pacific Islanders, students who were disabled in grade 12, and graduates who completed all low- or all high-level academic coursework in high school. There were no significant changes between 1982 and 1998 in the share of total high school credits earned by these latter groups in the vocational/technical curriculum.

### ***Trends in Occupational Coursetaking Overall***

As with vocational/technical education overall, there were no significant changes in the breadth of occupational coursetaking, with most public high school graduates earning at least

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<sup>39</sup>Groups that earned below-average numbers of vocational/technical credits in 1982 compared with all 1982 graduates and that did not exhibit significant declines as of 1998 included Asians/Pacific Islanders; students earning high GPAs; students completing all high-level academic coursework in high school; and students taking high-level grade 9 mathematics courses.

some occupational credits over the period studied. In addition, the average number of occupational credits that 1998 graduates earned in high school was not statistically different from the average number earned by 1982 graduates. Nonetheless, occupational coursetaking increased on average as a proportion of graduates' total vocational/technical coursetaking over the period. Some exceptions to these overall trends are listed below.

- Almost all public high school graduates (more than 75 percent) took some occupational coursework in high school, regardless of their special or protected population status (table 2). This was true between 1982 and 1998 for each graduating class studied.<sup>40</sup>
- Between 1982 and 1998, most student groups earned at least 1.5 occupational credits on average (table 4),<sup>41</sup> and at least 15 percent of most identified groups earned 3.0 or more occupational credits during the period studied (table 12),<sup>42</sup> regardless of their special or protected population status.
- There was no significant difference in the average number of occupational credits earned by the 1982 and 1998 public high school graduates (3.03 credits and 2.87 credits, respectively) (table 4). However, trends varied somewhat among student groups.
- In particular, students with disabilities in grade 12 earned more occupational credits and students without such disabilities earned fewer occupational credits over the period studied (table 4). While there was no significant difference in the numbers of occupational credits earned by 1982 graduates with and without disabilities in grade 12, by 1998, students with disabilities in grade 12 earned 1.03 more occupational credits than their peers without such disabilities, a difference that is equivalent to about one full-year occupational course.
- Additionally, Hispanic graduates earned fewer occupational credits between 1982 and 1998, while there were no significant changes over the period in the numbers of such credits earned by the other racial/ethnic groups (table 4).
- The share of the total vocational/technical credits earned by graduates that were occupational credits increased from 59.4 percent for 1982 graduates to 68.4 percent for

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<sup>40</sup>The 67.5 percent of 1982 graduates who completed all high-level academic coursework in high school and who took some occupational coursework was not statistically different from 75.0 percent.

<sup>41</sup>The 1.82 occupational credits earned by 1982 graduates who had limited English proficiency in grade 12 and the occupational credits earned by 1982, 1990 and 1994 graduates who completed all high-level academic coursework in high school (1.51 credits, 1.53 credits, and 1.56 credits, respectively) were not statistically different from 1.5 credits.

<sup>42</sup>The 19.6 percent of 1982 graduates who had limited English proficiency in grade 12 and earned 3.0 or more occupational credits in high school and the percentages of 1982 and 1990 graduates who completed all high-level academic coursework in high school and earned 3.0 or more occupational credits (23.7 percent and 15.9 percent, respectively) were not statistically different from 15 percent.

1998 graduates (table 6). This trend was evident for most graduates regardless of their special or protected population status. Exceptions included American Indians/Alaska Natives, graduates who were disabled in grade 12, and graduates who completed all low-level academic coursework in high school. No significant changes were detected over the period in the proportions of vocational/technical credits earned in the occupational curriculum by these groups.

### ***Trends in Concentrating in Occupational Education***

While the average number of occupational credits that 1998 graduates earned in high school was not statistically different from the average number earned by 1982 graduates, the percentage of public high school graduates who concentrated in occupational education (those who earned 3.0 or more credits in one of the 10 broad occupational program areas in figure 1) declined from 33.7 percent for 1982 graduates to 27.8 percent for 1990 graduates. After this year, the percentage of students concentrating was about 25.0 percent for each of the graduating classes studied through 1998 (table 13). However, trends varied among student groups.

