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Vocational Education in the United States: Toward the Year 2000

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Executive Summary

I. INTRODUCTION

With the advent of the 21st century, vocational education in the United States is in transition. Historically, the purpose of vocational education has been to prepare students for entry-level jobs in occupations requiring less than a baccalaureate degree. Over the last 15 years, however, this purpose has shifted toward broader preparation that develops the academic, vocational, and technical skills of students in vocational education programs. This preparation involves integrating academic and vocational education, emphasizing all aspects of an industry, and implementing academic performance measures, among other reform efforts. Vocational education policy now also encourages high school students to continue their studies at the postsecondary level, and 2-year postsecondary students to pursue 4-year credentials through various articulation or "tech-prep" arrangements. The traditional focus of vocational education is giving way to a broader purpose—one that includes greater emphasis on academic preparation and provides a wider range of career choices.

Vocational Education in the United States: Toward the Year 2000 attempts to capture this evolving enterprise. In addition to describing trends in participation in secondary and postsecondary vocational education, the report also presents findings about the academic preparation of high school students who participate in vocational education, relevant school reform efforts, and transitions after high school. However, the surveys available for assessing the status of vocational education were generally designed to capture more traditional conceptions of the enterprise and often do not provide information on the most current reform efforts. Nevertheless, the available data do signal that change is occurring in the directions advocated by reform efforts, although such change is often small and preliminary. The report also describes economic and labor market trends and their implications for vocational programs, as well as changing workplace practices and employer perspectives on worker skills and proficiency. The most important findings presented in the report are highlighted below.

II. THE CONTEXT

Economic Trends (page 15)

The United States is shifting from a manufacturing-based economy to one that overwhelmingly provides services and information. These trends have two important implications for vocational education programs. They signal an ongoing shift in the education and training fields that are required of the U.S. work force as well as shifts in the levels of that education and training. Vocational programs that prepare students for manufacturing jobs include trade and industry programs, such as construction, mechanics and repair, precision production, and transportation and material moving. Vocational programs that prepare students for jobs in the services and information industries include health care and technology and communications, among others.

Changing Education and Skill Requirements (page 24)

Generally, the research literature describes a trend toward greater education and training requirements and a greater need for critical thinking, personal responsibility, and social skills among work force participants. For example, recent projections anticipate that average growth will be greater for occupations requiring at least an associate's degree than for occupations requiring less education. However, these trends are not uniform across industries and occupations, and some disagree about their magnitude. Some emerging occupations require high education and training requirements (such as a bachelor's degree or moderate- to long-term on-the-job training), while many jobs still demand relatively low education and training levels. In 1996, 39 percent of all jobs required no more than short-term on-the-job training.

Understanding these economic and labor market trends provides a context for analyzing trends in vocational education. For example, if participation in vocational programs parallels changes in the economy, one would expect to see a decline in enrollments in trade and industry programs in recent years and an increase in enrollments in service- and information-related programs. Similarly, if vocational education reflects the labor market trend toward greater education and training requirements, one would expect to find that the academic preparation of students participating in vocational education has increased in recent years and that more of these participants are seeking and obtaining higher education and training credentials. These issues are addressed in sections IV–VI below.

III. EMPLOYER PERSPECTIVES[1]

Workplace Practices (page 34)

Changes in the economy and in education are altering workplace practices, which have implications for the skills required of employees. Increased global competition has spurred some U.S. businesses to create "high-performance workplaces," relying on flexible and decentralized work practices and multi-skilled workers. These firms, however, are still in the minority. For example, 20 percent of surveyed employers reported engaging in performance benchmarking in 1997, and 25 percent had undergone reengineering. Larger firms were more likely than smaller firms to report these practices, indicating that the percentage of employees affected by these practices may be greater than the percentage of employers reporting them.

Also, the 1994 School-to-Work Opportunities Act advocated employer involvement in school-to-work partnerships and wider implementation of work-based learning, including job shadowing, mentoring, internships, and apprenticeships. Once again, however, a minority of firms reported participating in these activities. One-quarter of surveyed employers reported participating in a school-to-work partnership, and 42 percent reported providing at least one formal work-based learning activity. As above, larger firms were more likely than smaller firms to report these different practices.

Perspectives on Employees (page 38)

While the general labor market trend may be toward higher education and training requirements, employers have a unique perspective, which is particularly important in the short term. When hiring front-line workers from an established applicant pool, surveyed employers did not rate years of completed schooling or academic performance as highly as attitude and communication skills. However, it may be that years of completed schooling and academic performance are more important during initial applicant screening. It may also be that employers have historically found that schooling measures are not reliable indicators of what students know and can do.

With the evolving economy and changes in education and skill requirements, attention over the last two decades has focused on whether employees are adequately prepared for the demands of the workplace. According to most surveyed employers, the proficiency of their production

[1]The findings in this section come from the 1994 and 1997 National Employer Surveys, which gathered data from a random sample of private firms with 20 or more employees.

workers either stayed the same or increased in recent years.[2] In addition, the majority of employers with new production employees who participated in work-based learning reported that these employees were superior to comparable new hires in terms of productivity and attitude. Virtually no employers reported that employees with work-based learning experience were inferior in these two respects to comparable new hires.[3]

IV. TRENDS IN SECONDARY VOCATIONAL EDUCATION[4]

Participation in High School Vocational Education (page 49)

From 1982 to 1994, there was a general decline in the participation of high school students in vocational education (figure A). The average number of vocational credits public high school graduates earned decreased over the period studied, as did the percentage of graduates completing a sequence of related occupational courses.[5]

Trade and industry and business were the most popular occupational programs in 1994—about 8 percent of public high school graduates concentrated in each of these areas. These were also the most popular programs in earlier years. However, consistent with reported economic trends, the percentage of graduates concentrating in trade and industry declined over the period studied, as did the percentage of graduates concentrating in business. (In 1982, about 15 percent of graduates had concentrated in trade and industry, and 12 percent in business.) Exhibiting an opposite trend, the proportions of students concentrating in health care and in technology and communications almost doubled between 1982 to 1994. Nevertheless, the percentages of high school graduates concentrating in these program areas in 1994 were still quite small (about 1 percent each).

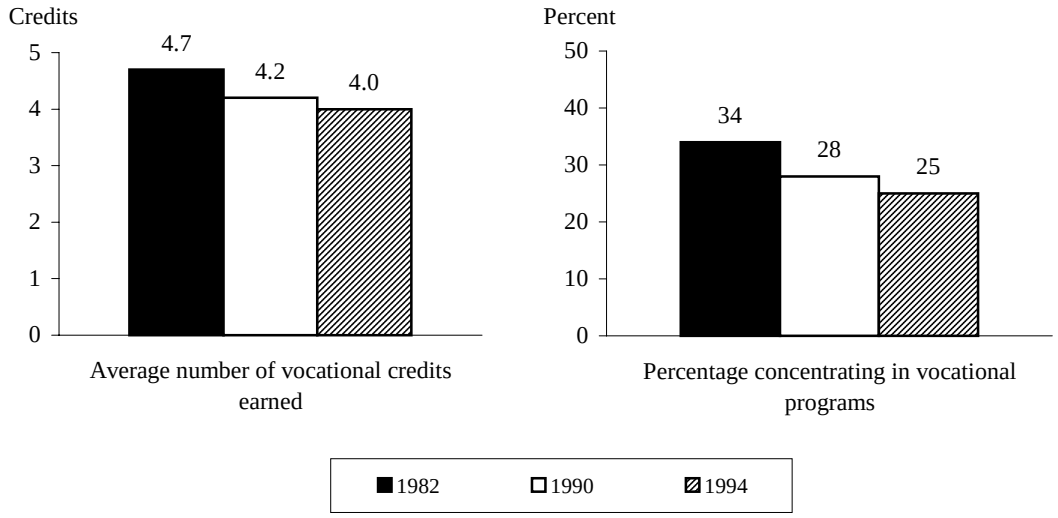
[2]Employer-provided training, which also increased over this time period, may have contributed to proficiency gains. Alternatively, education reform efforts over the last decade may have contributed to the improvement in worker proficiency. In either case, it is impossible to establish a causal link from the available data.

[3]However, in a rigorous evaluation of the benefits of work-based learning, it would be necessary to compare all work-based learning participants, not just those who were hired, with other comparable workers. It may be, for example, that those work-based learning participants who were hired had better recommendations or references than those who were not.

[4]Unless otherwise noted, trends in this section come from an analysis of transcripts for public high school graduates in 1982, 1990, and 1994. In addition to the topics described in this section, Chapter IV of the report also presents findings on academic achievement gains (page 62), work experience and work-based learning (page 87), technology literacy (page 90), and teacher professional development activities (page 101).

[5]These decreases may be partly due to increases in high school graduation requirements implemented by many states after the publication of *A Nation at Risk* in 1983. Because students have been required to take more academic coursework, they may have elected to take fewer vocational courses. Alternatively, because of fiscal or economic pressures, or both, schools may have reduced their vocational offerings in recent years.

Figure A—Average number of vocational credits earned by public high school graduates and percentage of public high school graduates concentrating (accumulating 3 or more credits) in vocational programs: 1982, 1990, 1994



SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Characteristics of High School Students Participating in Vocational Education (page 52)

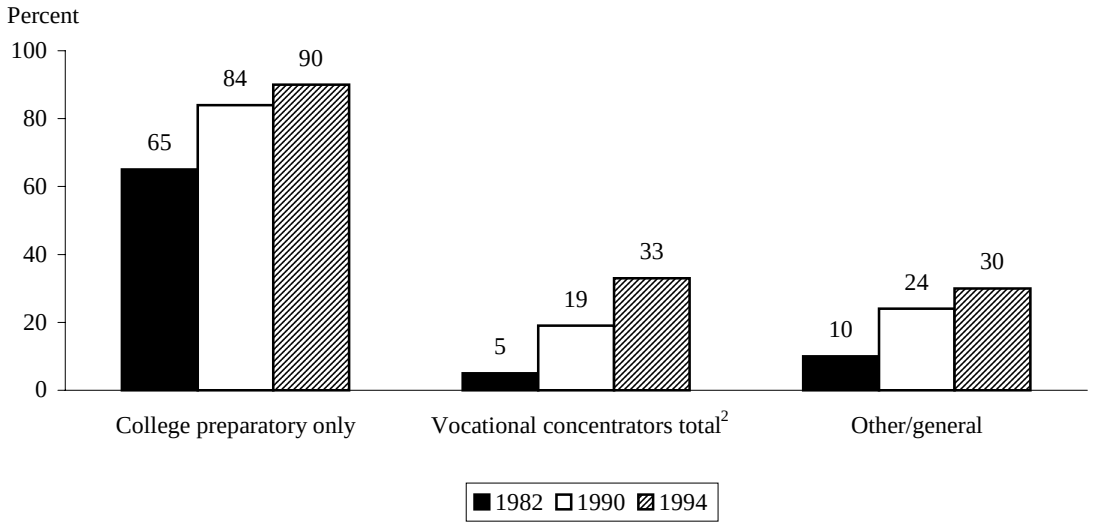
Although participation in vocational education declined for most groups of public high school students between 1982 and 1994, there were a few exceptions to this trend. The percentages of black, non-Hispanic students and Asian/Pacific Islander students concentrating in vocational education stayed about the same over this period, and the concentration rate of students with disabilities increased. The increase in participation of students with disabilities is consistent with the emphasis of the 1990 Perkins Act on serving students with special needs.

Academic Course-Taking Trends (page 62)

The academic preparation of high school students participating in vocational education increased between 1982 and 1994, in both absolute and relative terms (figure B). While public high school graduates generally increased their coursetaking in the core academic subjects (English, mathematics, science, and social studies), the rate of increase was greater for vocational concentrators than for either college preparatory students or those completing general coursework in

high school. Vocational concentrators also generally increased the rigor of their academic coursework, particularly in mathematics, science, and social studies. However, in 1994, vocational concentrators still completed fewer total credits in each of the core academic subjects than did either college preparatory students or those completing general coursework in high school.

Figure B—Percentage of public high school graduates meeting the New Basics core academic standards,[1] by curriculum specialization in high school: 1982, 1990, and 1994



[1]The New Basics core academic standards include 4 years of English and 3 years each of mathematics, science, and social studies.
[2]Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

School Reform Efforts[6] (page 81)

By 1997, some public comprehensive high schools had implemented vocational education-related reforms, although the quality and specific forms of these efforts were not discernible from the available survey data. About half of these schools reported integrating academic and vocational education, and a similar proportion reported offering tech prep. Fewer schools reported having block scheduling, career majors, school-based enterprises, skill standards, or skill or

[6]The findings in this section come from the National Longitudinal Study of Youth of 1997, which provides information on public schools with a 12th grade. Unfortunately, schools classified by their districts as primarily "vocational" were excluded from the sample. Consequently, the survey generally describes public comprehensive high schools and, therefore, may provide a conservative estimate of local reform efforts.

occupational certificates. Generally, schools with career academies and larger schools were more likely to report these reforms, while rural schools were less likely to do so.

Vocational Teacher Qualifications and Experience[7] (page 93)

Vocational and academic high school teachers were similar in a number of ways: about the same proportions held bachelor's degrees, and similar percentages held either standard or advanced certification. However, about 8 percent of vocational teachers had less than a bachelor's degree, in comparison with less than 1 percent of academic teachers.[8] Also, vocational teachers were generally older than academic teachers, which may be due to the fact that vocational teachers entered the teaching profession at an older age, possibly after obtaining industry experience. There were some variations among vocational teachers who taught in different program areas and school settings. For example, trade and industry and technical teachers and those teaching in more than one vocational field were generally less likely than other vocational teachers to have a bachelor's or advanced degree.

V. TRANSITIONS AFTER HIGH SCHOOL[9]

The Transition to Postsecondary Education: 2 Years After High School (page 109)

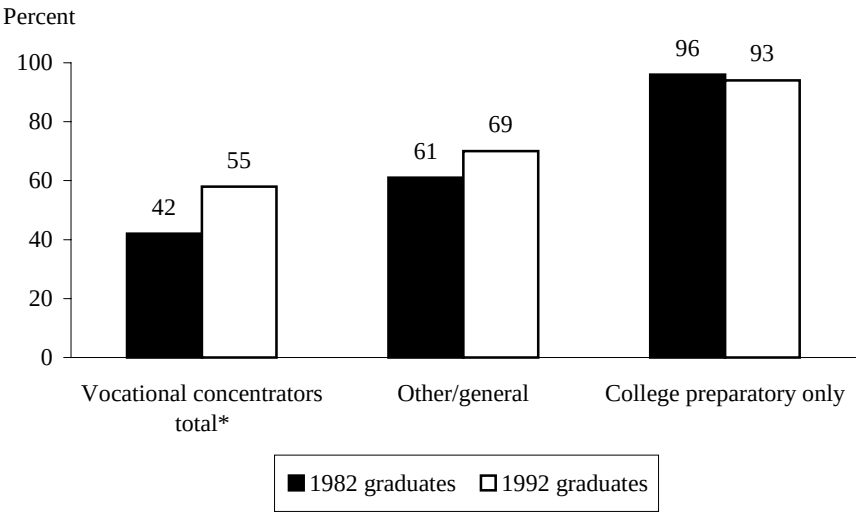
The postsecondary enrollment rates of public high school graduates showed a marked increase between 1982 and 1992. About half of those students graduating in 1982 enrolled in a postsecondary institution within 2 years, while about three-fourths of the more recent graduating class enrolled within 2 years. Between 1982 and 1992, postsecondary enrollment rates increased for vocational concentrators and students completing general coursework in high school, but not for college preparatory graduates (figure C). While the gap in enrollment rates among the three groups of students appeared to be narrowing, 1992 vocational concentrators were still less likely than their college preparatory peers and those completing general coursework in high school to enroll in a postsecondary institution within 2 years. However, vocational concentrators who also completed a college preparatory curriculum had enrollment outcomes that were more like those of their college preparatory peers than did strictly vocational concentrators.

[7]The findings in this section come from the Schools and Staffing Surveys of 1991 and 1994.

[8]Academic teachers were more likely than vocational teachers to have a master's or doctorate/first-professional degree.

[9]Two data sets were used for the analysis in this section: High School and Beyond, for 1982 public high school graduates, and the National Education Longitudinal Study of 1988, for 1992 public high school graduates. In addition to the topics described in this section, Chapter V of the report also presents findings on postsecondary remedial coursework (page 125).

Figure C—Percentage of 1982 and 1992 public high school graduates enrolling in postsecondary institutions by 1984 and 1994, respectively, by curriculum specialization in high school



*Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and Second Follow-up Survey, and National Education Longitudinal Study of 1988, Third Follow-up and High School Transcript Study.

Vocational concentrators were more likely than students completing general coursework in high school to obtain a degree or certificate within 2 years, despite the fact that the two groups enrolled at similar rates in community colleges and that vocational concentrators were more likely to be employed while in school.

The Transition to Postsecondary Education: 10 Years After High School **(page 118)**

Among 1982 graduates, vocational concentrators were less likely than either their college preparatory peers or students completing general coursework in high school to enroll in post-secondary education by 1992. However, vocational concentrators who also completed a college preparatory curriculum were about as likely as college preparatory graduates to enroll during this 10-year period.

Postsecondary Completion 10 Years After High School (page 129)

More than half of 1982 public high school graduates who enrolled in postsecondary education completed a degree or certificate by 1992. Vocational concentrators had lower overall rates of postsecondary completion than their peers. However, vocational concentrators who also completed a college preparatory curriculum were as likely as college preparatory graduates to earn a postsecondary degree or certificate during this period. Among graduates who enrolled in postsecondary education by 1992, vocational concentrators were less likely than their peers to earn a bachelor's degree, but more likely to obtain a certificate or an associate's degree.

Labor Market Outcomes 2 Years After High School (page 132)

Labor market outcomes 2 years after leaving high school were similar for the graduating classes of 1982 and 1992. In both cases, about three out of four public high school graduates were in the labor force. Vocational concentrators in both graduating classes were more likely than their college preparatory peers to be in the labor force 2 years after graduation. While 1992 public high school graduates had similar labor market experiences regardless of their course of study in high school, 1982 college preparatory graduates tended to have lower unemployment rates than vocational concentrators and those completing general coursework in high school. This difference between the two graduating classes may be due to shifts over the decade in economic conditions, changes in the academic preparation of high school graduates, or other factors.