- Most often, declines in occupational concentration rates occurred among groups with 1982 concentration rates that were not statistically different from the average for all 1982 graduates. This was true for Hispanics, Whites, graduates without disabilities in grade 12, graduates with a mid-range GPA (2.0 to 3.5), graduates completing mid-level or mixed academic coursework in high school, graduates taking mid-level mathematics in grade 9, and graduates from suburban or rural schools (table 13).<sup>43</sup>
- In addition, there were few significant changes detected between 1982 and 1998 in the concentration rates for several groups that exhibited *below*-average occupational concentration rates in 1982. These groups included Asians/Pacific Islanders, graduates with a high GPA (greater than 3.5), graduates who completed all high academic coursework in high school, and graduates who took high-level mathematics in grade 9 (table 13).<sup>44</sup>

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<sup>43</sup>Exceptions to this pattern included American Indians/Alaska Natives, Blacks, graduates with disabilities in grade 12, graduates with low GPAs, and graduates from urban schools, whose occupational concentration rates were not significantly different from the average for either 1982 or 1998 graduates.

<sup>44</sup>One exception to this pattern included females, who concentrated in occupational education at a below-average rate in 1982 and whose concentration rate declined between 1982 and 1998.

- However, a couple of groups with *above-average* occupational concentration rates in 1982 also exhibited declines in these concentration rates as of 1998, including males and graduates who took low-level mathematics in grade 9.<sup>45</sup>

As a consequence of these changes, most subgroups of graduates kept their relative occupational concentration status over the period studied. That is, most groups that exhibited *above-average* occupational concentration rates in 1982 still concentrated in occupational education at above-average rates as of 1998 (including males and graduates completing all low academic coursework in high school). In addition, most groups that exhibited *below-average* occupational concentration rates in 1982 still concentrated in occupational education at below-average rates as of 1998 (including females and high academic achievers). Finally, most groups that exhibited occupational concentration rates in 1982 that were not statistically different from the average for all 1982 graduates were also in this middle concentrating group as of 1998.

However, there were several exceptions to this overall pattern. Three groups that exhibited occupational concentration rates in 1982 that were not statistically different from the average for all 1982 graduates exhibited *above-average* occupational concentration rates as of 1998 (including graduates with disabilities in grade 12, graduates earning a low GPA, and graduates who attended rural schools). In comparison, graduates who took low-level mathematics in grade 9 (who exhibited *above-average* occupational concentration rates in 1982) exhibited occupational concentration rates in 1998 that were not statistically different from the average for all 1998 graduates. Finally, Asians/Pacific Islanders (who concentrated in occupational education in 1982 at rates that were *below-average* for all 1982 graduates) also exhibited occupational concentration rates in 1998 that were not statistically different from the average for all 1998 graduates.

### ***Trends in Occupational Concentrating by Program Area***

Trends in occupational concentrating (earning 3.0 or more credits in an occupational program area) varied widely among the 18 narrow program areas in figure 1. Program areas with declining rates of concentration included business services (table 18), materials production (table 28), and mechanics and repair (table 25). In contrast, program areas with increasing concentration rates included communications technology (table 33) and child care and education (table 36).<sup>46</sup> To some extent, these changes in concentrated coursetaking reflect changes in projected occupational employment over the period studied (Hurst and Hudson 2000). Exceptions to these overall trends among different student groups are listed below.

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<sup>45</sup>One other group that had an above-average occupational concentration rate in 1982 (graduates completing all low-level academic coursework in high school) did not exhibit a significant change in this concentration rate as of 1998.

<sup>46</sup>Although the percentage of public high school graduates concentrating in health care also appeared to increase between 1982 and 1998, this difference was not statistically significant.

*Program Areas with Declining Overall Concentration Rates*

- Male graduates were more likely to concentrate in business services in 1998 than in 1982, although female graduates who were members of the class of 1998 were still more likely than their male classmates to concentrate in this occupational program area (table 18). In addition, there was no significant change between 1982 and 1998 in rates of concentrating in business services for a few student groups, including American Indians/Alaska Natives, Asians/Pacific Islanders, students with disabilities in grade 12, and students completing either all low- or all high-level academic coursework in high school.
- Declines in mechanics and repair were limited to males, students without disabilities in grade 12, students completing mid-level or mixed academic coursework in high school, and students taking low-level mathematics in grade 9 (table 25). There were no significant changes between 1982 and 1998 in rates of concentrating in mechanics and repair for any other subgroup of graduates.<sup>47</sup>
- Declines in rates of concentrating in materials production between 1982 and 1998 were restricted to Hispanics, Whites, males, students without disabilities in grade 12, students with mid-level GPAs (2.0 to 3.5), and students completing mid-level or mixed academic coursework in high school (table 28). There were no significant changes between 1982 and 1998 in rates of concentrating in materials production for any other subgroup of graduates.<sup>48</sup>

*Program Areas with Increasing Overall Concentration Rates*

- In communications technology, only a few groups did not exhibit statistically significant increases in rates of concentrating between 1982 and 1998, including Blacks, Hispanics, students with disabilities in grade 12, students taking low-level mathematics in grade 9, and students in urban schools (table 33). No significant changes were detected for these five subgroups, while the communications technology concentration rates for all other identified subgroups increased between 1982 and 1998.
- In child care and education, increases in rates of concentrating were limited to Whites, females, students without disabilities in grade 12, students with mid-range GPAs (2.0 to 3.5), students who completed mid-level or mixed academic coursework in high

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<sup>47</sup>Although it appeared that American Indians/Alaska Natives, students who were disabled in grade 12, and students completing all low-level academic coursework increased their rates of concentrating in mechanics and repair, these apparent increases were not statistically significant.