Labor Market Outcomes 10 Years After High School (page 135)

Vocational concentrators and students completing general coursework in high school had similar labor market outcomes 10 years after graduation from high school. While the number of months employed and unemployed was similar regardless of students' course of study in high school, college preparatory graduates tended to enjoy higher earnings in 1991 than their peers, possibly because of their greater postsecondary attainment. Obtaining a bachelor's degree was generally associated with increased earnings and lower unemployment rates. At the other end of the educational spectrum, students who earned a postsecondary certificate had similar annual earnings and unemployment rates as their peers who did not complete a postsecondary degree or certificate. Both those who held a postsecondary certificate and those who held a high school diploma earned less and were more likely to be unemployed in 1991 than graduates who held an associate's degree or higher.

VI. TRENDS IN POSTSECONDARY VOCATIONAL EDUCATION[10]

Trends in Educational Attainment (page 149)

The United States has experienced both greater educational participation and higher attainment in recent years, continuing long-standing patterns. More people are attending postsecondary institutions than ever before, and the average educational attainment of the adult population has been steadily rising. While the total number of adults who earned vocational associate's degrees appeared to increase slightly between 1992 and 1996, this difference was not statistically significant. However, the total number of adults who held academic associate's degrees increased over the 4 years by approximately an additional 1 million people.[11]

Although postsecondary enrollments overall have shown recent increases, there is no evidence that bachelor's degree holders are returning in large numbers for additional undergraduate schooling, as some have speculated. In particular, small proportions of students who were pursuing associate's degrees or certificates had already earned a bachelor's or advanced degree. The vast majority of students who enroll in postsecondary education are pursuing a higher level credential than the one they currently possess. However, this report focused on students who participate in for-credit postsecondary programs. It may be that a significant number of bachelor's degree holders are taking noncredit, adult, or continuing education courses.

Participation in Postsecondary Vocational Education (page 152)

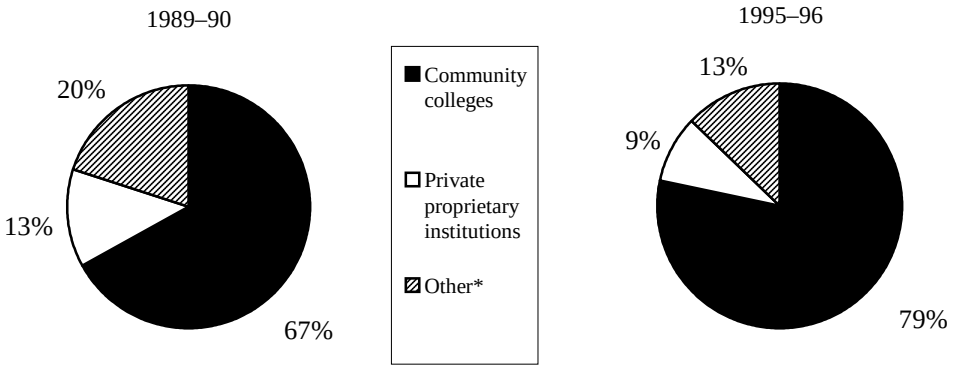
Vocational coursework represents a substantial component of subbaccalaureate students' education. Among all subbaccalaureate students, about one-half majored in a vocational program area in 1996; the proportion decreased from 54 to 49 percent over the 6 years from 1990 to 1996.[12] There was an increase between 1990 and 1996 in the proportion of postsecondary vocational students being served by community colleges, with a corresponding decrease at private proprietary institutions (figure D).

[10]Unless otherwise noted, the findings in this section come from the 1989–90 and 1995–96 National Postsecondary Student Aid Study (NPSAS). Because recent postsecondary transcript data were not available, the information on trends at the postsecondary level is generally less detailed than that at the secondary level. Specifically, it was not possible to examine actual course-taking patterns in this section. Instead, the analysis relied primarily on self-reported degrees and majors. In addition to the topics described in this section, Chapter VI of the report also presents findings on work experience while enrolled (page 168), licensure (page 178), and labor market participation (page 179).

[11]The findings presented in this paragraph come from the U.S. Census Bureau's Current Population Surveys.

[12]There were substantial amounts of missing data on student's major field in both NPSAS surveys. About 24 percent of subbaccalaureate students in 1990 and 28 percent in 1996 did not report their major field.

Figure D—Percentage distribution of subbaccalaureate students reporting a vocational major according to type of postsecondary institution: 1989–90 and 1995–96



*Other institution types include public 4-year; private, not-for-profit 4-year; private, not-for-profit less-than-4-year; and public vocational-technical institutions.

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1989–90 and 1995–96 National Postsecondary Student Aid Study.

Subbaccalaureate Student Characteristics (page 157)

Subbaccalaureate students with vocational majors were more likely to be older, to have family responsibilities, to receive financial aid, to have a previous postsecondary degree or certificate, and to report higher postsecondary grade-point averages (GPAs) than their academic counterparts. These students with vocational majors also tended to have parents with lower educational attainment: as the education level of their parents increased, students' likelihood of reporting a vocational major generally decreased. Differences by race–ethnicity among subbaccalaureate students in their probability of having a vocational major were either minimal or not statistically significant. Also, among subbaccalaureate students, there was no clear association between majoring in a vocational field and disability status.

Specific Occupational Preparation (page 164)

Business, health, and technical fields (the latter including engineering/science technologies, computers/data processing, and protective services) accounted for large numbers of vocational students' majors. However, between 1990 and 1996, there were small decreases in the proportions of subbaccalaureate students reporting majors in business, marketing, computers/data processing, and engineering/science technologies. Thus, the absolute level of participation in service-

and information-related programs was relatively high in 1996, while the trend in these areas was generally downward over the 6-year period.

Among subbaccalaureate students, gender gaps persisted in the fields of business, health, and "other vocational" fields (where women predominated), as well as in trade and industry, protective services, computers/data processing, and engineering/science technologies (where men predominated). A particularly large gap between the participation of men and women occurred in 1996 in engineering/science technologies, a field in which 12 percent of male students and only 2 percent of female students declared a major.

Postsecondary Completion (page 172)

Among the group of students who first began their postsecondary studies in 1989–90, those with academic majors were more likely than those with vocational majors to have completed at least one postsecondary credential 4 years later. However, a majority of both academic and vocational majors completed some type of degree or certificate within 4 years.

VII. CONCLUSION

This publication describes vocational education at the turn of the century as an enterprise in transition. The available data signal that change is occurring in the directions advocated by recent reform efforts, in particular, improved academic preparation and greater postsecondary participation. Evidence of change includes findings that the academic preparation of public high school students participating in vocational education increased between 1982 and 1994; about half of public comprehensive high schools reported integrating academic and vocational education in 1997, and a similar proportion reported offering tech prep; and from 1982 to 1992, postsecondary enrollment rates within 2 years of public high school graduation increased significantly for vocational concentrators.

There is mixed evidence that trends in participation in vocational programs reflect economic shifts away from manufacturing toward services and information industries. For example, at the high school level, the percentage of graduates who concentrated in trade and industry declined between 1982 and 1994, and the proportions of students who concentrated in health care and in technology and communications increased over the period. However, the percentages of high school graduates who concentrated in health care and in technology and communications were still quite small in 1994 (about 1 percent each). At the postsecondary level, for example, health and engineering/science technologies were popular vocational majors in 1996. However, there were small decreases between 1990 and 1996 in the proportions of subbaccalaureate

students reporting majors in computers/data processing and in engineering/science technologies. Thus, data on trends in and levels of participation in health and technology programs provided conflicting information about whether vocational program participation is paralleling the economic shift toward services and information industries.

Foreword

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 rather than separate vocational education questionnaires. 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.

This report is the third in a series published by NCES. The first two reports, *Vocational Education in the United States: 1969–1990* and *Vocational Education in the United States: The Early 1990s*, were published in 1992 and 1995, respectively. Each describes vocational education in America, updating key trends based on available data and focusing on selected issues relevant to current policy discussions. The first publication had about one page of text dedicated separately to each of 60 tables. The second provided a 25-page synthesis of data from over 100 tables published as an appendix to the report. This third publication incorporates relevant tables and figures into a more detailed analysis of vocational education trends toward the year 2000.

NCES intends to continue producing a report on the status of vocational education about every 3 years. In the future, different analytic approaches may be tried and various related products produced. Your comments about the NCES vocational education publication series are welcome and may be sent to Lisa Hudson, NCES, 555 New Jersey Avenue, NW, Room 3106, Washington, DC 20208.

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I. Introduction

VOCATIONAL EDUCATION TOWARD THE YEAR 2000

With the advent of the 21st century, vocational education in the United States is in transition. The traditional focus on preparing students for entry-level jobs after high school or 1 or 2 years of postsecondary training is giving way to a broader purpose—one that includes greater emphasis on academic preparation and provides a wider range of career choices. *Vocational Education in the United States: Toward the Year 2000* attempts to capture this evolving enterprise. However, the surveys available for assessing the status of vocational education were generally designed to capture more traditional conceptions of the enterprise and often do not provide information on the most current reform efforts. Nevertheless, the available data do signal that change is occurring in the directions advocated by reform efforts, although such change is often small and preliminary. Because the Carl D. Perkins Vocational and Applied Technology Education Act of 1998 (1998 Perkins Act) generally continues the reforms mandated by its 1990 predecessor rather than changing the course of reform, future data collection may detect greater shifts in the structure, content, and impact of vocational education.

This report is the third in a series published by the National Center for Education Statistics (NCES). The first two reports, *Vocational Education in the United States: 1969–1990* and *Vocational Education in the United States: The Early 1990s*, were published in 1992 and 1995, respectively. Each describes vocational education in America, updating key trends based on available data and focusing on selected issues relevant to current policy discussions. This introduction describes the direction reform has taken in recent years, as well as the current structure of vocational education at both the high school and postsecondary levels.

The Direction of Reform

Historically, the purpose of vocational education has been to prepare students for entry-level jobs in occupations requiring less than a baccalaureate degree. Over the last 15 years, however, this purpose has shifted toward broader preparation that develops the academic, vocational, and technical skills of students in vocational education programs. This preparation involves the integration of academic and vocational education, emphasis on all aspects of an industry, and implementation of academic performance measures, among other reform efforts. Vocational

education legislation and policy now also encourage high school students to continue their studies at the postsecondary level, and 2-year postsecondary students to pursue 4-year credentials through various articulation or "tech-prep" arrangements. This shift in purpose began in the mid-1980s, was first passed into law at the federal level in the 1990 Perkins Act, and was confirmed by the recently passed 1998 Perkins Act.

In the mid-1980s, after publication of *A Nation at Risk*,[1] some educators and school reformers began advocating for strengthening academic learning and better preparing students for the world of work. They believed this could be accomplished by integrating academic and vocational education and developing tech-prep programs.[2] Integration was seen as a means to make academic learning more meaningful for all students, to prepare all students more broadly for employment, to improve student engagement and learning, and to improve the academic content of vocational courses, among other objectives. Tech-prep programs that articulate the last 2 years of high school and the first 2 years of postsecondary vocational education programs were designed to help students develop both strong academic and occupational skills and were seen as a way to prepare them for a growing number of technical jobs and for greater flexibility and adaptability in the workplace.

At the federal level, these reforms were first enacted in the 1990 Perkins Act, along with a new requirement for states to develop performance measures and standards—including a measure of academic gains—for assessing local vocational programs. The 1994 School-to-Work Opportunities Act (the STWO Act) later reinforced the call for integration of academic and vocational education and articulation of secondary and postsecondary education; however, the STWO Act advocated these reforms for *all* students, not just those in vocational education programs. The STWO Act also advocated wider implementation of work-based learning—a common component of traditional vocational education programs—and called for multiple forms of it, including job shadowing, mentoring, internships, and apprenticeships.

The 1998 Perkins Act, which will accompany vocational education into the 21st century, continues the emphasis on integration, secondary–postsecondary articulation, and "all aspects of the industry," and once again requires a measure of academic performance. Furthermore, the new Act strengthens the accountability mechanism of performance measures by linking monetary disincentives to poor performance on them.

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[1]National Commission on Excellence in Education, *A Nation at Risk: The Imperative for Educational Reform* (Washington, D.C.: 1983).

[2]See C. Stasz, T. Kaganoff, and R.A. Eden, *Integrating Academic and Vocational Education: A Review of the Literature, 1987–1992* (MDS–1034) (Berkeley: National Center for Research in Vocational Education, March 1995); and C. Dornsife, *Beyond Articulation: The Development of Tech Prep Programs* (MDS–311) (Berkeley: National Center for Research in Vocational Education, February 1992).

Vocational education is evolving into a multipurpose enterprise that seeks to impart not only occupational skills to students wishing to enter employment directly, but also academic skills deemed to provide students with better preparation for both the world of work and post-secondary education. Consequently, more students will likely have a greater set of options available to them as they choose and invent their careers. Where this evolution will eventually lead is uncertain. That it is evolving is clear.

Vocational Education at the High School Level

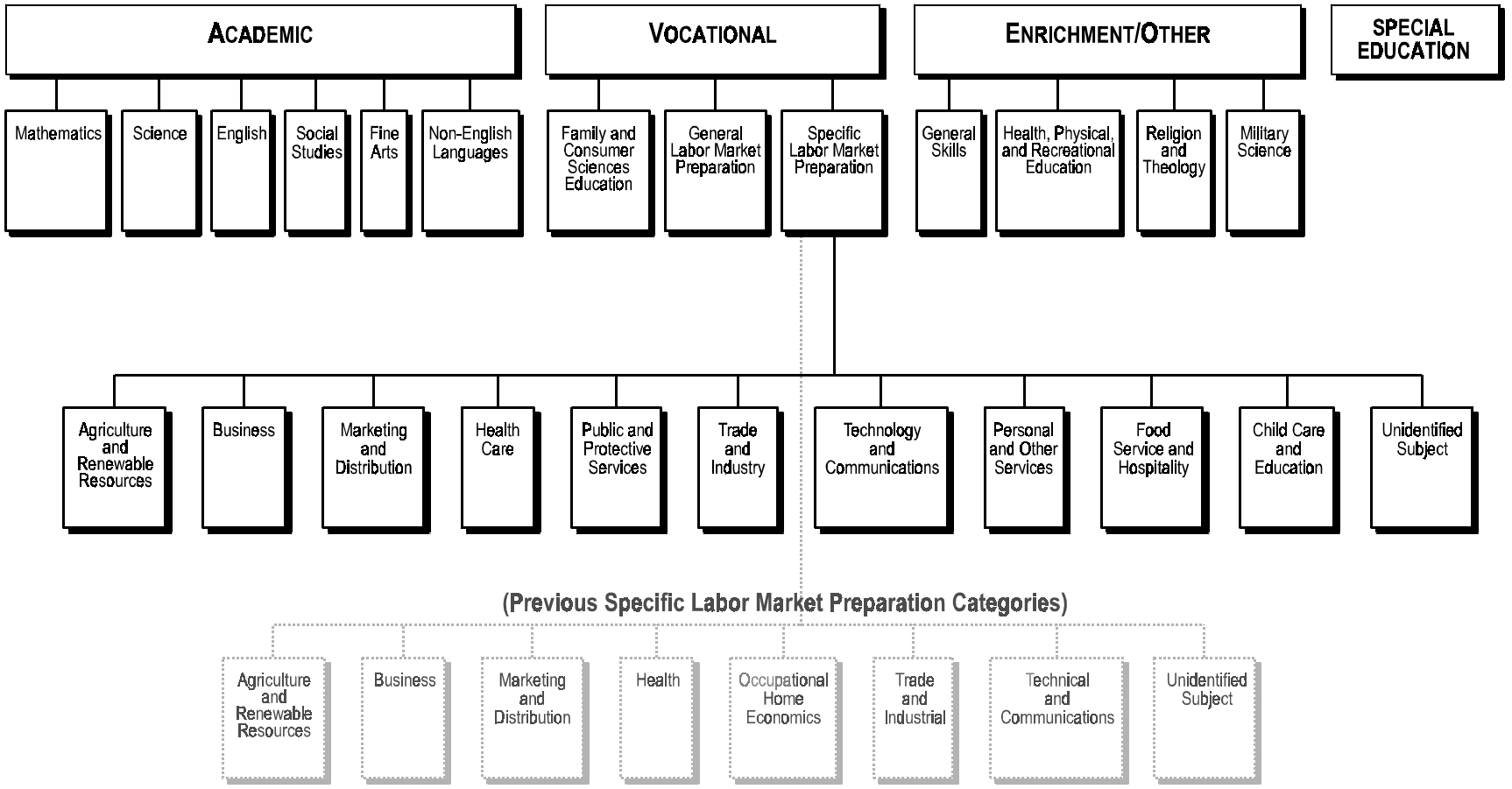
When investigating trends in vocational education at the high school level, two questions should be addressed: How has vocational education traditionally been organized and delivered? and How does one measure participation in vocational education?

The Organization and Delivery of Vocational Education

Vocational education at the high school level has traditionally consisted of courses in specific labor market preparation (SLMP) (such as agriculture and renewable resources, business, health care, and trade and industry); family and consumer sciences education (FCSE) (formerly called "consumer and homemaking education"); and general labor market preparation (GLMP) (a loose collection of general preparation coursework, including basic keyboarding and typewriting, industrial arts and the newer technology education, and career preparation and general work experience). Figure 1 classifies high school courses according to the taxonomy used for this report, including academic, vocational, enrichment/other, and special education courses. This taxonomy was recently revised by NCES, and changes in the SLMP categories are noted for anyone comparing this report with the previous two *Vocational Education in the United States* publications. Generally, only minor revisions in course classifications were made, although a few were notable.[3] For example, the revised taxonomy now includes English as a Second Language courses under English rather than under Non-English (previously Foreign) Languages. Additionally, all computer-related courses are now included under the Vocational curriculum, whereas some were previously included under Mathematics. Because of these and other shifts in the placement of specific courses, there may be small differences between the percentages and average credits published in this report and those published in previous *Vocational Education in the United*

[3]See D. Bradby and E.G. Hoachlander, *1998 Revision of the Secondary School Taxonomy* (Working Paper No. 1999–06) (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, March 1999).

FIGURE 1—SECONDARY SCHOOL TAXONOMY



SOURCE: Adapted from Denise Bradby and E.G. Hoachlander, *1998 Revision of the Secondary School Taxonomy* (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, Working Paper No. 1999-06, March 1999).