<sup>48</sup>Although it appeared that American Indians/Alaska Natives increased their rate of concentrating in materials production between 1982 and 1998, this apparent increase was not statistically significant.

school, students who took mid-level grade 9 mathematics, and students who attended suburban schools (table 36). There were no significant changes between 1982 and 1998 in rates of concentrating in child care and education for other subgroups of graduates.

### *Program Areas with No Changes in Overall Concentration Rates*

No significant changes between the classes of 1982 and 1998 were detected in overall rates of concentrating in agriculture (table 16), business management (table 19), marketing (table 20), protective services (table 22), construction (table 24), print production (table 27), “other” precision production (table 29), transportation (table 30), computer technology (table 32), “other” technologies (table 34), food service and hospitality (table 35), personal and other services (table 37), and health care (table 21).<sup>49</sup> Generally, program areas without significant changes in overall concentration rates between 1982 and 1998 exhibited few significant changes among the different subgroups of students. However, some exceptions to these trends are listed below.

- Some of these occupational program areas attracted more high-achieving groups of students over the period studied. Graduates who took high-level mathematics courses in grade 9 were *more* likely to concentrate in marketing (table 20), and graduates who completed all high-level academic coursework in high school were *more* likely to concentrate in print production and in computer technology (tables 27 and 32, respectively) between 1982 and 1998. However, graduates with a low GPA (less than 2.0) were *less* likely to concentrate in agriculture over the period (table 16).
- Only one other statistically significant change in concentration rates was detected among subgroups in these relatively steady program areas: male graduates were increasingly likely to concentrate in business management between 1982 and 1998 (table 19).

### *Trends in Participation Among Protected Populations*

The following bullets describe trends in gaps in occupational concentration rates among protected populations based on race/ethnicity, sex, and disability status in grade 12 (as described in the Introduction). A majority of statistically significant differences in occupational concentration rates among racial/ethnic groups in 1982 were no longer detected by 1998. In contrast, most 1982 differences between males and females persisted as of 1998. However, some of these gender gaps decreased, particularly in business services where male graduates increased their con-

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<sup>49</sup>As noted above, although the percentage of public high school graduates concentrating in health care appeared to increase between 1982 and 1998 by the largest amount for any program area, this difference was not statistically significant.

centration rate over the period. With regard to disability status in grade 12, in no program areas were students with disabilities more likely to concentrate than students without disabilities in 1982. However, by 1998, students with disabilities in grade 12 were more likely than those without to concentrate in agriculture, construction, mechanics and repair, and materials production.

### *Racial/Ethnic Gaps in Concentration Rates*

- Asians/Pacific Islanders were less likely than all other racial/ethnic groups in 1982 to concentrate in occupational education overall (earn 3.0 or more credits in one of the 10 broad occupational program areas in figure 1) (table 13). Asians/Pacific Islanders who were members of the class of 1982 were less likely than their peers from some other racial/ethnic groups to concentrate (earn 3.0 or more credits) in agriculture (table 16), business services (table 18), marketing (table 20), health care (table 21), construction (table 24), materials production (table 28), communications technology (table 33), food service and hospitality (table 35), and personal and other services (table 37).<sup>50</sup> However, gaps in five of these areas were no longer detected in 1998, including business services (table 18), marketing (table 20), health care (table 21), communications technology (table 33), and food service and hospitality (table 35). In contrast, gaps persisted in agriculture (table 16), materials production (table 28), and construction (table 24).<sup>51</sup>
- American Indians/Alaska Natives and Hispanics were less likely than Whites to concentrate in computer technology in 1982, although these gaps were no longer detected by 1998 (table 32). In contrast, Blacks were more likely than Hispanics and Whites to concentrate in materials production in 1982, and these gaps persisted in 1998 (table 28).

To some extent, diminishing racial/ethnic gaps were due to American Indians/Alaska Natives, Asians/Pacific Islanders, and Blacks concentrating in occupational education at overall

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<sup>50</sup>Specifically, in 1982, Asians/Pacific Islanders were less likely than 1) Hispanics and Whites to concentrate in agriculture and in personal and other services; 2) Blacks, Hispanics, and Whites to concentrate in business services; 3) Blacks to concentrate in marketing; 4) Blacks and Whites to concentrate in health care; 5) Blacks and Hispanics to concentrate in the construction trades; 6) Hispanics to concentrate in materials production; and 7) Whites to concentrate in communications technology and in food service and hospitality.

<sup>51</sup>In agriculture, the gap between Asians/Pacific Islanders and Hispanics was no longer detected by 1998, while the gap between Asians/Pacific Islanders and Whites persisted. In materials production, the gap between Asians/Pacific Islanders and Hispanics was no longer detected by 1998, while the gap between Asians/Pacific Islanders and Blacks persisted. In construction, the gap between Asians/Pacific Islanders and Hispanics was no longer detected by 1998, while a gap between Asians/Pacific Islanders and Whites emerged and the gap between Asians/Pacific Islanders and Blacks persisted. There were too few Asians/Pacific Islanders concentrating in personal and other services in 1998 to produce a reliable estimate, so the trend in gaps from 1982 to 1998 in this program area could not be determined.



rates that did not change significantly between 1982 and 1998, while the overall concentration rates of Hispanics and Whites declined during this period (table 13).<sup>52</sup>

### *Gender Gaps in Concentration Rates*

- Among 1982 graduates, males were more likely than females to concentrate in occupational education overall (earn 3.0 or more credits in one of the 10 broad occupational program areas in figure 1) (table 13). Specifically, this overall 1982 pattern existed in agriculture (table 16), construction (table 24), mechanics and repair (table 25), print production (table 27), materials production (table 28), and “other” technologies (table 34). However, females who were members of the class of 1982 were more likely than their male classmates to concentrate in business services (table 18), health care (table 21), child care and education (table 36), and personal and other services (table 37). All of these gender gaps persisted as of 1998.
- However, gender gaps decreased between 1982 and 1998 in business services, mechanics and repair, and materials production. In the first case, the gap diminished because males increased their concentration rate in business services while females decreased their concentration rate in this program area (table 18). In contrast, the gaps in mechanics and repair and materials production were not due to females being more likely to concentrate in these areas between 1982 and 1998, but rather to males being less likely to do so (tables 25 and 28, respectively).
- In child care and education, the gender gap increased over the period, due to an increase between 1982 and 1998 in the concentration rate of females in this program area (table 36).

### *Disability Status Gaps in Concentration Rates*

- Among 1982 graduates, there was no significant difference between students with and without disabilities in grade 12 in their overall rates of concentrating in occupational education (earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 1) (table 13). However, by 1998, students with disabilities in grade 12 were more likely than their peers without such disabilities to concentrate in occupational education. Specifically, this overall trend was noted in agriculture (table 16),

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<sup>52</sup>Although it appeared that American Indians/Alaska Natives were less likely to concentrate in occupational education in 1998 than in 1982, this difference was not statistically significant, perhaps due to the relatively small sample sizes and large standard errors for this group in each survey year.

construction (table 24), mechanics and repair (table 25), and materials production (table 28).

- Despite no significant difference in overall concentration rates between students with and without disabilities in grade 12 in 1982, students with disabilities in grade 12 who were members of the 1982 graduating class were less likely than their peers without such disabilities to concentrate in business services (table 18) and communications technology (table 33). However, with generally increasing occupational concentration rates for students with disabilities in grade 12 over the period studied, these gaps were no longer detected in 1998.

### ***Trends in the Characteristics of Occupational Concentrators***

Over time, some changes in the characteristics of occupational concentrators (graduates who earned 3.0 or more credits in one of the 10 broad occupational program areas in figure 1) were consistent with changes in the student body in general. In cases where trends for occupational concentrators were different from those for graduates in general, this pattern may signal that occupational programs attracted a different mix of students in 1998 than in 1982 that extended beyond general demographic and coursetaking trends. This section compares trends in the percentage distributions for all graduates in general (table 38) and for occupational concentrators in particular (table 39).

- Both public high school graduates in general (table 38) and occupational concentrators in particular (table 39) were more likely in 1998 than in 1982 to be Asian/Pacific Islander or Black, have no reported disabilities in grade 12, earn a mid- or high-level GPA (2.0 or higher), complete high-level academic coursework in high school, take mid- or high-level mathematics in grade 9, and attend urban schools.<sup>53</sup>
- The proportion of occupational concentrators who took mid-level mathematics in grade 9 *grew more* than the corresponding proportion for graduates in general (increases of 18 percentage points versus 10 percentage points) (tables 39 and 38, respectively). No other significant differences were detected in the rates of change for occupational concentrators and all graduates on any other variables.