States publications or other NCES publications, such as the *Digest of Education Statistics*. However, differences should generally be small.[4]

The program areas listed under the "specific labor market preparation" heading represent broad groupings of related occupational programs.[5] For example, "agriculture and renewable resources" encompasses programs in agricultural technology and horticulture, among others. The "trade and industry" classification consists of the construction trades, mechanics and repair, precision production, and transportation and material moving; these groupings encompass even narrower programs. Construction trades, for instance, includes specific programs in electricity, carpentry, and plumbing, among others. The categories in figure 1 were constructed for a couple of reasons. First, while some schools offer a sequence of courses in a single narrow occupational area (such as Electricity 1 and Electricity 2), many programs of study involve taking coursework in related occupational areas. For example, both electricity and carpentry programs may recommend that their students take electrical fundamentals, blueprint reading, and customer relations courses in addition to their core technical coursework. Although these courses may be associated with a particular occupational program, they may be available to and form part of the program of study for students in several different occupational programs. Moreover, individual schools may attach specific courses to program areas in varying ways. For example, one school may consider blueprint reading to be part of the electricity program, while another may offer it through its carpentry program. Grouping related courses and programs together avoids misclassifying some courses. The second reason for establishing these broad groupings is that the number of students included in a national educational survey who take courses in any one narrow occupational area is often too small to be reported reliably.

Recent research suggests that schools are beginning to organize occupational education around broader occupational clusters or specific industries. These new initiatives represent attempts to provide students with broader academic and occupational preparation so they have a greater choice of careers and postsecondary paths and can bring a wider array of skills into the work world. Some practices include organizing entire schools around a broad occupational or industry theme (such as aviation, fashion, or finance); these schools are sometimes called "magnet" or "theme schools." Other practices include creating one or more schools-within-a-school that have occupational or career-related themes (such as health science, business and finance, natural resources, graphic arts, communications, or technology). These career academies or "houses" may be designed for either at-risk or academically talented students, or for a

[4]Differences among published data may also be due to the application of different rules for determining which students should be included in an analysis. This report bases its analysis of high school coursetaking on the sample of public high school graduates who earned 16 or more Carnegie units in high school and a positive number of Carnegie units in English.

[5]For simplicity's sake, the "specific labor market preparation" categories in figure 1 are often referred to in this report as "occupational program areas."

heterogeneous mix of students. Still other practices involve grouping occupational programs into clusters, majors, or pathways. The current taxonomy of high school courses and the reliance of NCES on transcript data for obtaining reliable information on students' course-taking patterns are generally not able to capture these school-level phenomena. Instead, a survey of school administrators included in this report provides some information on the prevalence of these activities.[6]

These reforms aside, vocational education has usually been offered in three main public high school settings.[7] Comprehensive high schools—the traditional American high school—typically offer the full range of academic and vocational education, including FCSE, GLMP, and SLMP coursework, although the latter offerings may be limited depending on the school. In addition to comprehensive high schools, some states have area vocational schools, usually offering a wide range of occupational programs, that students attend for part of the day to take their occupational coursework. Where area vocational schools exist, the comprehensive "sending" high school may restrict its vocational offerings to FCSE and GLMP courses. Finally, a few states have full-time vocational high schools that provide students with all of their academic preparation, as well as offer a variety of occupational programs. Such high schools may or may not be organized around occupational or industry themes or function as magnet or theme schools; they differ from comprehensive high schools in that students are generally required to select and complete an occupational program or major. Some of the surveys used for this report are able to identify comprehensive high schools and vocational schools but are unable to distinguish between area vocational schools and full-time vocational high schools.[8]

Measuring Participation in Vocational Education

Except in traditional full-time vocational high schools where graduates are typically required to complete a vocational program of study, most high school students are free to take as much and as varied vocational coursework as they want. Some states have traditionally required that students complete a small number of vocational courses (usually one or two semester-long courses) to graduate. However, the vast majority of public high school graduates take more than 1.0 Carnegie unit of vocational education, and more than half take the equivalent of three or

[6]The National Longitudinal Survey of Youth–1997 was conducted by the Bureau of Labor Statistics with support from the National School-to-Work Office. It contains a school administrator component.

[7]See U.S. Department of Education, Office of Educational Research and Improvement, *National Assessment of Vocational Education Final Report to Congress, Vol. II* (Washington, D.C.: July 1994).

[8]For example, the 1991 and 1994 Schools and Staffing Surveys, which provide information on high school teachers, can identify comprehensive high schools, vocational schools, and "other" schools (including special education schools). In contrast, the 1990 and 1994 High School Transcript Studies do not identify vocational schools separately from other public high schools.

more year-long courses.[9] Moreover, students may take a sequence of related occupational courses, may dabble in different occupational program areas, or may take no specific occupational coursework whatsoever. This report documents the different patterns of participation in vocational education found in public high schools and the trends in such participation over time.

Almost all public high school students take vocational courses. In 1994, 97 percent of public high school students took at least one vocational education course, and 91 percent completed at least one specific occupational course (table 1). However, it can be useful to identify the subset of high school students who complete a sequence of related occupational courses for several reasons. Examining this pattern of participation helps determine whether schools are preparing students adequately for the world of work. It also provides one indication of the size of the vocational enterprise and whether it is growing or shrinking. Completing a sequence of related occupational courses can be examined in conjunction with completing a college preparatory curriculum. That is, to what extent do students complete both courses of study or neither, and what are the trends over time? Additionally, identifying different curriculum pathways makes it possible to examine the outcomes associated with these pathways, such as achievement in high school and subsequent postsecondary and labor market participation.

Table 1—Percentage of public high school graduates completing one or more courses in vocational education, by type of vocational education: 1982–94

Vocational education type	1982	1990	1994
Total	98.2	98.0	97.2
Family and consumer sciences education	50.2	48.1	45.1
General labor market preparation	77.6	68.8	61.1
Specific labor market preparation	88.7	90.6	90.8

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Nonetheless, deciding on appropriate criteria for what constitutes completion of a sequence of related occupational courses is somewhat arbitrary. States and individual high schools have varying definitions of "vocational completion." However, to facilitate our analysis, two definitions were used in this study. The report defines "vocational concentrators" as those public high

[9]Among 1992 public high school graduates, about 91 percent earned 1.0 or more credits in vocational education, and about 58 percent earned 3.0 or more such credits. See K. Levesque et al., *Vocational Education in the United States: The Early 1990s* (NCES 95–024) (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1995), table 10. In secondary education, a Carnegie unit is awarded for the completion of a course that meets one period per day for one year, or the equivalent. For simplicity's sake, the terms "Carnegie unit" and "credit" will be used interchangeably in this report.

school graduates who completed 3.0 or more Carnegie units in a single occupational program area, as indicated by the major headings under the "specific labor market preparation" classification in figure 1. A more restrictive definition of "vocational specialization" was defined as completing 4.0 or more Carnegie units in one of these occupational areas, with 2.0 or more of the units taken beyond the introductory level. Because a number of states count students as "vocational completers" if they take 3.0 or more vocational credits, generally the focus here is on the less restrictive definition.

Vocational Education at the Postsecondary Level

Some of the issues facing vocational education at the postsecondary level are similar to those at the high school level, and others are unique.

The Organization and Delivery of Vocational Education

Federal legislation historically defines vocational education as leading to less than a bachelor's degree. Vocational education at the postsecondary level, therefore, covers associate's degree and subbaccalaureate certificate programs. Both 4-year and less-than-4-year postsecondary institutions offer subbaccalaureate vocational programs. Unlike at the high school level, postsecondary vocational education is commonly offered in both the public and private sectors. In all, six main types of postsecondary institutions offer vocational education programs and are included in this report:

- public 4-year institutions
- public 2-year institutions (sometimes referred to as "community colleges")
- public less-than-2-year institutions (sometimes referred to as "vocational–technical institutes")
- private, not-for-profit 4-year institutions
- private, not-for-profit 2-year institutions (which includes all private, not-for-profit less-than-4-year institutions)
- private, for-profit institutions

The designation "4-year" means that the institution awards bachelor's or graduate degrees as its highest degree type. The designation "2-year" means the institution awards associate's

degrees or less-than-4-year, subbaccalaureate certificates as its highest award type. The designation "less-than-2-year" means that the institution does not award degrees but awards subbaccalaureate certificates of less than 2 years in length. Private, for-profit institutions usually offer certificates but may offer other degrees as well.

Figure 2 presents the taxonomy used in this report to classify subbaccalaureate postsecondary majors as either academic or vocational.[10] Some institutions that offer subbaccalaureate programs explicitly identify their programs as either academic or vocational. In some cases, different degrees are awarded, for example, Associate of Arts (A.A.) degrees for completing academic programs and Associate of Science (A.S.) degrees for completing vocational programs. Other institutions do not make this distinction. The taxonomy in figure 2 provides a uniform standard for classifying majors as either academic or vocational that is independent of institutional differences.[11]

Most of the reforms advocated for high school vocational education have also been advocated for postsecondary vocational education. These include integration of academic and vocational education, tech prep, work-based learning, and performance measures.

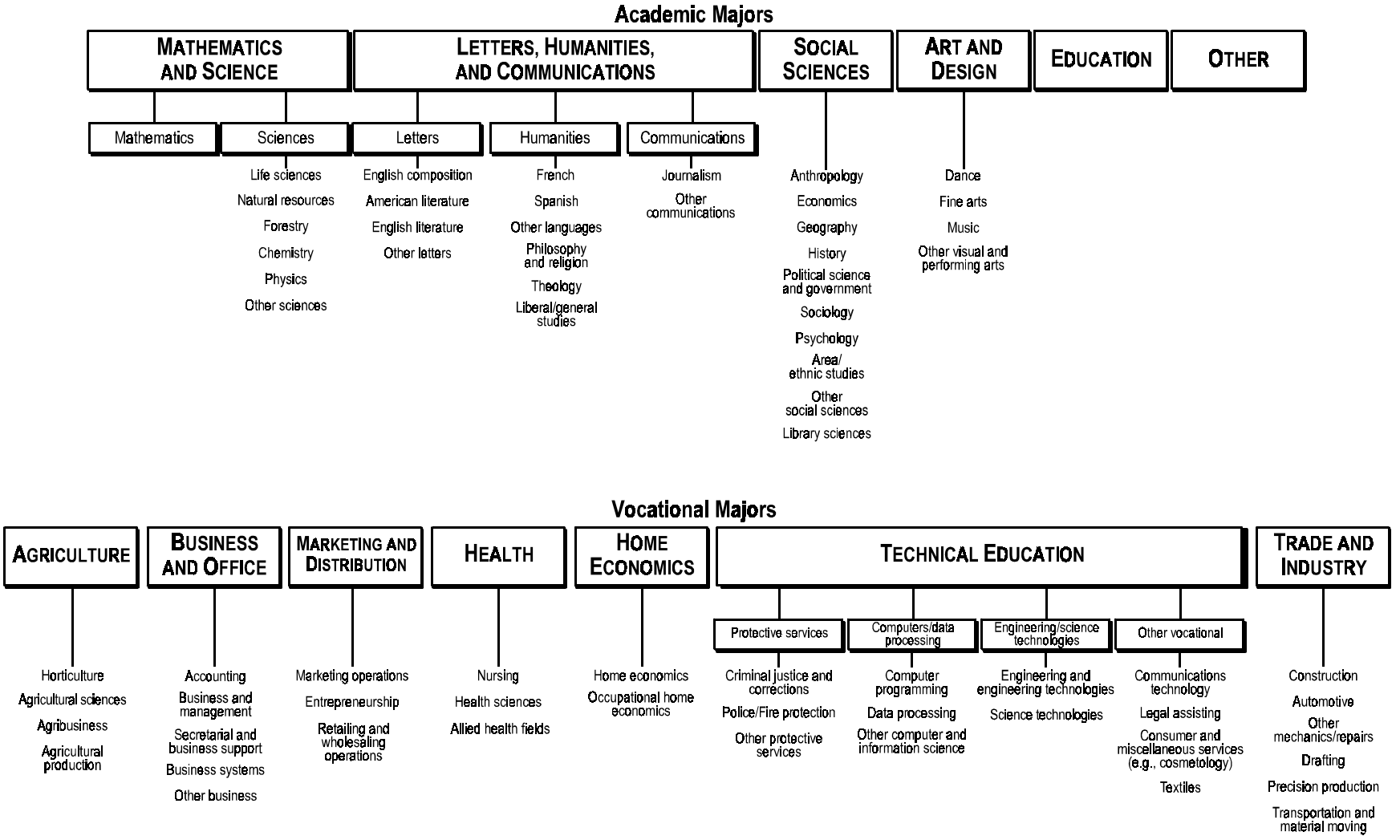
Measuring Participation in Vocational Education

As at the high school level, postsecondary students participate in vocational education to varying degrees and with different intentions. Certain students enter postsecondary institutions with a specific course of study in mind. In some cases, students must apply and be accepted to a vocational program or otherwise formally enroll. For example, associate's degree nursing programs are often in such great demand that they require formal admission. Some shorter-term vocational certificate programs with a set course of study that students pursue as a cohort also require formal enrollment. In many cases, however, postsecondary students are responsible for their own course enrollment and select from a broad range of academic and vocational courses each semester. Students who have clear degree intentions may follow the recommended course of study for a program that is laid out in the institution's course catalog. However, many students may explore different types of coursework before settling on a "major." Others may enroll for credit but do not have clear intentions of completing a degree or certificate program. Still others may have specific short-term goals for obtaining new skills that do not involve certificate or

[10]All for-credit vocational coursework at the postsecondary level is considered to be specific labor market preparation. For-credit postsecondary vocational education does not have the equivalent of family and consumer sciences education and general labor market preparation, which are found at the high school level, although not-for-credit courses may include some similar coursework. Information on not-for-credit "adult" or "continuing" education courses is generally not available from the surveys used in this report and, therefore, is not covered in much depth in this publication.

[11]Some small changes have been made to the taxonomy since it was used in the previous two reports.

FIGURE 2—CLASSIFICATION OF ACADEMIC AND VOCATIONAL MAJORS FOR SUBBACCALAUREATE POSTSECONDARY PROGRAMS



SOURCE: Adapted from Susan P. Choy and Laura J. Horn, *A Guide to Using Postsecondary Transcript Data and an Overview of Course Taking in Less-than-Four-Year Postsecondary Institutions* (Berkeley: National Center for Research in Vocational Education, March 1992).

degree completion. Most of the postsecondary data included in this report were derived from surveys of students enrolled for credit in postsecondary institutions.

If postsecondary transcript data were available, it would be interesting to explore the different paths and combinations of coursework that subbaccalaureate students take. However, no such recent data are available.[12] Instead, this publication relies on self-reported degree intentions and major fields to identify subbaccalaureate students and classify them by their reported majors as either academic or vocational (or not reported). For this reason, the postsecondary analysis in this report is less extensive and detailed than the high school analysis, which had access to course enrollment data contained in high school transcripts. Additionally, comparable data were generally available beginning in 1990, shortening the timeframe over which postsecondary trends could be analyzed.[13]

Content and Structure of the Report

Policymakers and vocational educators need information about the status and direction of vocational education in the United States. To respond to these information needs, this report addresses the following questions:

- What are the major national economic and labor market trends and their implications for vocational education programs and policies?
- What skills do employers value, and how have skill requirements and worker proficiency changed in recent years?
- How large is the vocational education enterprise at both the secondary and postsecondary levels, and is it growing, shrinking, or holding constant over time?
- What types of vocational education do students take at each level, and how much do they take?
- Who participates in vocational education, and is this changing?

[12]High School and Beyond collected postsecondary transcripts for 1982 high school graduates. The Fourth Follow-up of the National Education Longitudinal Study of 1988 survey in 2002 may collect transcript data for 1992 high school graduates. The Beginning Postsecondary Students survey does not plan to collect transcripts for the 1989–90 cohort.

[13]The 1987 National Postsecondary Student Aid Survey (NPSAS) gathered data on students enrolled in postsecondary institutions only during the fall semester. Subsequent NPSAS surveys, usually administered about every 3 years, gathered data for students enrolled during the entire academic year. To maintain comparable student samples, the 1990 and 1996 NPSAS surveys were selected for the trend analysis in this report.

- Is the academic preparation of students who participate in vocational education improving over time?
- What is the role of work experience and work-based learning in students' courses of study?
- To what extent have recent vocational education reform efforts taken hold at the local level?
- What are the postsecondary and labor market outcomes associated with participation in vocational education?
- What are the trends in vocational teacher qualifications and experience over time?
- In what types of professional development do vocational teachers participate?

Sources of Information

To address the above questions, the authors analyzed data from nine separate national surveys sponsored by one of three federal statistical agencies: NCES, the Bureau of Labor Statistics (BLS), and the Census Bureau. The surveys were administered to representative samples of students, teachers, adults in the general population, schools, and/or employers. The following is a list of the databases analyzed for each section of the report:

Employer Perspectives

- First and Second *National Employer Surveys*[14] (describing private, for-profit employers with 20 or more employees in 1994 and 1997)

Trends in Secondary Vocational Education

- *High School and Beyond* Sophomore Cohort Surveys and High School Transcript Study (describing 1982 high school graduates)
- *High School Transcript Studies* of 1990 and 1994 (describing 1990 and 1994 high school graduates)

[14]These surveys were administered by the U.S. Bureau of the Census. They were designed by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania, which was funded by the Office for Educational Research and Improvement, U.S. Department of Education.

- *National Education Longitudinal Study of 1988* Surveys, Assessment File, and High School Transcript Study (describing 1992 high school graduates)
- *National Longitudinal Study of Youth–1997* (describing schools with a 12th grade)[15]
- *Schools and Staffing Surveys* of 1991 and 1994 (describing high school teachers)

Transitions After High School

- *High School and Beyond* Third and Fourth Follow-up Surveys (describing outcomes for 1982 high school graduates, 2 and 10 years after graduation)
- *National Education Longitudinal Study of 1988* Third Follow-up Survey (describing outcomes for 1992 high school graduates, 2 years after graduation)

Trends in Postsecondary Vocational Education

- *Current Population Surveys* of 1990, 1991, 1994, and 1996, October supplements (describing adults in the general U.S. population)
- *National Postsecondary Student Aid Studies* of 1990 and 1996 (describing students enrolled for credit in postsecondary institutions)
- *Beginning Postsecondary Students Longitudinal Study* of 1990, Base Year through Second Follow-up (describing outcomes for students who began their postsecondary education for the first time in 1989–90, 4 years later in 1994)

The data sets and the analytic methods used in this report are described in detail in appendix B.

[15]Unfortunately, due to an error during the design stage, vocational schools were excluded from the sample. Consequently, the survey generally describes comprehensive high schools and, therefore, may provide a conservative estimate of local reform efforts.

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II. The Context

The trends toward a service- and information-based economy in recent decades have two important implications for vocational education programs. These trends signal an ongoing shift in the education and training fields that are required of the U.S. work force as well as the levels of that education and training. In order to prepare students for the industries and occupations of the 21st century, it is crucial for vocational educators and policymakers to understand the transitions taking place. This chapter summarizes the current literature on economic and labor market trends and provides a context for understanding the data in the following chapters.