One discernible pattern from these findings is that both graduates in general and occupational concentrators in particular increased the level of their academic coursetaking between 1982

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<sup>53</sup>The apparent increase in the percentage of occupational concentrators who attended urban schools was not statistically significant, although the increase for all graduates was. In contrast to these trends, between 1982 and 1998, both graduates in general and occupational concentrators in particular were less likely to earn a low-level GPA (less than 2.0); complete mid-level or mixed academic coursework in high school; take low-level mathematics in grade 9; and attend suburban schools.

and 1998. However, the shift toward moderate academic achievement was greater for occupational concentrators than for the larger group of graduates.

## **Computer-Related Coursetaking**

This section focuses on courses whose *primary objective* is to teach students computer-related skills and knowledge, referred to here as computer-related courses. As discussed in chapter 1, the course classification system used in this report places all computer-related courses (including those taught in mathematics and computer science departments) within the vocational/technical curriculum (figure 2). The summary presented here focuses on computer-related coursetaking in typewriting/keyboarding, business services, and computer technology, in addition to examining computer-related coursetaking overall.<sup>54</sup>

### ***Computer-Related Coursetaking Among 1998 Graduates***

Among the class of 1998, graduates with disabilities as of grade 12 took *less* computer-related coursework overall than their 1998 counterparts without such disabilities. In addition, graduates in low-poverty schools took less computer-related coursework than their counterparts in higher poverty schools. In contrast, graduates who were moderate academic achievers, who attended rural schools, or who were Black took *more* computer-related coursework overall than their 1998 peers who were lower academic achievers, who attended urban or suburban schools, or who were Asian/Pacific Islander, respectively. Few significant differences were detected as of 1998 with regard to coursetaking in the main computer-related sub-areas of typewriting/keyboarding, business services, and computer technology, although those differences that were detected were generally consistent with patterns for overall computer-related coursetaking. Generally, there was mixed evidence about the relationship between student advantage and the amount of computer-related coursework taken by 1998 graduates.

### ***Overall Computer-Related Coursetaking Among 1998 Graduates***

- The 1998 public high school graduates earned on average 1.05 credits in computer-related courses—equivalent to about one full-year computer-related course (table 41). The largest numbers of computer-related credits earned on average by 1998 graduates were in the areas of business services (0.33 credits), computer technology (0.31 cred-

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<sup>54</sup> As explained in chapter 1, all typewriting/keyboarding and all computer technology courses were considered to be computer related for this analysis. In contrast, only a subset of courses in business services was considered to be computer related.

its), and typewriting/keyboarding (0.29 credits) in comparison with technology education and drafting/graphics (each with 0.06 credits).

- Graduates with disabilities in grade 12 took less computer-related coursework than their 1998 peers without disabilities as of this grade (table 41). In contrast, there was no significant difference between 1998 graduates who had limited English proficiency in grade 12 and their English proficient peers in the numbers of computer-related credits they earned in high school.
- The 1998 graduates who were moderate academic achievers—specifically, those with a mid-level GPA (2.0 to 3.5) or who completed mid-level or mixed academic coursework in high school—earned more total computer-related credits than their lower achieving counterparts (table 41).<sup>55</sup>
- Graduates in rural schools took *more* computer-related coursework than their counterparts in suburban or urban schools as of 1998 (table 41). In addition, Black graduates earned more computer-related credits than their 1998 peers who were Asian/Pacific Islander. In contrast, graduates in low-poverty schools took *less* computer-related coursework than their counterparts in middle- or high-poverty schools.<sup>56</sup> There was no significant difference between males and females who were members of the class of 1998 in the numbers of computer-related credits they earned in high school.

### *Computer-Related Coursetaking Among 1998 Graduates, By Sub-Area*

Few significant differences were detected as of 1998 with regard to coursetaking in the main computer-related sub-areas of typewriting/keyboarding, business services, and computer technology (table 41). However, those differences that were detected were generally consistent with patterns for overall computer-related coursetaking.

- Among 1998 graduates, students who completed all low academic coursework in high school took less computer technology coursework than their more academically advantaged peers (table 41). However, students who attended low-poverty schools took less computer technology coursework than their peers in higher poverty schools.

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<sup>55</sup>No significant difference was detected between moderate academic achievers and their higher achieving counterparts on these two variables (GPA and academic coursework completed). In addition, no significant differences were detected in the total number of computer-related credits earned by graduates with regard to grade 9 mathematics.

<sup>56</sup>No significant difference was detected in the average number of computer-related credits earned by graduates in high-poverty and in middle-poverty schools.

- The 1998 graduates who attended rural schools took *more* typewriting/keyboarding than their peers in other schools (table 41).<sup>57</sup> In contrast, graduates with disabilities in grade 12 took *less* typewriting/keyboarding coursework than their 1998 peers without disabilities as of this grade.
- Female graduates took more typewriting/keyboarding and more computer-related business services coursework than their male peers as of 1998 (table 41).

### ***Trends in Computer-Related Coursetaking***

This section focuses on trends in computer-related coursetaking for the graduating classes from 1990 to 1998. No significant changes were detected in overall computer-related coursetaking over this period. However, patterns varied by computer-related sub-area. While coursetaking in computer technology and in computer-related business services was similar to the overall trend (with no significant changes detected for all graduates during the 1990s), coursetaking declined in typewriting/keyboarding over the same period.

Computer-related coursetaking trends also varied somewhat by student sub-group. Compared to their 1990 peers, 1998 graduates who had disabilities in grade 12 or who were male took *more* computer-related coursework overall and in business services. In addition, 1998 graduates with disabilities in grade 12 took more computer technology coursework than their 1990 peers. In contrast, 1998 graduates who were female took *less* computer-related coursework overall than their 1990 peers. The 1998 graduates who completed all high-level academic coursework in high school took *more* computer-related business services courses and *fewer* computer technology courses than the 1990 peers, with no significant change detected in their overall computer-related coursetaking during this period.

### ***Computer-Related Coursetaking Overall***

- There were no significant changes in computer-related coursetaking between 1990 and 1998 for graduates overall. Public high school graduates earned between 1.03 and 1.05 computer-related credits throughout the 1990s—equivalent to about one full-year computer-related course (table 42). However, trends varied somewhat among student groups. In particular, 1998 graduates who had disabilities in grade 12 or who were male took *more* computer-related coursework than their 1990 peers. In contrast, female graduates took *less* computer-related coursework in 1998 than their 1990 peers.

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<sup>57</sup>As explained in the Introduction, all basic typewriting/keyboarding courses for the classes of 1990 through 1998 were considered to be computer related.

### *Computer-Related Sub-Areas*

Trends also varied by computer-related sub-area.

- The 1998 public high school graduates earned 0.15 fewer credits in typewriting/keyboarding than 1990 graduates (table 43). There was no significant change in the numbers of credits earned in computer-related business services and in computer technology by 1990 and 1998 graduates (tables 44 and 45).
- The number of typewriting/keyboarding credits that public high school graduates earned decreased between 1990 and 1998 for most identified student groups (table 43). However, no significant change was detected for several disadvantaged groups, including students with disabilities as of grade 12, students with limited English proficiency as of grade 12, and students who completed all low-level academic coursework in high school. In addition, no significant change in the number of typewriting/keyboarding credits was detected for American Indians/Alaska Natives and Asians/Pacific Islanders.
- Although no significant change was detected between 1990 and 1998 in the numbers of credits earned in computer-related business services by all graduates and by most student groups, there were some exceptions to this overall trend (table 44). Specifically, students with disabilities as of grade 12 and some high academic achievers (including graduates completing all high-level academic coursework in high school and those who took high-level mathematics coursework in grade 9) took more computer-related business services by the end of the period. In addition, males and Asians/Pacific Islanders who were member of the 1998 graduating class also earned more computer-related business services credits than their 1990 counterparts.
- Although there were no detectable changes between 1990 and 1998 in the numbers of credits earned in computer technology by all graduates and by most student groups, there were some exceptions to this trend (table 45). Specifically, 1998 graduates who were disabled in grade 12 earned *more* computer technology credits than their 1990 counterparts. In contrast, 1998 graduates who completed all high-level academic coursework in high school earned *fewer* computer technology credits than their 1990 counterparts.

## **Combining Vocational/Technical and Academic Coursetaking**

This section examines some of the ways that public high school graduates combined academic and vocational/technical education between 1982 and 1998, focusing primarily on the academic coursetaking of occupational concentrators.<sup>58</sup>