ECONOMIC TRENDS

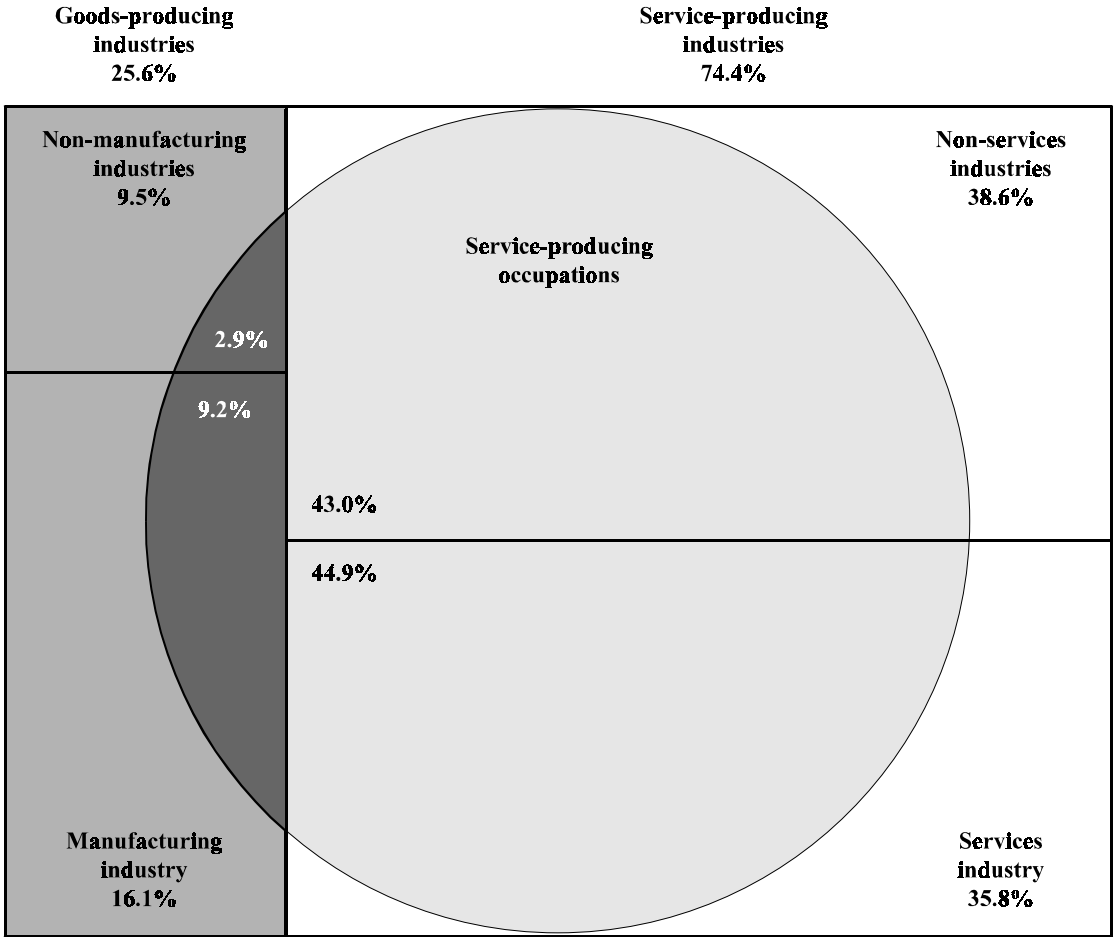
Defining Key Terms

A clear discussion of the trend toward a service-based economy demands that key terms be defined. Confusion can arise because the terms "service-producing industries," the "services industry," "service-producing occupations," and "service occupations" refer to four distinct but overlapping phenomena. Figure 3 illustrates the relationships among several of these concepts. At the most fundamental level, industrial classification systems typically divide employment into two main sectors: service-producing and goods-producing industries. Service-producing industries encompass transportation, communications, and public utilities; wholesale and retail trade; finance, insurance, and real estate; government; and "services." Goods-producing industries encompass agriculture, mining, construction, and manufacturing.[16] At times, economists compare the service-producing industries and goods-producing industries. At other times, they compare two major industry groups within these broad sectors: the services industry and the manufacturing industry. In 1997, the broader "service-producing industries" classification covered 74.4 percent of total employment in the U.S.; the narrower "services industry" classification covered 35.8 percent of total employment (figure 3 and table 2a).

The services industry includes a broad variety of activities, such as health care, advertising, computer and data processing services, personnel supply, private education, social services, legal

[16]Sometimes discussion about the goods-producing sector excludes agricultural employment.

Figure 3—Percentage distribution of total employment, by sector and type of industry, and percentage distribution of service-producing occupations by sector and type of industry: 1997



SOURCE: (Derived from tables 2a and 2b.) U.S. Department of Commerce, Bureau of the Census, Current Population Survey, 1997, unpublished data.

services, management and public relations, engineering and architectural services, accounting, and recreation. The services industry includes establishments as diverse as Microsoft™ and 24 Hour Fitness.™ The manufacturing industry encompasses both durable and nondurable goods production.

To complicate matters further, "service-producing occupations" and "service occupations" do not overlap neatly with either of the industrial classifications. Service-producing occupations encompass managerial and professional specialty occupations, technicians and related support, sales and administrative support (including clerical), and "service occupations." The narrower

Table 2a—Column percentage distribution of U.S. workers employed in service-producing and goods-producing occupations according to industry: 1997

Industry	Total all occupations	1997 Occupational classification							
		Service-producing occupations					Goods-producing occupations		
		Total	Managerial and professional specialty	Technicians and related support	Sales and administrative support, including clerical	Service	Total	Precison production, craft, repair, operators, fabricators, and laborers	Farming, forestry, and fishing
Total all industries	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Goods-producing industries	25.6	12.1	17.5	19.2	10.5	1.9	60.7	58.2	84.0
Agriculture	2.6	0.5	0.5	1.1	0.5	0.1	8.2	0.4	80.6
Mining	0.5	0.3	0.4	0.6	0.2	0.0	1.1	1.2	0.0
Construction	6.4	2.1	3.8	1.1	1.5	0.2	17.5	19.3	0.6
Manufacturing	16.1	9.2	12.8	16.4	8.3	1.5	34.0	37.4	2.7
Service-producing industries	74.4	87.9	82.5	80.8	89.5	98.1	39.3	41.6	16.0
Transportation and public utilities	7.1	5.4	4.8	8.1	7.6	1.7	11.6	12.8	0.5
Wholesale and retail trade	20.7	23.3	8.0	4.8	39.5	29.1	13.9	15.1	2.9
Finance, insurance, and real estate	6.4	8.6	7.3	3.6	14.2	1.8	0.7	0.7	1.1
Services, except professional	11.9	13.0	11.7	9.0	8.6	25.2	9.2	9.3	8.3
Professional services	23.9	31.9	44.9	50.1	15.8	31.0	3.0	3.1	2.7
Public administration	4.4	5.8	5.9	5.2	3.9	9.4	0.9	0.9	0.7

NOTE: Percentages may not add to 100 due to rounding. Estimates appearing as 0.0 may be nonzero but less than 0.05.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, 1997, unpublished data.

service occupations category covers, for example, janitors and cleaners, food preparation workers, waiters and waitresses, nursing aides and orderlies, home health aides, correction officers, and guards. Thus, service-producing occupations include managers in agribusiness companies and computer technicians in high-technology firms, as well as service occupations such as McDonalds'™ cooks and janitors at General Motors.™

In 1997, the broader "service-producing occupations" classification covered 72.2 percent of total employment in the U.S.; the narrower "service occupations" classification covered 13.5 percent of total employment (table 2b). Although most service-producing occupations occur in service-producing industries, 12.1 percent of these occupations occur in goods-producing industries (figure 3 and tables 2a). In contrast, the vast majority of service occupations (98.1 percent) occur in service-producing industries, although just 56.2 percent occur in the services industry (table 2a).

Table 2b—Row percentage distribution of U.S. workers employed in service-producing and goods-producing industries according to occupation: 1997

Industry	Total all occupations	1997 Occupational classification							
		Service-producing occupations					Goods-producing occupations		
		Total	Managerial and professional specialty	Technicians and related support	Sales and administrative support, including clerical	Service	Total	Precision production, craft, repair, operators, fabricators, and laborers	Farming, forestry, and fishing
Total all industries	100.0	72.2	29.1	3.3	26.3	13.5	27.8	25.1	2.7
Goods-producing industries	100.0	34.1	19.9	2.4	10.8	1.0	65.9	57.0	8.9
Agriculture	100.0	13.5	6.1	1.4	5.3	0.7	86.6	3.6	83.0
Mining	100.0	39.1	22.6	3.9	12.0	0.6	60.9	60.7	0.2
Construction	100.0	24.2	17.2	0.5	6.0	0.4	75.8	75.5	0.3
Manufacturing	100.0	41.2	23.1	3.3	13.5	1.3	58.8	58.3	0.5
Service-producing industries	100.0	85.3	32.3	3.5	31.7	17.9	14.7	14.1	0.6
Transportation and public utilities	100.0	54.6	19.5	3.7	28.1	3.3	45.4	45.2	0.2
Wholesale and retail trade	100.0	81.3	11.3	0.8	50.2	19.1	18.7	18.3	0.4
Finance, insurance, and real estate	100.0	96.8	33.0	1.8	58.3	3.7	3.2	2.7	0.5
Services, except professional	100.0	78.5	28.6	2.5	18.9	28.6	21.5	19.6	1.9
Professional services	100.0	96.5	54.6	6.8	17.5	17.6	3.5	3.2	0.3
Public administration	100.0	94.4	38.7	3.9	23.3	28.7	5.6	5.2	0.4

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, 1997, unpublished data.

Ascendance of Services

At the beginning of the 20th century, the U.S. economy was in the midst of a massive transition, one that involved workers moving from agriculture into industry. At the end of the 20th century, the economy is again in a state of flux, with more and more workers finding employment in the services industry as opposed to manufacturing. In 1945, the services industry accounted for 10 percent of nonfarm employment, compared with 38 percent for manufacturing. By 1996, services accounted for 29 percent of nonfarm employment, while manufacturing declined to 15 percent.[17] These trends are expected to continue into the 21st century. The Bureau of Labor

[17]See J.R. Meisenheimer II, "The Services Industry in the 'Good' Versus 'Bad' Jobs Debate," *Monthly Labor Review* (February 1998): 22–47.

Statistics projects that the service-producing sector will create virtually all of the new jobs between 1996 and 2006, with almost two-thirds of these jobs in the services industry.[18]

Some have argued that services industry jobs are not as good as manufacturing jobs and that the trend toward services is therefore worrisome for the American worker.[19] However, research shows that the services industry is very diverse and that the shift from manufacturing to services does not necessarily signal a deterioration in overall job quality.[20] In 1996, average hourly earnings for workers in the services industry was $11.79—about 92 percent of the $12.78 average for manufacturing workers. The wage differential between these two industries had narrowed considerably since 1964, when average hourly earnings in services were 77 percent of the manufacturing average.[21] In 1996, the distribution, or spread, of earnings was similar for the two industries, so that one could not simply be labeled "low wage" and the other "high wage." A comprehensive assessment of job quality that examined employee benefits, job security, occupational structure, and occupational safety, in addition to average wages, found that the services industry was very diverse in terms of job quality and that many service jobs compared favorably with those in manufacturing.[22]

The types of employment covered under service-related classifications is very broad. Service-producing occupations cover anyone from filing clerks to chief executive officers, and service-producing industries cover anything from fast-food restaurants to corporate banks. Consequently, the shift to a service-based economy describes a complex process that encompasses both low- and high-wage jobs, requires varying skill levels, and presents a broad range of employment opportunities.

The Emerging Information Economy

What accounts for the decline of manufacturing and the movement toward a service-based economy? The decline of manufacturing is often referred to as "economic restructuring," a term that encompasses technological change and new competitive pressures on firms. Assessing the impact of economic restructuring, though, is not a simple matter and is subject to much debate in the economic literature and the popular press. The work of Paul Krugman, Jeffrey Sachs, Howard

[18]J.C. Franklin, "Industry Output and Employment Projections to 2006," *Monthly Labor Review* (November 1997): 39–57.

[19]See, for example, L. Mishel and J. Simon, "The State of Working America," *Challenge* (November-December 1988): 50–51; and M. Mahar, "Blue Collar, White Collar: Good Jobs Are Vanishing Throughout the Economy," *Barron's* (May 11, 1992): 8–24.

[20]See J.R. Meisenheimer II, "The Services Industry in the 'Good' Versus 'Bad' Jobs Debate" (February 1998).

[21]The narrowing of the wage gap may be due in part to increases over the years in service-related employment associated with high technology, particularly in the computer, telecommunications, and health fields. Additionally, the narrowing wage gap may be due in part to increasing demand for services employment and slackening demand for manufacturing employment.

[22]See J.R. Meisenheimer II, "The Services Industry in the 'Good' Versus 'Bad' Jobs Debate" (February 1998).

Shatz, and Gary Burtless contradicts the prevalent assumption that international trade is the main cause of widespread changes in the manufacturing sector during the past 30 years.[23]

There is more consensus about the role that technology has played in the growth of the service sector. The U.S. economy is in the midst of what Alan Greenspan calls a "once-in-a-century event," a "structural technological advance" in information technology that is changing the shape of the economy and the nature of work.[24] He argues that development of the transistor and integrated circuit and the resulting explosion of advancements in the computing and telecommunications technologies have fundamentally changed the structure of the American economy. Much like the industrial revolution, which caused people to move from working in the fields to working in factories, advances in information technology are causing employment to shift from factories to service-producing firms.

As a result, major industrialized economies are becoming "knowledge-based," where the creation, distribution, and use of information and knowledge—including both technology and human capital—are becoming increasingly important. According to some calculations, more than half of the total gross domestic product in the major industrialized economies is now knowledge-based, including industries such as telecommunications, computers, software, pharmaceuticals, education, and television.[25] High-technology industries have almost doubled their share of manufacturing output over the past two decades to around 25 percent, and knowledge-intensive services are growing even faster.[26] By one reckoning, "knowledge workers," from brain surgeons to journalists, account for 8 out of every 10 new jobs.[27]

[23]P. Krugman, *Pop Internationalism* (Cambridge and London: MIT Press, 1997); J. Sachs and H. Shatz, "Trade and Jobs in U.S. Manufacturing," *Brookings Papers on Economic Activity I* (1994): 1–84; and G. Burtless, "International Trade and the Rise in Earnings Inequality," *Journal of Economic Literature* 23 (June 1995): 800–816. For an alternate viewpoint, see G.J. Borjas and V.A. Ramey, "The Relationship Between Wage Inequality and International Trade," in J.H. Bergstrand et al., eds., *The Changing Distribution of Income in an Open U.S. Economy* (Amsterdam, North-Holland: 1994), 217–242; and A. Wood, *North-South Trade, Employment, and Inequality: Changing Fortunes in a Skill-Driven World* (Oxford: Clarendon Press, 1994).

[24]A. Greenspan, "Job Insecurity and Technology," address given at the Federal Reserve Bank of Boston's Conference on Technology and Growth, June 1996.

[25]Organisation for Economic Co-operation and Development (OECD), *Employment and Growth in the Knowledge-Based Economy* (Paris: 1996).

[26]P. Woodall, "A Survey of the World Economy: A Hitchhiker's Guide to Cybernomics," *The Economist* 340 (7985) (Sept. 28, 1996): S3–S5.

[27]Ibid.

LABOR MARKET TRENDS

Against the backdrop of the shift toward a service- and information-based economy, this section describes occupational trends and changing education and skill requirements.

Occupational Trends

In order to understand occupational trends clearly, it is important to draw the distinction between "fast-growing occupations" and those with "large job growth." A fast-growing occupation—one, for example, that doubles the number of jobs over a 10-year period—may add only a small absolute number of jobs to the economy. In contrast, a slow-growing occupation, one that increases only 10 or 20 percent over a 10-year period, may add a large absolute number of jobs, because it began with a much larger employment base. Fast-growing occupations may receive a lot of attention because they represent "emerging" occupations and, possibly, are the wave of the future. However, it is important to consider the contribution of occupations with large job growth as well as these fast-growing occupations, in order to have a complete employment picture.

The Department of Labor's Bureau of Labor Statistics (BLS) periodically publishes employment outlooks that make projections about the fastest-growing occupations and those with the largest job growth. A recent report, published in November 1997, makes projections for the period from 1996 to 2006.[28]

Among the major occupational groups, employment in professional specialty occupations is projected to increase the fastest and add the most jobs between 1996 and 2006 (table 3). The group with the second fastest growth rate is projected to be technicians and related support occupations, although this group is small and is not expected to add a large number of jobs. The next fastest growing group is service occupations, which together with professional specialty occupations are projected to add nearly half of all new jobs from 1996 and 2006.

Among detailed occupations, the 10 occupations with the highest projected growth rates are all service-producing occupations, and they can be classified in either the computer technology or health fields (table 4a). Between 1996 and 2006, these occupations are projected to grow from 69 to 117 percent, while the average growth rate for all occupations is projected to be 14 percent over the same period. However, these fastest growing occupations are projected to make up 3 percent of all jobs by the year 2006.

[28]See G. Silvestri, "Occupational Employment Projections to 2006," *Monthly Labor Review* (November 1997): 58–83.

Table 3—Employment by major occupational group: 1996 and projected 2006

Occupational group	Employment 1996 (in thousands of jobs)	Employment 2006 (in thousands of jobs)	Change Number (in thousands of jobs)	Change Percent
All occupations	132,353	150,927	18,574	14.0
Executive, administrative, and managerial	13,542	15,866	2,324	17.2
Professional specialty	18,173	22,998	4,826	26.6
Technicians and related support	4,618	5,558	940	20.4
Marketing and sales	14,633	16,897	2,264	15.5
Administrative support, including clerical	24,019	25,825	1,806	7.5
Service	21,294	25,147	3,853	18.1
Agriculture, forestry, fishing, and related occupations	3,785	3,823	37	1.0
Precision production, craft, and repair	14,446	15,448	1,002	6.9
Operators, fabricators, and laborers	17,843	19,365	1,522	8.5

SOURCE: G. Silvestri, "Occupational Employment Projections to 2006," *Monthly Labor Review,* Bureau of Labor Statistics, Office of Employment Projections, November 1997.