### ***Academic Coursetaking of 1998 Graduates***

- For most identified student groups, 1998 graduates in general (table 47) earned more credits in core academic subjects (English, mathematics, science, and social studies) than occupational concentrators in particular (table 48). However, there were no significant differences between occupational concentrators and the larger group of 1998 graduates in the numbers of core academic credits earned by students with disabilities as of grade 12, who completed either all low- or all high-level academic coursework in high school, who took high-level mathematics coursework in grade 9, or who attended urban or high-poverty schools. In addition, no significant differences between occupational concentrators and all graduates were detected with regard to race/ethnicity, except among White graduates.
- Among the class of 1998, occupational concentrators who were members of more advantaged groups generally earned more core academic credits than occupational concentrators who were less advantaged (table 48). This was true with regard to disability status in grade 12, GPA, academic coursework completed, and grade 9 mathematics. However, no significant differences were detected among occupational concentrators with regard to school poverty level or school urbanicity. In addition, occupational concentrators who were Asian/Pacific Islander and were female earned more core academic credits than occupational concentrators who were members of other racial/ethnic groups and were male, respectively.<sup>59</sup>
- All of these 1998 patterns for occupational concentrators held for the larger group of public high school graduates as well (table 47).<sup>60</sup>

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<sup>58</sup>See Levesque (2003) for a more detailed examination of academic and vocational/technical coursetaking trends. There were too few 1998 occupational concentrators who had limited English proficiency in grade 12 to examine coursetaking for this group.

<sup>59</sup>No significant difference was detected in the number of core academic credits earned by occupational concentrators who were Asian/Pacific Islander and who were Black.

<sup>60</sup>The difference in number of core academic credits earned by all graduates who were Asian/Pacific Islander and were Black was statistically significant.

### ***Trends in Academic Coursetaking***

This section examines trends in academic coursetaking for the graduating classes from 1982 to 1998.

- Both the larger group of 1998 public high school graduates (table 47) and the subset of these graduates who were occupational concentrators (table 48) earned more core academic credits than their 1982 counterparts, regardless of their special or protected population status.<sup>61</sup> For every identified student group, there was no significant difference in the rates of increase over the period in the number of core academic credits earned by all graduates and by occupational concentrators.
- However, among occupational concentrators, increases were smaller for students with disabilities in grade 12, American Indians/Alaska Natives, and males than for students without disabilities in grade 12, Hispanics, and females, respectively (table 48).<sup>62</sup>
- Similar to patterns for occupational concentrators, increases were smaller for all graduates with disabilities in grade 12, graduates who were American Indian/Alaska Native, and male graduates than for graduates without disabilities in grade 12, Hispanic graduates, and female graduates, respectively.

### **Conclusion**

Various federal legislation is concerned with the participation of special and protected populations in education programs. This report examined the participation of public high school graduates in vocational/technical education between 1982 and 1998, focusing on the participation of graduates based on their special and protected population status.

Trends in participation for most subgroups reflected overall trends for graduates. Generally, graduates took fewer vocational courses between 1982 and 1998, although their occupational coursetaking was relatively steady. The percentage of graduates concentrating in occupational education (earning 3.0 or more credits in one of the 10 broad occupational program areas cited in the report) also declined over the period.

A few groups of graduates exhibited exceptions to these general trends, however. In particular, graduates with disabilities as of grade 12 took more vocational and occupational coursework by the end of the period studied. In addition, Asians/Pacific Islanders and high academic

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<sup>61</sup>The only exception was that the 15.50 core academic credits earned by 1998 occupational concentrators with a high GPA (3.5 or higher) was not statistically different from the 12.77 core academic credits earned by 1982 occupational concentrators with a high GPA.

<sup>62</sup>There were no other significant differences detected among racial/ethnic groups.



achievers earned numbers of vocational credits and exhibited occupational concentration rates at the end of the period that were not statistically different from corresponding figures for 1982. Thus, these latter groups did not exhibit the usual declines. Both Asians/Pacific Islanders and high academic achievers participated in vocational/technical education at below-average rates at the beginning of the period.

As of 1998, there were differences in participation in vocational/technical education on all of the variables examined in the report: race/ethnicity, sex, disability status, English proficiency, academic achievement, and school urbanicity and poverty level. In particular, groups exhibiting relatively high levels of participation in vocational/technical education in comparison with their peers included males, graduates with disabilities as of grade 12, low academic achievers, and graduates in rural and in high-poverty schools. In contrast, females, Asians/Pacific Islanders, and graduates who had limited English proficiency as of grade 12 exhibited relatively low levels of such participation.

With regard to computer-related coursetaking, groups exhibiting relatively low levels of participation in comparison with their 1998 peers included students with disabilities as of grade 12, low academic achievers, Asians/Pacific Islanders, and students in low-poverty and in urban and suburban schools. Among these groups, 1998 graduates who had disabilities as of grade 12 and graduates who were low academic achievers also earned fewer core academic credits than their more advantaged counterparts. However, 1998 graduates who were Asian/Pacific Islander as well as female graduates earned relatively large numbers of core academic credits in comparison with their peers. All of these core academic coursetaking patterns also held for the subset of graduates who were occupational concentrators.