Table 4a—Employment in the 10 projected fastest-growing occupations: 1996 and projected 2006

Occupations	Employment 1996 (in thousands of jobs)	Employment 2006 (in thousands of jobs)	Change Number (in thousands of jobs)	Change Percent	Quartile rank by 1996 median weekly earnings of full-time workers	Education and training category
All occupations	132,353	150,927	18,574	14	—	—
Ten fastest-growing occupations: 1996–2006						
1. Database administrators, computer support specialists, and all other computer scientists	212	461	249	117	1	Bachelor's degree
2. Computer engineers	216	451	235	109	1	Bachelor's degree
3. Systems analysts	506	1,025	520	103	1	Bachelor's degree
4. Personal and home care aides	202	374	171	85	4	Short-term on-the-job training
5. Physical and corrective therapy	84	151	66	79	4	Moderate-term on-the-job train
6. Home health aides	495	873	378	76	4	Short-term on-the-job training
7. Medical assistants	225	391	166	74	3	Moderate-term on-the-job train
8. Desktop publishing specialists	30	53	22	74	2	Long-term on-the-job training
9. Physical therapists	115	196	81	71	1	Bachelor's degree
10. Occupational therapy assistants and aides	16	26	11	69	3	Moderate-term on-the-job train
Total	2,101	4,001	1,899	90	—	
Share of all jobs (percent)	1.6	2.7	10.2	—	—	

—Not applicable.

SOURCE: G. Silvestri, "Occupational Employment Projections to 2006," *Monthly Labor Review,* Bureau of Labor Statistics, Office of Employment Projections, November 1997.

The 10 detailed occupations with the largest projected increases in number of jobs are somewhat more varied, although they also include several health occupations (table 4b). These occupations are projected to make up 16 percent of total employment by 2006. Only systems analysts and home health aides are included on both lists. Nine of the 10 occupations with the largest projected numeric increases will grow at average or above-average rates. The retail sales occupation, projected to grow at a 10 percent rate, is expected to add more jobs than all but one of the fastest-growing occupations listed in table 4a.[29]

Table 4b—Employment in the 10 occupations with largest projected job growth: 1996 and projected 2006

Occupations	Employment		Change		Quartile rank by 1996 median weekly earnings of full-time workers	Education and training category
	1996 (in thousands of jobs)	2006 (in thousands of jobs)	Number (in thousands of jobs)	Percent		
All occupations	132,353	150,927	18,574	14	—	—
Ten occupations with largest job growth: 1996–2006						
1. Cashiers	3,146	3,677	530	17	4	Short-term on-the-job training
2. Systems analysts	506	1,025	520	103	1	Bachelor's degree
3. General managers and top executives	3,210	3,677	467	15	1	Work experience plus bachelor's or higher degree
4. Registered nurses	1,971	2,382	411	21	1	Associate's degree
5. Salespersons, retail	4,072	4,481	408	10	3	Short-term on-the-job training
6. Truck drivers, light and heavy	2,719	3,123	404	15	2	Short-term on-the-job training
7. Home health aides	495	873	378	76	4	Short-term on-the-job training
8. Teacher aides and educational assistants	981	1,352	370	38	4	Short-term on-the-job training
9. Nursing aides, orderlies, and attendants	1,312	1,645	333	25	4	Short-term on-the-job training
10. Receptionists and information clerks	1,074	1,392	318	30	4	Short-term on-the-job training
Total	19,486	23,627	4,139	21	—	
Share of all jobs (percent)	14.7	15.7	22.3	—	—	

—Not applicable.

SOURCE: G. Silvestri, "Occupational Employment Projections to 2006," *Monthly Labor Review,* Bureau of Labor Statistics, Office of Employment Projections, November 1997.

[29]It should be remembered that BLS projections are based on past performance rather than anticipated developments or innovations, and may under- or over-predict the growth of some jobs.

Changing Education and Skill Requirements

Workforce 2000 estimated that more than half of new jobs between 1984 and 2000 would require some education beyond high school, and one-third would require a bachelor's degree or more.[30] More recent projections anticipate that average growth will be greater for occupations requiring at least an associate's degree than for occupations requiring less education.[31] Indeed, the 10 occupations with the highest projected growth rates in table 4a have relatively high education and training requirements (8 require bachelor's degrees or moderate- to long-term on-the-job training). In contrast, however, the 10 occupations with the highest projected increases in number of jobs have relatively low education and training requirements (7 require no more than short-term on-the-job training) (table 4b). While some emerging occupations require high education and training requirements, the majority of jobs still demand relatively low education and training levels. In 1996, 39 percent of all jobs required no more than short-term on-the-job training (table 5).

Table 5—Employment and median weekly earnings by education and training category: 1996

	Employment		
Education and training category	Number (in thousands of jobs)	Percentage distribution	Median weekly earnings, full-time workers
All occupations	132,353	100.0	$483
First-professional degree	1,707	1.3	1,057
Doctoral degree	1,016	0.8	847
Master's degree	1,371	1.0	682
Work experience plus bachelor's or higher degree	8,971	6.8	786
Bachelor's degree	15,821	12.0	686
Associate's degree	4,122	3.1	639
Postsecondary vocational training	8,091	6.1	444
Work experience in a related occupation	9,966	7.5	534
Long-term on-the-job training	12,373	9.3	490
Moderate-term on-the-job training	16,792	12.7	434
Short-term on-the-job training	52,125	39.4	337

NOTE: Details may not add to totals due to rounding.

SOURCE: G. Silvestri, "Occupational Employment Projections to 2006," *Monthly Labor Review,* Bureau of Labor Statistics, Office of Employment Projections, November 1997.

[30]W. Johnston and A. Packer, *Workforce 2000: Work and Workers for the 21st Century* (Indianapolis: Hudson Institute for the U.S. Department of Labor, 1987).

[31]See G. Silvestri, "Occupational Employment Projections to 2006," *Monthly Labor Review* (November 1997): 58–83.

Some changes in business practices are demanding greater skills of workers. Increased global competition since World War II has spurred some U.S. businesses to create "high-performance workplaces," relying on flexible and decentralized work practices and multiskilled workers. Although a growing number of firms are adopting high-performance characteristics, some claim this trend will probably affect only a small number of firms clustered in a few industrial sectors.[32] To the extent that new business practices are adopted, there may be some increase in the required skills of front-line workers. Some have argued that front-line production workers will need to be proficient at using a range of machines and will need to demonstrate increased flexibility, problem-solving, responsibility, teamwork, initiative, and care and attention, especially in monitoring automated equipment.[33]

Some have also argued that the shift to a service-based economy increases the need for critical-thinking and social skills. For example, jobs that require direct contact with customers and clients require problem solving, responsibility, and social skills.[34] Additionally, while customer service occupations (such as cooks, nursing aides, secretaries, clerical workers, and cashiers) may require only modest technical skill levels, workers in these occupations are expected to possess social, communication, problem-solving, and basic academic skills.[35]

Generally, research has shown that obtaining workers with a good work ethic and appropriate social behavior has been a priority for employers. Employers complain about the attitude and character of workers—particularly about absenteeism, an inability to adapt, a lack of discipline, and negative work behaviors.[36] In response to criticisms about the general employability of the work force, the Secretary's Commission on Achieving Necessary Skills (SCANS) identified a range of skills that all work force participants should have.[37] These include the following:

Basic Skills
Reading
Writing
Arithmetic
Mathematics

[32]S. Klein and R. Vergun, *Workplace Skill Requirements: The Upskilling vs. Deskilling Debate* (Washington, D.C.: U.S. Department of Education, National Assessment of Vocational Education, 1994).

[33]H. Shaiken, S. Herzenberg, and S. Kuhn, "The Work Process Under More Flexible Production," *Industrial Relations* 25 (2) (Spring 1986): 167–182.

[34]P. Adler, "New Technologies, New Skills," *California Management Review* 29 (1) (Fall 1986): 9–28.

[35]P. Capelli, *Are Skill Requirements Rising? Evidence from Production and Clerical Jobs* (Philadelphia: National Center on the Educational Quality of the Workforce, 1991).

[36]P. Capelli, *Is the "Skills Gap" Really About Attitudes?* (Philadelphia: National Center on the Educational Quality of the Workforce, 1992).

[37]U.S. Department of Labor, *Skills and Tasks for Jobs: A SCANS Report for America 2000* (Washington, D.C.: 1990).

Listening
Speaking

Thinking Skills
Creative Thinking
Decision Making
Problem Solving
Seeing Things in the Mind's Eye
Knowing How to Learn
Reasoning

Personal Qualities
Responsibility
Self-Esteem
Sociability
Self-Management
Integrity/Honesty

In summary, the preponderance of the research evidence argues that there are trends toward greater education and training requirements and a greater need for critical-thinking skills, personal responsibility, and social skills among work force participants. However, these trends are not uniform across industries and occupations, and some disagree about their magnitude.

Returns to Education and Training

Research has consistently documented positive labor market returns to increasing educational attainment. For example, both rates of employment and labor force participation rise with educational attainment. In 1996, 39 percent of adults who had not completed high school were employed, while 70 percent of those with at least some college (including those with postsecondary vocational certificates) were employed (table 6). Similarly, more than half (56 percent) of people lacking a high school education were not in the labor force, compared with 27 percent of those with at least some college education. The unemployment rate of those who had not completed high school was twice that of adults with some college education (10 percent versus 4 percent, among labor force participants). Additionally, in 1996, median weekly earnings for full-time workers generally increased as the education and training requirements of an occupation increased (table 5). For example, while workers in jobs requiring no more than short-term on-the-job training earned $337 per week, on average, those with an associate's degree earned almost twice as much ($639).

Table 6—Percentage distribution of all adults aged 18 years or older and of those in the labor force according to their employment status, by educational attainment: 1996

	Of all adults			Adults in labor force	
Educational attainment	Employed	Unemployed	Not in labor force	Employed	Unemployed
Total	65.1	3.2	31.8	95.3	4.7
Less than high school completion	39.4	4.4	56.2	90.0	10.0
High school completion	63.7	3.7	32.6	94.5	5.5
Some college, no degree	69.7	3.0	27.3	95.9	4.2
Associate's degree	77.5	2.6	20.0	96.8	3.2
Bachelor's degree or higher	79.6	1.7	18.7	97.9	2.1

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Commerce, Bureau of the Census, October Current Population Survey, 1996.

While there is a consistent and strong association between education and training and labor market success, to some extent, these greater returns may be due to "selection bias." That is, persons attaining higher levels of education may be different from those with lower educational attainment in ways—exclusive of education—that affect labor market success. If this is true, then the impact of obtaining more education and training on success in the labor market, in itself, may be overstated. However, recent increases in income disparities between those with more and less education suggest that there are, in fact, direct returns to education and training.

The trend away from a manufacturing-based economy toward a services-based one has been positive for many individuals and industries.[38] This is not to say, however, that recent changes have benefited everyone. Those without the appropriate education and skills to meet the demands of an increasingly competitive and technical marketplace have watched their wages stagnate and decline over the past 20 years. The rise of information technologies has contributed to the widening inequality in income. Disparities between the more and less educated have increased, and individuals whose work involves less conceptual activities have had either stagnant or falling real income over the past two decades. Table 7 and figure 4 illustrate that income inequality has widened over the period from 1970 to 1995 between holders of high school diplomas and those who have earned bachelor's degrees or higher.

[38]A. Greenspan, "Job Insecurity and Technology," address given at the Federal Reserve Bank of Boston's Conference on Technology and Growth, June 1996.

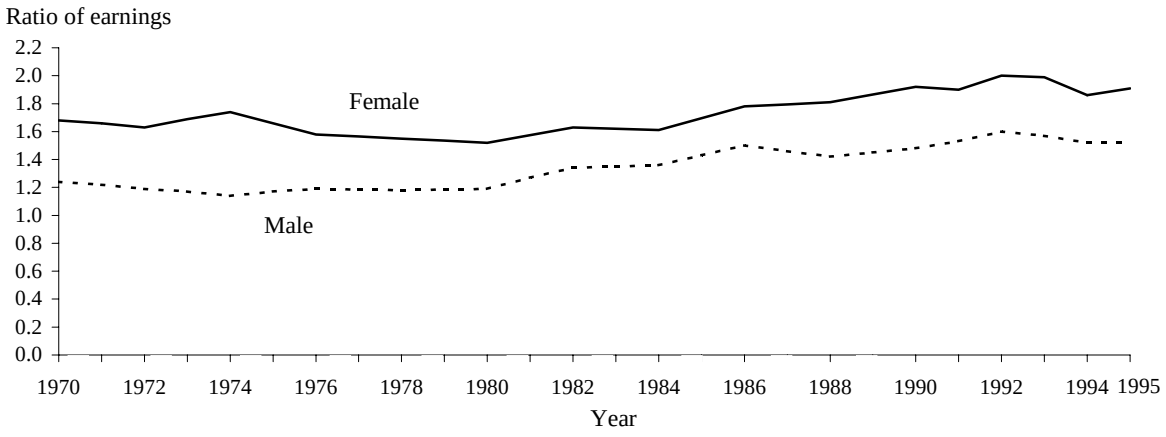
Table 7—Ratio* of median annual earnings of wage and salary workers aged 25–34 whose highest education level was a bachelor's degree or higher to those with a high school diploma, by sex: Selected years 1970–95

Year	Male	Female
1970	1.24	1.68
1972	1.19	1.63
1974	1.14	1.74
1976	1.19	1.58
1978	1.18	1.55
1980	1.19	1.52
1982	1.34	1.63
1984	1.36	1.61
1986	1.50	1.78
1988	1.42	1.81
1990	1.48	1.92
1991	1.53	1.90
1992	1.60	2.00
1993	1.57	1.99
1994	1.52	1.86
1995	1.52	1.91

*This ratio is most useful when compared to 1.0. For example, the ratio of 1.52 in 1995 means that males whose highest education level was a bachelor's degree or higher earned 52 percent more than males who had a high school diploma.

SOURCE: U.S. Department of Commerce, Bureau of the Census, March Current Population Surveys.

Figure 4—Ratio* of median annual earnings of wage and salary workers aged 25–34 with a bachelor's degree or higher to those with a high school diploma, by sex: Selected years 1970–95



*This ratio is most useful when compared to 1.0. For example, the ratio of 1.52 in 1995 means that males whose highest education level was a bachelor's degree or higher earned 52 percent more than males who had a high school diploma.

SOURCE: U.S. Department of Commerce, Bureau of the Census, March Current Population Surveys.

The reported benefits of higher educational attainment are consistent with recent vocational education reforms emphasizing greater academic preparation and further education and training. Research has also shown the following positive employment and earnings outcomes for participants in vocational education:[39]

1) High school students who concentrate their coursework in a vocational field of study have been shown to have better employment and earnings outcomes than those who take fewer than 2.0 credits in a single vocational field;
2) Vocational completers who obtain a job in an occupation that matches their vocational field of study have been shown to outperform their peers who obtain employment in an unrelated field;
3) Female high school students who complete coursework in the business and health fields have been shown to have better outcomes than those who train in other fields. Similarly, both male and female postsecondary students who complete coursework in the health and technical fields have been shown to have better outcomes than those who train in other vocational fields;
4) Students who pursue their vocational studies at a community college have been shown to have better outcomes than students attending other types of postsecondary institutions; and
5) Postsecondary students who complete a vocational program and obtain a degree or certificate have been shown to have better outcomes than those who do not complete or obtain certification.

Participating in vocational education has also been shown to have particular economic benefits for women in general and students with disabilities.

KEY FINDINGS

The following presents a summary of key findings based on the discussion in this chapter:

- The United States is shifting from a manufacturing- to a service- and information-based economy. These trends have two important implications for vocational education programs. They signal an ongoing shift in the education and training fields that are required of the U.S. work force as well as the levels of that education and training.

[39]D. Boesel, L. Hudson, S. Deich, and C. Masten, "Employment Outcomes," *National Assessment of Vocational Education Final Report to Congress, Vol. II,* Chapter Six (Washington, D.C.: U.S. Department of Education, Office of Educational Research and Improvement, 1994).

- The occupations with the highest projected growth rates are generally in the computer technology and health fields. Those with the highest projected increase in number of jobs are somewhat more varied, although they also include several health occupations.

- While the occupations with the highest projected growth rates have relatively high education and training requirements, those with the highest projected increase in number of jobs have relatively low education and training requirements. Some emerging occupations require high education and training requirements, while the majority of jobs still demand relatively low education and training levels.

- There is consensus in the research literature that there are trends toward greater education and training requirements and a greater need for critical thinking, personal responsibility, and social skills among work force participants. However, these trends are not uniform across industries and occupations, and some disagree about their magnitude.

- Although researchers have long identified the association between increased educational attainment and better labor market outcomes, the disparity in incomes between those with more and less education has increased in recent years. Some argue that this means that education and training are increasingly crucial for narrowing the income gap and for preventing the creation of a society of haves and have nots.

- Research has shown that positive employment and earnings outcomes accrue to participants in vocational education who concentrate their coursework in a vocational field of study in high school, who complete a postsecondary vocational program and obtain a certificate or degree, and who obtain a job in a field related to their vocational education.

IMPLICATIONS FOR DATA ANALYSIS

How might the economic and labor market trends in this chapter be reflected in employer, education, and labor market data? The following is a list of questions to guide readers as they examine the data in the following chapters:

- What skills do employers value and how have skill requirements changed in recent years? Are employers implementing high-performance workplaces?

- What are the trends in specific occupational preparation at the high school and postsecondary levels? Specifically, is there a shift from participation in traditional manufacturing programs (such as trade and industrial programs) toward service-sector and information-age programs (such as health and technology and communications programs)?

- Are high school students enrolling in courses that teach technological skills?

- Are students who participate in high school vocational education more academically prepared than in the past, for either the world of work or postsecondary education?

- Are more students in secondary vocational education programs enrolling in and completing postsecondary education than in the past? Are more adults obtaining postsecondary vocational education credentials than before?

- What are the labor market outcomes for persons concentrating in vocational education programs? How do these outcomes compare with other kinds of preparation?

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III. Employer Perspectives

OVERVIEW

This chapter examines how workplaces are changing and how employers view current and prospective employees. The analysis relies on the 1994 and 1997 National Employer Surveys, which gathered data from a random sample of private firms with 20 or more employees. Public and not-for-profit institutions, firms with fewer than 20 employees, and corporate headquarters were not surveyed.[40,41] Additional information on the surveys is provided in appendix B.

Key questions about workplace practices examined in this chapter include the following:

- To what extent are firms becoming "high-performance workplaces"?
- What percentage of firms are participating in school-to-work partnerships?
- What forms does this participation take?