On measures that classified students into three levels of advantage (low-, moderate- or middle-, and high-advantage), most occupational concentrators were from the middle groups. In some cases, occupational concentrators were more likely to be from the middle groups than was the 1998 public high school class as a whole. Although no significant difference was detected in the proportion of occupational concentrators and all graduates who were from the lowest academic achievement groups, occupational concentrators were less likely than the 1998 graduating class as a whole to be from the highest academic achievement groups.

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## References

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- Alt, M.N., and Bradby, D. (1999). *Procedures Guide for Transcript Studies* (NCES 1999–05). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.
- Bradby, D., and Hoachlander, E.G. (1999). *1998 Revision of the Secondary School Taxonomy* (NCES 1999–06). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.
- Boesel, D., Hudson, L., Deich, S., and Masten, C. (1994). Participation in Secondary Vocational Education. In *National Assessment of Vocational Education, Final Report to Congress, Volume II: Participation in and Quality of Vocational Education* (pp. 3–38). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
- Education Commission of the States. (1990, July). *Clearinghouse Notes*. Denver, CO: Author.
- Gifford, A.G., Harde, D., Hoachlander, E.G., Meyer, R.H., and Tuma, J.E. (1989). Course Enrollment Patterns in Public Secondary Schools: 1969 to 1987. A discussion paper for the National Assessment of Vocational Education, U.S. Department of Education.
- Hoachlander, E.G., and Levesque, K.A. (1993). *Improving National Data for Vocational Education: Strengthening a Multiform System*. Berkeley, CA: National Center for Research in Vocational Education.
- Hurst, D., and Hudson, L. (2000). *Changes in High School Vocational Coursetaking in a Larger Perspective* (NCES 2001–026). U.S. Department of Education. Washington, DC: National Center for Education Statistics.
- Ingels, S.J., Dowd, K.L., Taylor, J.R., Bartot, V.H., Frankel, M.R., and Pulliam, P.A. (1995). *Second Follow-up: Transcript Component Data File User's Manual* (NCES 95–377). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Jones, C., Clark, M., Mooney, G., McWilliams, H., Crawford, I., Stephenson, B., and Tourangeau, R. (1983). *High School and Beyond, 1980 Sophomore Cohort, First Follow-up (1982)*,

- Data File User's Manual* (NCES 83–214). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Jones, C., Knight, S., Butz, M., Crawford, I., and Stephenson, B. (1984). *High School and Beyond Transcripts Survey (1982)*, *Data File User's Manual* (NCES 84–205). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Levesque, K. (2003). *Trends in High School Vocational/Technical Coursetaking: 1982–1998* (NCES 2003–025). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Levesque, K., Lauen, D., Teitelbaum, P., Alt, M., and Librera, S. (2000). *Vocational Education in the United States: Toward the Year 2000* (NCES 2000–029). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- National Commission on Excellence in Education. (1983). *A Nation at Risk: The Imperative for Educational Reform*. Washington, DC: Author.
- Office for Civil Rights. (2001). *About OCR*. Available:  
<http://www.ed.gov/offices/OCR/aboutocr.html> [June 10, 2003]
- Roey, S., Caldwell, N., Rust, K., Blumstein, E., Krenzke, T., Legum, S., Kuhn, J., Waksberg, M., and Haynes, J. (2001a). *The 1998 High School Transcript Study User's Guide and Technical Report* (NCES 2001–477). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Roey, S., Caldwell, N., Rust, K., Blumstein, E., Krenzke, T., Legum, S., Kuhn, J., Waksberg, M., and Haynes, J. (2001b). *The 1998 High School Transcript Study Tabulations: Comparative Data on Credits Earned and Demographics for 1998, 1994, 1990, 1987, and 1982 High School Graduates* (NCES 2001–498). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Silverberg, M., Warner, E., Goodwin, D., and Fong, M. (2002). *National Assessment of Vocational Education: Interim Report to Congress*. U.S. Department of Education. Washington, DC: Office of the Under Secretary.

- Snyder, T.D., and Hoffman, C.M. (2001). *Digest of Education Statistics 2000* (NCES 2001–034). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- Tuma, J. (1996). *Trends in Participation in Secondary Vocational Education: 1982–1992* (NCES 96–004). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.
- U.S. Department of Education, Office of Vocational and Adult Education. (2002). Appendix. In *Carl D. Perkins Vocational and Technical Education Act of 1998, Report to Congress on State Performance, Program Year 1999–2000*. Washington, DC: Author.
- Westat. (1992, April 13). *Classification of Secondary School Courses*. Rockville, MD: Author.
- Wolter, K.M. (1985). *Introduction to Variance Estimation*. New York: Springer-Verlag.

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