The extent to which firms are becoming "high-performance workplaces" may affect the types of skills demanded of employees. Because "high-performance workplaces" are typically decentralized, they demand flexibility and multiple skills from workers. Additionally, employees need to have good critical-thinking and problem-solving skills, and since they often work in teams, good communication and social skills are also necessary. The National Employer Surveys also asked about employer participation in school-to-work partnerships. These data provide one indication of the extent to which the integration of school- and work-based learning is occurring at the local level.

In this chapter, a number of key questions about employer perspectives on employees are addressed, including the following:

[40]Because corporate headquarters were not included in the survey sample, and because several local establishments that fall under a single corporate headquarters might have been surveyed, the precise unit of analysis for these surveys is the "work establishment." To simplify the terminology used in this report, this chapter refers to the percentage of "firms" or "employers"—rather than "work establishments"—reporting specific characteristics.

[41]Problems with large nonresponse on certain survey items meant that some of the items could not be used for this report.

- What do employers look for in front-line workers? Is educational attainment important to employers?
- What percentage of front-line workers have postsecondary education?
- Have skill requirements and worker proficiency changed in recent years?
- How do new hires with work experience (such as cooperative education, internships, or apprenticeships) compare with other new hires?

These questions provide a counterpoint to what the research literature says about changing skill requirements. While the general labor market trend may be toward higher education and training requirements, employers have a unique perspective, which is particularly important in the short term. The National Employer Surveys also allow one to examine from the employer point of view whether previous work experience affects performance on the job, particularly for new hires. These findings have important implications for the current emphasis on providing work-based learning experiences to students.

WORKPLACE PRACTICES

High-Performance Workplaces

There is evidence that some employers are transforming their firms into high-performance workplaces, with larger firms being more likely than smaller firms to undergo certain changes. These firms, however, are still in the minority. Both good critical-thinking and social skills are necessary in the decentralized and team-based environment of the high-performance workplace. However, the extent to which these practices will be implemented and these skills be required in the future is uncertain.

- Between 20 and 25 percent of surveyed employers reported some form of high-performance work characteristic in 1997 (table 8). Twenty percent reported performance benchmarking, and one-quarter had recently undergone reengineering. Larger firms were more likely to participate in these activities. On average, about one in five nonsupervisory employees participated in job rotation in 1997, and about 16 percent of nonsupervisory employees worked in self-managed teams.

Table 8—Percentage of employers reporting selected high-performance work characteristics, by firm size: 1994 and 1997

Firm size (number of employees)	Percentage of employers who			Average percentage of nonmanagerial and nonsupervisory employees participating in	
	Adopted total quality management program	Underwent reengineering within past 3 years	Participated in performance benchmarking	Job rotation	Self-managed teams
			1994		
Total	36.6	—	22.7	18.8	13.1
20–49	33.1	—	19.2	21.6	13.8
50–99	37.3	—	24.6	13.7	12.0
100–249	42.6	—	26.2	16.7	12.1
250 or more	59.9	—	47.1	12.1	11.6
		—			
			1997		
Total	—	24.9	20.4	21.7	15.5
20–49	—	20.4	15.6	24.6	16.3
50–99	—	29.2	24.7	16.7	13.9
100–249	—	30.9	28.8	17.8	14.1
250 or more	—	44.9	39.3	18.4	16.5

—Not available.

SOURCE: 1994 National Employer Survey, Phase I, and 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

- In 1994, 37 percent of surveyed employers had adopted Total Quality Management (TQM) practices (table 8). Although larger firms were more likely to report adopting TQM, one-third of firms in the smallest category also reported these practices.

Employer Participation in School-to-Work Activities

Some employers are also participating in school-to-work partnerships and different kinds of work-based learning opportunities for students. Once again, however, these firms are in the minority.

- In 1997, one-quarter of surveyed employers reported participating in a school-to-work partnership (table 9; figure 5). Larger employers were more likely than smaller ones to report such participation.

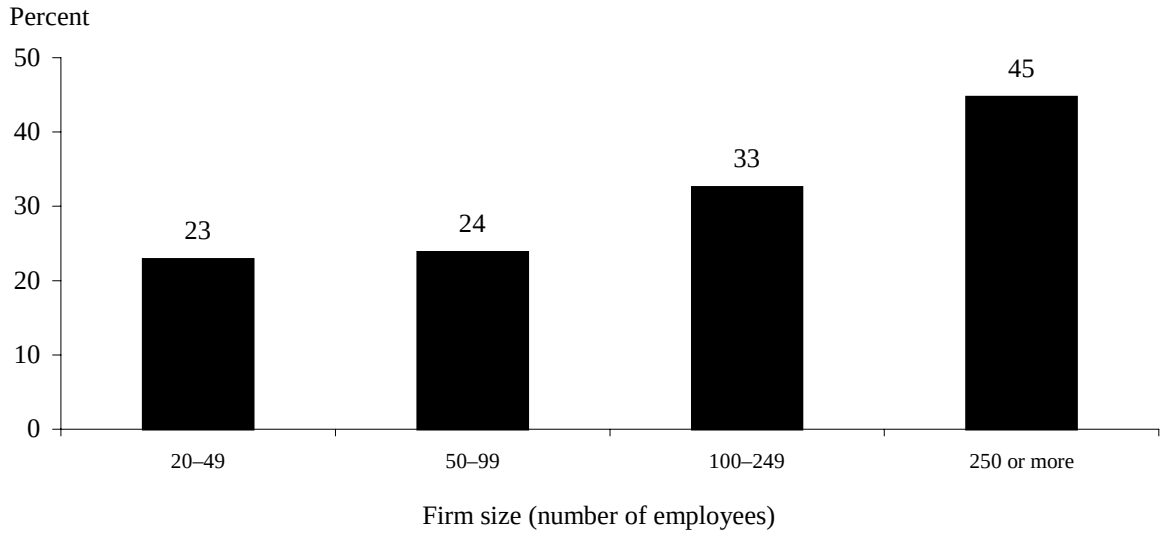
Table 9—Percentage of employers reporting that they were involved in a school-to-work partnership, by firm size: 1997

Firm size (number of employees)	School-to-work partnership
Total	25.4
20–49	22.9
50–99	23.8
100–249	32.6
250 or more	44.7

NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Figure 5—Percentage of employers reporting that they were involved in a school-to-work partnership, by firm size: 1997



NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

- Forty-two percent of employers in 1997 reported providing at least one formal work-based learning activity (table 10 and figure 6a). Twenty-one percent provided internships, 15 percent job shadowing, 14 percent cooperative education, and 10 percent mentoring. Larger employers and services industry employers were more likely to provide internships and job shadowing than other employers (table 10 and figure 6b).

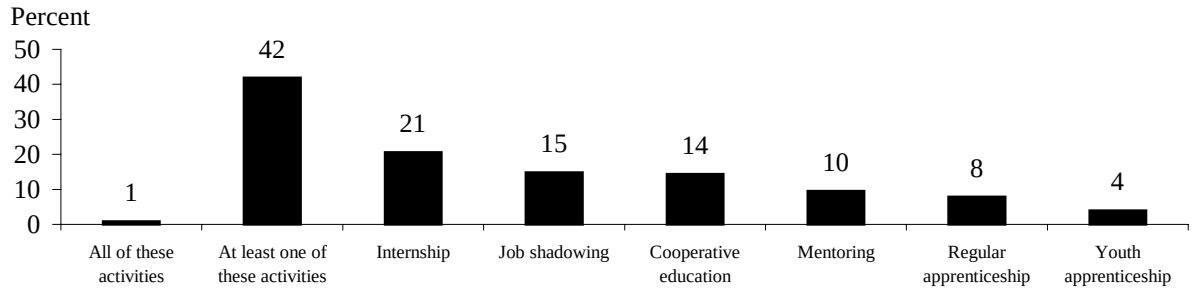
Table 10—Percentage of employers reporting that they participated in selected work-based learning activities, by firm size and type: 1997

Firm size and type	All of these activities	At least one of these activities	Internship	Job shadowing	Cooperative education	Mentoring	Regular apprenticeship	Youth apprenticeship
Total	0.8	41.9	20.6	14.8	14.4	9.5	7.8	3.9
Firm size (number of employees)								
20–49	1.3	35.2	17.0	14.6	12.2	9.2	8.1	4.3
50–99	0.0	47.1	18.9	13.0	15.4	7.7	7.4	3.0
100–249	0.2	54.2	29.3	14.9	19.1	10.6	7.4	3.6
250 or more	0.4	68.5	48.6	24.6	24.0	19.4	7.4	3.7
Firm type								
Construction, manufacturing, and transportation	0.0	39.7	16.6	9.0	11.1	5.2	12.3	1.5
Wholesale/retail trade	1.7	38.3	17.1	13.9	18.0	11.4	7.7	6.2
Services	0.1	50.5	31.0	22.6	11.6	11.1	3.1	2.4

NOTE: The sample is made up of private, for-profit employers with 20 or more employees. Estimates appearing as 0.0 may be nonzero but less than 0.05.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

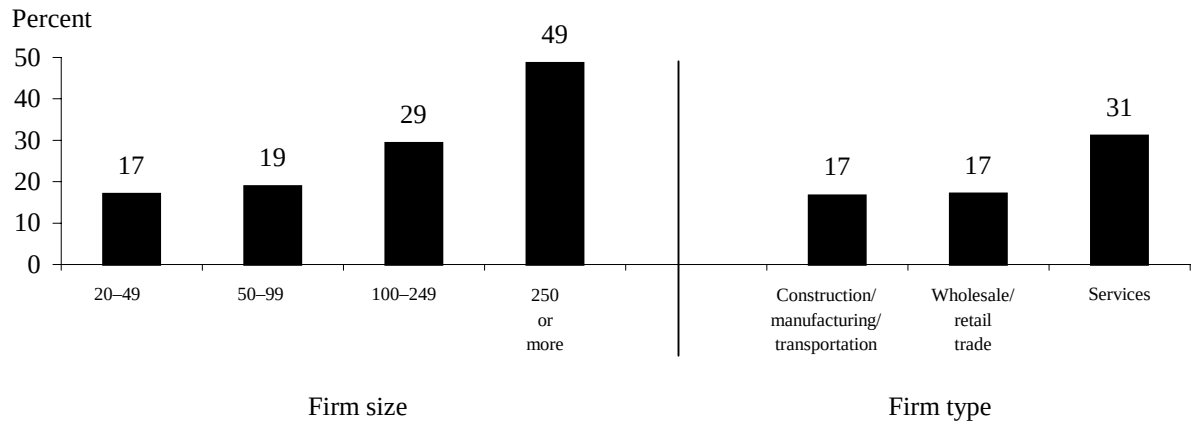
Figure 6a—Percentage of employers reporting that they participated in selected work-based learning activities: 1997



NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Figure 6b—Percentage of employers reporting that they offered internships, by firm size and firm type: 1997



NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

PERSPECTIVES ON EMPLOYEES

Hiring Practices

Employers do not rate years of completed schooling or high academic performance as important as attitude and communication skills, when hiring front-line workers from among an established applicant pool.[42] However, it may be that years of completed schooling and high academic performance are more important during initial applicant screening.[43] It may also be that employers have historically found that schooling measures are not reliable indicators of what students know and are able to do.[44] High academic performance may also not be as important as satisfactory academic performance.

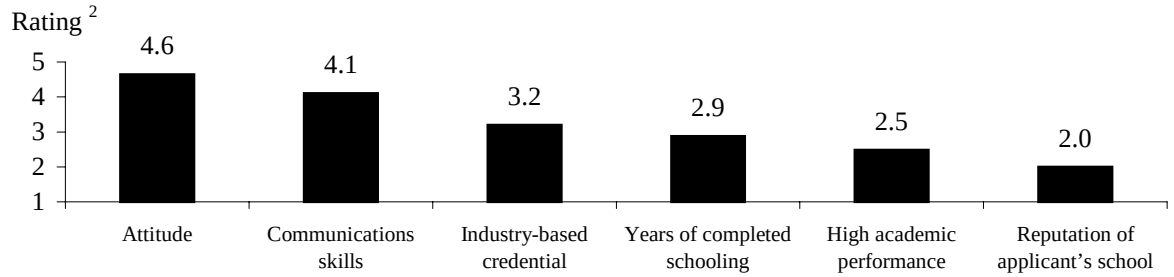
[42]For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.

[43]The surveys also did not ask whether education level or high academic performance were factors in retaining employees.

[44]In recent years, there have been several efforts to reinforce the connection between school performance and workplace success. For example, in 1997 the Business Coalition for Education Reform, which includes the National Alliance of Business and other organizations, began a two-year nationwide effort to encourage the use of school records in the hiring process. See J. Hughes, "Business Group Encourages Employers to Seek Prospective Workers' Academic Transcripts," in *Chronicle of Higher Education* (Washington, D.C.: February 11, 1999).

- In 1997, employers rated attitude and communications skills as the most important factors in hiring front-line workers from an established applicant pool (4.6 and 4.1 on a 5-point scale) (figure 7). In a list of six possible hiring factors, years of completed schooling ranked fourth in importance, and high academic performance fifth (2.9 and 2.5 on a 5-point scale).

Figure 7—Average employer rating of hiring factors for front-line workers[1] in an established applicant pool: 1997



[1]For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.
[2]On a 1–5 scale, a response of 1 indicates the hiring factor is not important and is not considered in hiring; a rating of 5 indicates it is very important to employers in hiring.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Education Levels of Front-Line Workers

Firms in the services industry report higher education levels of front-line workers than firms in the wholesale/retail trade industry and the construction, manufacturing, and transportation industries.[45]

- The education levels of front-line workers employed in service firms were higher than those of their counterparts employed in other types of firms in 1997 (table 11; figure 8). Fifty-six percent of front-line workers in service firms had at least some postsecondary education, compared with 20 percent of front-line workers in construction, manufacturing, and transportation firms and 39 percent of these workers in wholesale and retail trade firms.

[45]For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.

Table 11—Percentage distribution of employers according to their estimations of the education levels of new front-line workers,[1] by firm type: 1997

Firm type	Some postsecondary education[2]	High school diploma or less
Total	36.8	63.2
Construction, manufacturing, and transportation	20.4	79.6
Wholesale/retail trade	38.7	61.3
Services	56.1	43.9

[1]For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.

[2]Certification, some college, 2-year degree, or 4-year degree or higher.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees. Percentages may not add to 100 due to rounding.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Figure 8—Average percentage of front-line workers[1] reported by employers to have at least some postsecondary education,[2] by firm type: 1997

[1]For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.

[2]Certification, some college, 2-year degree, or 4-year degree or higher.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

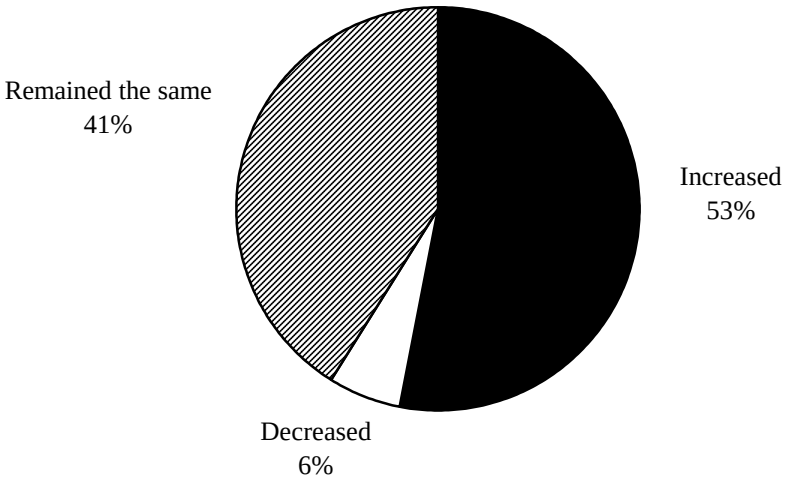
SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Skill Requirements

Most employers report that front-line skill requirements are increasing.

- In 1997, 53 percent of employers reported that the skills required to do production or support jobs at an acceptable level increased in the previous 3 years, while 41 percent reported that required skills stayed the same and 6 percent reported that they decreased (figure 9).

Figure 9—Percentage distribution of employers reporting that the skills required to do production or support jobs at an acceptable level increased, decreased, or remained the same during the last 3 years: 1997



NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Worker Proficiency and Training

According to most employers, the proficiency of their front-line workers either stayed the same or increased between 1994 and 1997. Employer-provided training, which also increased over this 3-year period, may have contributed to proficiency gains. Alternatively, education reform efforts over the last decade may have contributed to the improvement in worker proficiency. In either case, it is impossible to establish a causal link from the available data.

- Fifty-five percent of employers surveyed in 1997 reported that the proficiency of front-line workers remained the same over the last 3 years (1994–97) (table 12). About one-third said the proficiency of these workers increased, while 14 percent said it decreased. Firms in the lowest revenue category (less than $1 million per year) were generally less likely to report that the proficiency of their front-line workers increased (figure 10).

Table 12—Percentage distribution of employers reporting that the proficiency of front-line workers* has increased, decreased, or remained the same during the last 3 years, by firm revenues: 1997

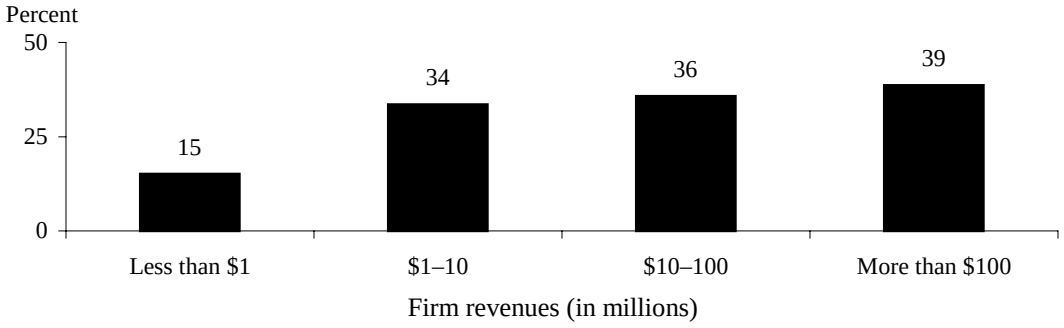
1996 Firm revenues (in millions)	Increased	Decreased	Remained the same
Total	31.9	13.7	54.5
Less than $1	15.2	22.1	62.8
$1–10	33.5	10.1	56.4
$10–100	35.7	14.4	49.8
More than $100	38.6	6.7	54.7

*For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees. Percentages may not add to 100 due to rounding.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Figure 10—Percentage of employers reporting that the proficiency of front-line workers* has increased during the last 3 years, by firm revenues: 1997



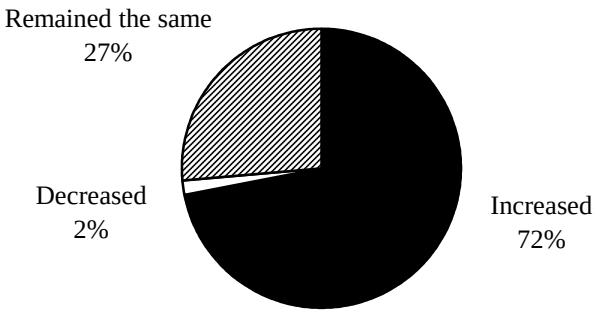
*For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

- Seventy-two percent of employers in 1997 reported increasing the amount of formal training provided to workers in the previous 3 years (figure 11a). Economic reasons—to remain competitive and improve the quality of output—were more likely to be given as the cause of this increase in training than lack of skills among newly hired workers (figure 11b).

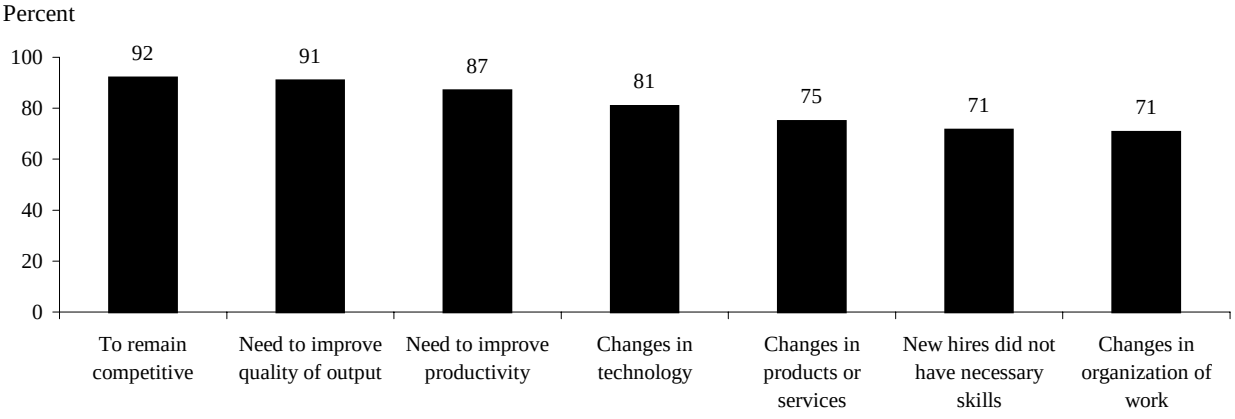
Figure 11a—Percentage distribution of employers reporting that the formal training provided to employees has increased, decreased, or remained the same during the last 3 years: 1994



NOTE: The sample is made up of private, for-profit employers with 20 or more employees. Percentages may not add to 100 due to rounding.

SOURCE: 1994 National Employer Survey, Phase I. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Figure 11b—Percentage of employers reporting an increase in formal training during the last 3 years, by reason for increase: 1994



NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1994 National Employer Survey, Phase I. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Comparing Previous Work-Based Learning and On-the-Job Experiences

The majority of employers with new front-line employees who participated in work-based learning report that these employees are superior to comparable new hires in terms of productivity and attitude. Virtually no employers report that new front-line workers with work-based learning experience are inferior in these two respects to comparable new hires.[46]

- In 1997, of those employers who reported hiring front-line workers with prior work-based learning experience (cooperative education, internships, or apprenticeships), most were more satisfied with these new hires than with other newly hired front-line workers aged 18–25 (table 13; figures 12a and 12b). Sixty-two percent reported that the new hires with work-based learning experience were more productive than workers aged 18–25 without such experience. Sixty-five percent reported that the attitude of these employees was better than that of their counterparts. At least one-third of employers reported that the productivity or attitude of front-line workers with work-based learning experience was about the same as that of other young new hires. No more than 1 percent of employers reported that the productivity or attitude of front-line workers with work-based learning experience was worse than that of other young new hires.

Table 13—Among firms with employees with work-based learning (WBL) experience, percentage distribution of employers according to their evaluations of new front-line workers[1] with WBL experience[2] versus their non-WBL counterparts aged 18–25, by selected employee characteristics: 1997

Selected employee characteristics	Rated WBL employees the same	Rated WBL employees better	Rated WBL employees worse
Productivity	37.6	61.9	0.5
Attitude	34.0	65.1	0.9

[1]For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.

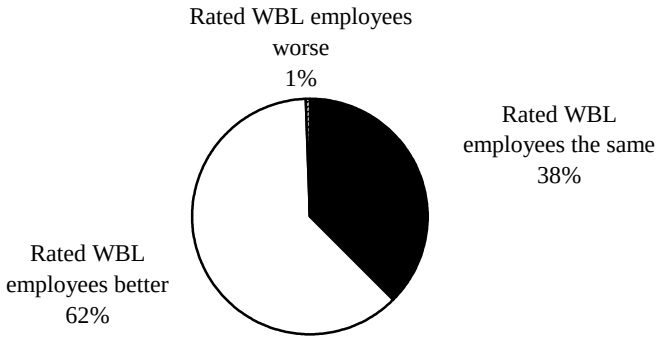
[2]The work-based learning experiences of these new front-line workers may have taken place at the current employer's firm or at another firm.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees. Percentages may not add to 100 due to rounding.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

[46]The work-based learning experiences of these new front-line workers may have taken place at the current employer's firm or at another firm. The survey did not specify the location of the work-based learning in question.

Figure 12a—Percentage distribution of firms with work-based learning (WBL) employees according to their evaluations of the productivity of new front-line workers[1] with WBL experience[2] versus their non-WBL counterparts aged 18–25: 1997

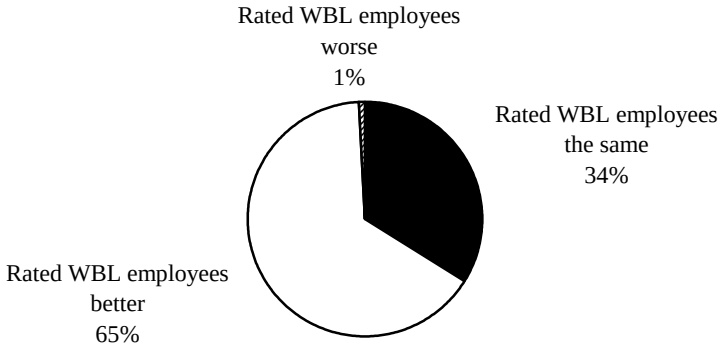


[1]For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.
[2]The work-based learning experiences of these new front-line workers may have taken place at the current employer's firm or at another firm.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees. Percentages may not add to 100 due to rounding.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

Figure 12b—Percentage distribution of firms with work-based learning (WBL) employees according to their evaluations of the attitude of new front-line workers[1] with WBL experience[2] versus their non-WBL counterparts aged 18–25: 1997



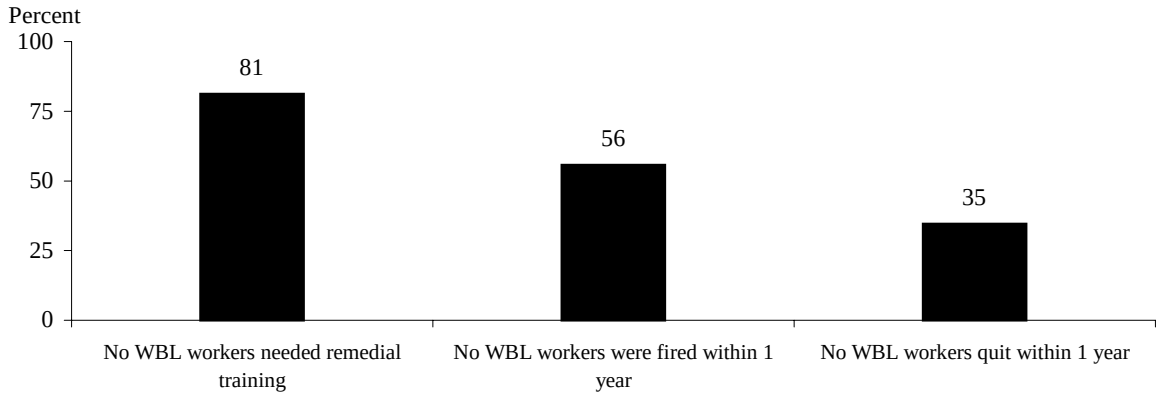
[1]For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.
[2]The work-based learning experiences of these new front-line workers may have taken place at the current employer's firm or at another firm.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

- Eighty-one percent of firms in 1997 who reported hiring front-line workers with prior work-based learning experience reported that none of these new hires needed remedial training in reading or mathematics (figure 13). Fifty-six percent of these firms also reported that none of their front-line workers with work-based learning experience were fired within 1 year of being hired, and 35 percent reported that none of these employees quit within a year of being hired. However, the survey did not ask for comparable information about front-line workers who did not have prior work-based learning experience.

Figure 13—Percentage of firms with work-based learning (WBL) employees reporting that none of their new front-line workers* with WBL experience needed remedial training or were fired or quit within 1 year: 1997



*For manufacturing establishments, the term "front-line workers" includes production workers; for other establishments, the term refers to sales and customer service workers.

NOTE: The sample is made up of private, for-profit employers with 20 or more employees.

SOURCE: 1997 National Employer Survey, Phase II. Administered by the U.S. Bureau of the Census; designed and funded by the National Center on the Educational Quality of the Workforce at the University of Pennsylvania.

IV. Trends in Secondary Vocational Education

OVERVIEW

This chapter provides information on trends in secondary vocational education during the period 1982–1994. Because little vocational education has historically been provided by private schools, the analysis focuses on public high schools (grades 9 through 12). The chapter also provides data on school reform efforts as of 1997 and teacher trends from 1991 to 1994. Specifically, this chapter provides information on these key topics:

- participation in vocational education
- characteristics of students participating in vocational education
- academic coursetaking and achievement
- school reform efforts
- work experience and work-based learning
- technology literacy
- vocational teachers

When making comparisons among different groups of high school graduates, three curriculum-based definitions were used:

Vocational concentrators completed 3.0 or more credits in a single occupational program area.[47] These program areas include the following:

- agriculture and renewable resources
- business
- marketing and distribution

[47]A second definition was also sometimes used: *vocational specialists* completed 4.0 or more credits in a single occupational program area, with 2.0 or more of these units taken beyond the introductory level. However, the report generally focuses on the first, less restrictive definition of vocational concentrators.

- health care
- public and protective services
- trade and industry
- technology and communications
- child care and education
- food service and hospitality
- personal and other services

College preparatory students completed a college preparatory course of study that was consistent with the prevailing entrance requirements at public 4-year institutions.[48] These included 4.0 credits in English; 3.0 credits in mathematics at the Algebra 1 level or higher; 2.0 credits in biology, chemistry, and/or physics; 2.0 credits in social studies with at least 1.0 credit in U.S. or World History; and 2.0 credits in a single foreign language.

Other/general students met neither of the above criteria.

Students who met both the vocational concentrator and college preparatory criteria were included in the vocational concentrators total in the tables and figures. Students who met only the vocational concentrator criteria, as well as the "both" group, were also reported separately. In most instances, the chapter focuses on the vocational concentrators total, and refers to this group simply as "vocational concentrators." When the chapter describes students who met only the vocational concentrator criteria or those who met both the vocational concentrator and college preparatory criteria, the text makes it clear that these subgroups are being discussed.

As previewed in the Introduction, the data sets used in this chapter include the following:

- *High School and Beyond (HS&B)* Sophomore Cohort Surveys and High School Transcript Study (describing 1982 high school graduates)
- *High School Transcript Studies (HSTS)* of 1990 and 1994 (describing 1990 and 1994 high school graduates)
- *National Education Longitudinal Study of 1988 (NELS:88)* Surveys, Assessment File, and High School Transcript Study (describing 1992 high school graduates)

[48]P. Flanagan, *Raising Standards: State Policies to Improve Academic Preparation for College* (Rockville, MD: Westat, 1992).

- *National Longitudinal Study of Youth (NLSY)* of 1997 (describing schools with a 12th grade)

- *Schools and Staffing Surveys (SASS)* of 1991 and 1994 (describing teachers)

The first three data sets, HS&B, HSTS:90, and HSTS:94, form the foundation of the trend analysis in this chapter. They contain transcript data, which provide a rich source of information on course-taking patterns, as well as other survey information. NELS:88 was used primarily to examine the relationship between vocational coursetaking and achievement test gains between the 8th and 12th grades. NLSY provided information on the extent to which certain school reforms have been implemented in public schools with a 12th grade.[49] SASS was used to provide trend data (1991–94) on the qualifications, experience, and demographic characteristics of vocational teachers, as well as to allow comparisons with other teachers. SASS:94 included questions that provide baseline data on teachers' professional development activities.

PARTICIPATION IN VOCATIONAL EDUCATION

From 1982 to 1994, there was a general decline in the participation of high school students in vocational education. The percentage of public high school graduates taking at least one vocational education course decreased slightly. However, the decline in the percentage of graduates completing a sequence of related occupational courses was more dramatic. These decreases may be partly due to increases in high school graduation requirements implemented by many states after the publication of *A Nation at Risk*[50] in 1983. As students have been required to take more academic coursework, they may have elected to take fewer vocational courses. See figure 1 in the Introduction for a summary of the high school curriculum categories referred to in this section (that is, the academic, vocational (and its subcategories), and enrichment/other curricula).

- The total amount of coursework completed by public high school graduates increased, on average, from 21.6 credits in 1982 to 24.2 credits in 1994, an increase of 12 percent (table 14; figure 14). This change was driven by a 23 percent increase in completed academic credits. The average number of credits public high school graduates earned in the enrichment/other curriculum remained steady over this time period at about 2.6, while the average number of vocational credits earned fell from 4.7 to 4.0. In 1994, credits

[49]Unfortunately, due to an error during the sample design stage, schools classified by their districts as primarily "vocational" were excluded from the NLSY sample. Consequently, the survey generally describes comprehensive high schools and, therefore, may provide a conservative estimate of local reform efforts.

[50]National Commission on Excellence in Education, *A Nation at Risk* (1983).

earned in the vocational education curriculum fell to 16 percent of total high school credits, while the share in 1982 was about 22 percent.

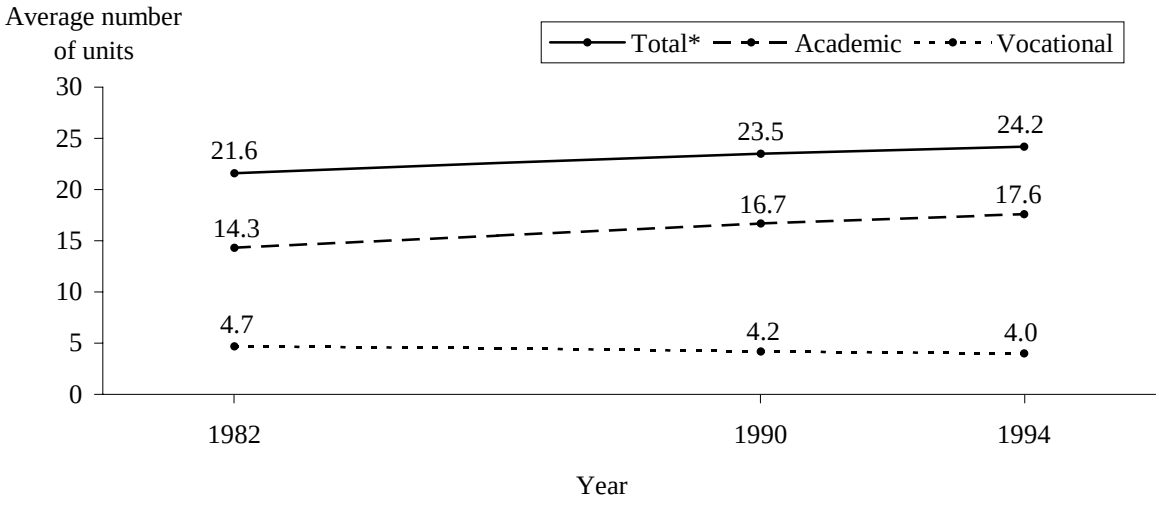
Table 14—Average number of Carnegie units accumulated by public high school graduates, by type of coursework: 1982, 1990, and 1994

Type of coursework	1982	1990	1994
Total	21.60	23.53	24.17
Academic	14.28	16.66	17.58
Vocational total	4.68	4.19	3.96
Specific labor market preparation	3.03	2.89	2.79
General labor market preparation	0.95	0.73	0.64
Consumer and homemaking education	0.69	0.57	0.52
Enrichment/other	2.64	2.68	2.63

NOTE: Averages may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Figure 14—Average number of Carnegie units accumulated by public high school graduates in academic and vocational curricula: 1982, 1990, and 1994



*Includes Carnegie units earned in enrichment/other courses.

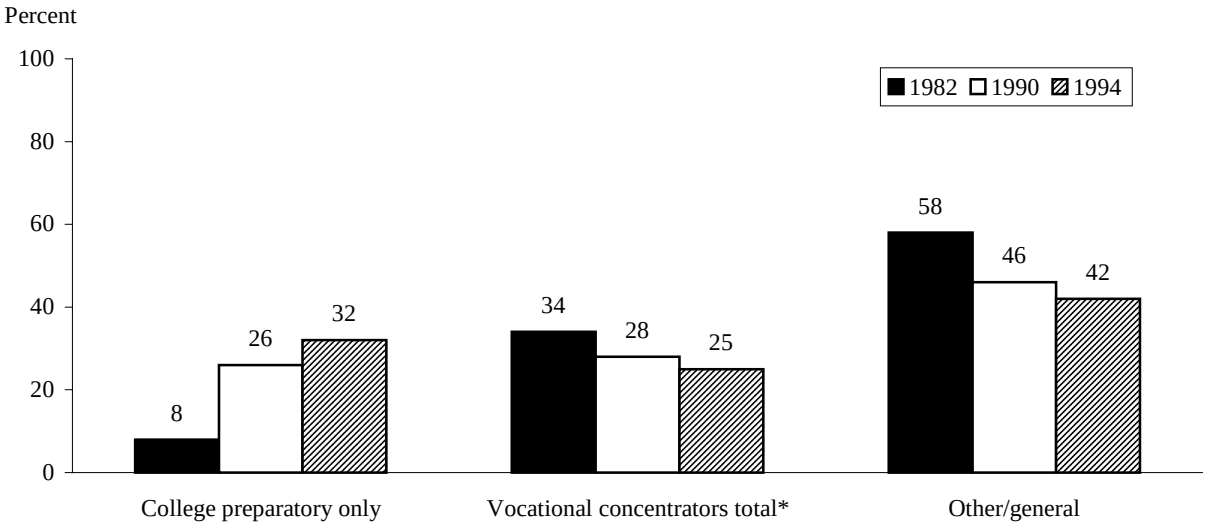
SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- The percentage of public high school graduates taking at least one vocational education course decreased slightly from 98.2 percent in 1982 to 97.2 percent in 1994 (table 1 in

the Introduction). Although the percentage of graduates taking at least one specific labor market preparation course increased slightly from 88.7 percent in 1982 to 90.8 percent in 1994, the average amount of coursework completed in the specific labor market preparation curriculum declined from 3.0 credits to 2.8 credits over the same time period (tables 1 and 14).

- The percentage of graduates concentrating in the vocational curriculum (taking three or more courses in a single occupational program area) decreased from 34 percent in 1982 to 25 percent in 1994, a decline of about 25 percent (figure 15; table 15). The percentage of graduates specializing in the vocational curriculum (taking four or more courses in a single occupational program area with at least two of those courses beyond the introductory level) declined more dramatically, from 13 percent in 1982 to 7 percent in 1994, a decline of about 44 percent.

Figure 15—Percentage distribution of public high school graduates according to their curriculum specialization in high school: 1982, 1990, and 1994



*Includes students who completed both a vocational concentration and a college preparatory curriculum.

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Table 15—Percentage of public high school graduates concentrating (accumulating 3 or more credits) and specializing (accumulating 4 or more credits with 2 or more of those credits beyond the introductory level) in vocational programs: 1982, 1990, and 1994

Vocational completers	1982	1990	1994
Concentrators	33.7	27.8	25.4
Specialists	12.6	7.7	7.0

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- Trade and industry and business were the most popular occupational programs in 1994—about 8 percent of graduates concentrated in each of these areas (table 16). These were also the most popular programs in earlier years; however, the percentage of graduates concentrating in trade and industry, as well as the percentage concentrating in business, declined over the period studied. In 1982, about 15 percent of graduates had concentrated in trade and industry and 12 percent in business.

- Fewer students concentrated in health care and in technology and communications than in business and in trade and industry in all the surveyed years from 1982 to 1994 (table 16). However, contrary to business and trade and industry trends, the proportions of students who concentrated in health care and in technology and communications increased between 1982 and 1994.[51]

CHARACTERISTICS OF STUDENTS PARTICIPATING IN VOCATIONAL EDUCATION

Although participation in the specific occupational curriculum declined for most groups of students between 1982 and 1994, there were a few exceptions to this trend. The percentage of black and Asian/Pacific Islander students concentrating in vocational education stayed about the same over this period, and the concentration rate of students with disabilities increased.[52] In addition, the average number of specific occupational credits earned by blacks stayed about the same and increased for Asians/Pacific Islanders and students with disabilities. The increase in participation of students with disabilities is consistent with the emphasis of the 1990 Perkins Act on serving students with special needs.

[51]For the health program area, the increase occurred primarily between 1990 and 1994.

[52]For simplicity's sake, this report refers to "black, non-Hispanic" students as "black" and "white, non-Hispanic" students as "white." However, it should be remembered that all Hispanic students, regardless of race, are included in the Hispanic group.

Table 16—Percentage of public high school graduates concentrating (accumulating 3 or more credits) in various vocational programs: 1982, 1990, and 1994

Year	Agriculture and renewable resources	Business	Marketing and distribution	Health care	Public and protective services	Trade and industry	Technology and communi-cations	Occupational home economics			
								Total	Personal and other services	Food service and hospitality	Child care and education
1982	2.8	11.6	1.8	0.6	0.0	14.8	0.5	1.7	1.3	0.2	0.2
1990	2.5	8.4	2.1	0.6	0.0	11.2	0.8	2.0	1.3	0.5	0.3
1994	3.2	7.7	2.2	1.0	0.0	8.5	0.9	2.0	1.1	0.4	0.6

NOTE: Estimates appearing as 0.0 may be nonzero but less than 0.05.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

In all the surveyed years from 1982 to 1994, male students, students in rural schools, and students with lower grade-point averages (GPAs) completed more specific occupational coursework and were more likely to be vocational concentrators than female students, students in urban and suburban schools, and students with higher GPAs.

Participation in Vocational Education Overall

Although the decline in vocational coursetaking between 1982 and 1994 was apparent for most groups, the decline was steeper for females than males and for Hispanics than other racial–ethnic groups. In contrast, students with disabilities increased their vocational coursetaking over this period.

- In 1994, both male and female public high school graduates earned approximately 24 credits in total coursework (table 17). Females averaged about 18 credits in academic classes, whereas males averaged 17. Both females and males increased their academic coursework from 1982 to 1994. However, the rate of increase was faster for female high school graduates than for their male counterparts, resulting in a greater gender difference in academic course completion in 1994 than in 1982. The number of vocational credits completed by both male and female public high school graduates decreased between 1982 and 1994. Although males and females completed about the same amount of vocational coursework in 1982, the number of vocational credits earned by females decreased at a faster rate than that of male graduates from 1982 to 1994. Consequently, males earned more vocational credits than females in 1994, completing 4.1 credits versus 3.8 for females.

- In all the surveyed years from 1982 to 1994, Asian/Pacific Islander students completed fewer courses in the vocational curriculum than did students of other race–ethnicities (table 18). Asians/Pacific Islanders earned about 3.0 vocational credits in 1994, while other students completed between 3.9 and 4.3 credits, on average. Hispanic students completed more vocational credits than white students in 1982; however, the two groups completed similar amounts in 1990 and 1994.[53] All students, despite their race–ethnicity, decreased the amount of vocational coursework they completed between 1982 and 1994. During this period, Hispanics had the sharpest decline in the amount of vocational coursework completed.

[53]The data show no other significant differences among racial–ethnic groups pertaining to the completion of vocational credits in 1982, 1990, and 1994.

Table 17—Average number of Carnegie units accumulated by public high school graduates, by type of coursework and sex: 1982, 1990, and 1994

Type of coursework and sex	1982	1990	1994
Total	21.60	23.53	24.17
Male	21.43	23.35	23.99
Female	21.76	23.69	24.34
Academic	14.28	16.66	17.58
Male	14.00	16.17	17.03
Female	14.55	17.10	18.11
Vocational total	4.68	4.19	3.96
Male	4.68	4.32	4.13
Female	4.68	4.08	3.80
Specific labor market preparation	3.03	2.89	2.79
Male	3.43	3.28	3.08
Female	2.66	2.53	2.52
General labor market preparation	0.95	0.73	0.64
Male	0.94	0.70	0.70
Female	0.97	0.76	0.58
Consumer and homemaking education	0.69	0.57	0.52
Male	0.31	0.33	0.35
Female	1.05	0.79	0.70
Enrichment/other	2.64	2.68	2.63
Male	2.75	2.87	2.83
Female	2.53	2.51	2.44

NOTE: Averages may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Table 18—Average number of Carnegie units accumulated by public high school graduates in the vocational and specific labor market preparation curricula, by race–ethnicity: 1982, 1990, and 1994

	Vocational total			Specific labor market preparation		
Race–ethnicity	1982	1990	1994	1982	1990	1994
Total	4.68	4.19	3.96	3.03	2.89	2.79
American Indian/Alaskan Native	4.93	4.62	4.26	3.40	3.16	2.84
Asian/Pacific Islander	3.31	3.07	3.01	2.01	2.07	2.13
Black, non-Hispanic	4.81	4.41	4.29	2.90	2.79	2.94
Hispanic	5.26	4.12	3.87	3.30	2.85	2.75
White, non-Hispanic	4.59	4.22	3.96	3.02	2.97	2.81

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- Students with and without disabilities increased at similar rates the amount of total high school coursework they completed between 1982 and 1994 (table 19). However, trends differed by type of coursework.[54] Students without disabilities completed 23 percent more academic credits in 1994 than they had completed in 1982, while students with disabilities maintained a steady academic course load of about 14 credits. In contrast, students without disabilities decreased their vocational coursetaking by 17 percent between 1982 and 1994, and students with disabilities increased their vocational coursework by about 24 percent over the same period. Therefore, although students with and without disabilities completed similar amounts of vocational coursework in 1982,

Table 19—Average number of Carnegie units accumulated by public high school graduates, by type of coursework and disability status: 1982, 1990, and 1994

Type of coursework and disability status	1982	1990	1994
Total	21.60	23.53	24.17
Has disability	21.32	22.81	24.00
No disability	21.63	23.54	24.18
Academic	14.28	16.66	17.58
Has disability	13.82	13.30	14.43
No disability	14.34	16.74	17.70
Vocational total	4.68	4.19	3.96
Has disability	4.82	6.01	5.99
No disability	4.66	4.14	3.88
Specific labor market preparation	3.03	2.89	2.79
Has disability	3.00	3.88	3.74
No disability	3.03	2.86	2.76
General labor market preparation	0.95	0.73	0.64
Has disability	1.05	1.28	1.45
No disability	0.95	0.72	0.61
Consumer and homemaking education	0.69	0.57	0.52
Has disability	0.77	0.86	0.79
No disability	0.69	0.56	0.51
Enrichment/other	2.64	2.68	2.63
Has disability	2.68	3.50	3.58
No disability	2.63	2.66	2.60

NOTE: Averages may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

[54]Total coursework includes academic, vocational, and enrichment/other coursework.

students with disabilities completed significantly more vocational credits than students without disabilities in 1990 and 1994. In fact, students with disabilities completed 54 percent more vocational credits in 1994 than students without disabilities. Students with disabilities also completed increasing numbers of enrichment/other credits throughout this period. In 1994, students with disabilities averaged 3.6 enrichment/other credits upon graduation, and students without disabilities earned 2.6 credits.

- In all the years surveyed, there was a positive relationship between graduates' GPAs and the total amount of coursework they completed (table 20). That is, graduates with higher GPAs completed more total coursework. Similarly, there was a positive association between GPA and academic coursetaking. Conversely, during this period, students with lower GPAs generally completed more vocational credits.

- In all the years surveyed, students graduating from rural high schools completed more vocational coursework than graduates of urban and suburban public high schools (table 21). These differences in vocational coursetaking remained relatively constant between 1982 and 1994.

Participation in Specific Occupational Programs

While specific occupational coursetaking declined for most groups between 1982 and 1994, it stayed about the same for blacks and for rural high school graduates. In addition, the number of specific occupational credits earned by Asians/Pacific Islanders and students with disabilities increased over the period studied.

- In 1994, male public high school graduates earned 22 percent more specific occupational credits than their female peers (table 17). This gender gap remained relatively constant between 1982 and 1994.

- Asian/Pacific Islander graduates increased their specific occupational coursetaking between 1982 and 1994 (table 18). Despite this increase, Asian/Pacific Islander graduates completed fewer specific occupational credits than students of other race–ethnicities in all the years studied. American Indian/Alaskan Native, Hispanic, and white graduates all completed fewer specific occupational credits in 1994 than they had in 1982, with the number of specific occupational credits earned by Hispanics decreasing at a faster rate than that of whites. Black students earned about the same number of specific occupational credits in all 3 years.

Table 20—Average number of Carnegie units accumulated by public high school graduates, by grade point average (GPA) and type of coursework: 1982, 1990, and 1994

GPA and type of coursework	1982	1990	1994
Total	21.60	23.53	24.17
GPA			
3.3 or more	22.93	24.66	25.35
2.6–3.29	22.05	23.99	24.62
1.6–2.59	21.08	22.99	23.39
Less than 1.6	19.60	21.35	21.58
Academic			
GPA			
3.3 or more	16.90	19.25	20.09
2.6–3.29	14.88	17.48	18.13
1.6–2.59	13.21	15.39	16.08
Less than 1.6	12.30	13.85	14.22
Vocational total			
GPA			
3.3 or more	3.44	2.79	2.77
2.6–3.29	4.46	3.82	3.84
1.6–2.59	5.25	4.89	4.62
Less than 1.6	4.88	4.97	4.78
Specific labor market preparation			
GPA			
3.3 or more	2.11	1.90	1.95
2.6–3.29	2.89	2.61	2.70
1.6–2.59	3.44	3.40	3.28
Less than 1.6	3.15	3.40	3.33
General labor market preparation			
GPA			
3.3 or more	0.80	0.57	0.49
2.6–3.29	0.90	0.71	0.64
1.6–2.59	1.05	0.81	0.71
Less than 1.6	0.93	0.73	0.76
Consumer and homemaking education			
GPA			
3.3 or more	0.53	0.32	0.33
2.6–3.29	0.66	0.51	0.51
1.6–2.59	0.76	0.68	0.62
Less than 1.6	0.80	0.85	0.69
Enrichment/other			
GPA			
3.3 or more	2.58	2.62	2.50
2.6–3.29	2.72	2.69	2.65
1.6–2.59	2.63	2.71	2.69
Less than 1.6	2.42	2.53	2.58

NOTE: Averages may not add to totals due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Table 21—Average number of Carnegie units accumulated by public high school graduates in the vocational and specific labor market preparation curricula, by school urbanicity: 1982, 1990, and 1994

	Vocational total			Specific labor market preparation		
School urbanicity	1982	1990	1994	1982	1990	1994
Total	4.68	4.19	3.96	3.03	2.89	2.79
Rural	5.23	4.66	4.68	3.32	3.22	3.25
Urban	4.28	3.66	3.34	2.83	2.52	2.39
Suburban	4.46	3.98	3.47	2.91	2.69	2.52

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- Graduates with disabilities increased the number of specific occupational credits they earned by 25 percent between 1982 and 1994 (table 19). Over the same period, graduates without disabilities completed 9 percent fewer of these credits. These contrasting trends led to a gap in specific occupational credits earned in 1994, with students who had disabilities earning 36 percent more credits than students without disabilities.

- In all the years surveyed from 1982 to 1994, graduates who earned higher GPAs completed fewer specific occupational credits than graduates with lower GPAs (table 20).

- Students graduating from rural public high schools in 1982, 1990, and 1994 completed more specific occupational courses than students graduating from either urban or suburban schools (table 21). The amount of specific occupational coursework students graduating from urban and suburban schools completed decreased between 1982 and 1994, with a steeper decline for urban graduates than for suburban ones. Students graduating from rural schools, however, did not significantly change their specific occupational course-taking patterns over the years studied.

Concentration in Vocational Education

While rates of concentration in vocational education declined for most groups between 1982 and 1994, they stayed about the same for blacks and Asians/Pacific Islanders and increased for students with disabilities.

- The percentage of graduates concentrating in the vocational curriculum (taking three or more courses in a single occupational program area) decreased over time for both male and female students (table 22). Rates of vocational concentration decreased uniformly

across rural, suburban, and urban schools. The percentage of graduates specializing in the vocational curriculum (completing four or more courses in a single occupational program area, with at least two of those courses beyond the introductory level) decreased for all categories of gender, GPA, and school urbanicity.

- In 1994, 29 percent of male public high school graduates were vocational concentrators, compared with 22 percent of female graduates (table 22). About 9 percent of males were vocational specialists, compared with about 6 percent of females. These 1994 gender disparities in vocational concentration and specialization are similar to the gender gaps in 1982 and 1990.

Table 22—Percentage of public high school graduates concentrating (accumulating 3 or more credits) and specializing (accumulating 4 or more credits with 2 or more of those credits beyond the introductory level) in vocational programs, by selected student and school characteristics: 1982, 1990, and 1994

Selected student and school characteristics	Vocational concentrators			Vocational specialists		
	1982	1990	1994	1982	1990	1994
Total	33.7	27.8	25.4	12.6	7.7	7.0
Sex						
Male	39.0	32.3	28.8	14.9	9.2	8.5
Female	28.7	23.6	22.2	10.5	6.4	5.6
Race–ethnicity						
American Indian/Alaskan Native	46.6	38.0	20.9	6.2	12.4	2.5
Asian/Pacific Islander	17.3	16.6	14.2	5.0	1.4	3.8
Black, non-Hispanic	32.7	27.3	29.0	11.7	7.8	8.2
Hispanic	37.7	27.9	24.9	13.2	7.2	6.5
White, non-Hispanic	33.2	28.5	25.3	12.9	8.1	7.1
Disability status						
Has disability	31.5	42.2	41.3	12.9	10.4	12.4
No disability	33.8	27.4	24.8	12.6	7.6	6.8
Grade point average						
3.3 or more	19.8	13.6	14.6	7.4	3.0	2.8
2.6–3.29	30.9	23.8	23.9	12.3	6.4	6.6
1.6–2.59	40.3	35.1	31.8	14.5	10.2	9.5
Less than 1.6	36.1	34.7	31.8	13.9	9.6	7.8
School urbanicity						
Rural	38.3	32.1	31.9	13.7	8.5	9.1
Suburban	31.8	26.5	22.3	12.7	10.4	6.5
Urban	30.7	22.6	19.3	10.6	5.9	4.9

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- Hispanics, American Indians/Alaskan Natives, and whites all decreased their rates of vocational concentration in public high school during the time period studied (table 22). Black graduates, as well as Asian/Pacific Islander graduates, did not significantly change their concentration rates over the years. In 1994, 29 percent of black students concentrated in vocational education, compared with about 25 percent of white and Hispanic students, 21 percent of American Indian/Alaskan Native students, and 14 percent of Asian/Pacific Islander students.

- Rates of specializing in vocational education (taking four or more courses in a single occupational program area, with at least two of those courses beyond the introductory level) declined among black, Hispanic, and white graduates between 1982 and 1994 (table 22). On the other hand, there was no consistent trend in the specialization rate for American Indians/Alaskan Natives during the 3 years studied, although their rate of specialization in vocational education declined significantly between 1990 and 1994. The specialization rate for Asians/Pacific Islanders did not change significantly over the 1982–1994 period. In 1994, American Indian/Alaskan Native and Asian/Pacific Islander graduates were generally less likely than graduates from all other racial–ethnic groups to specialize in vocational education.[55]

- Students with disabilities increased their rates of concentration in the vocational curriculum from 32 to 41 percent during the years studied (table 22). Conversely, rates of vocational concentration declined steadily among students without disabilities, from 34 percent in 1982 to 25 percent in 1994. The rate at which students without disabilities specialized in the vocational curriculum also decreased by almost one-half, from 13 percent in 1982 to 7 percent in 1994. Rates of vocational specialization among students with disabilities remained relatively similar over the years studied.

- Public high school graduates with GPAs of 1.6 or higher had decreasing rates of concentration in the vocational curriculum between 1982 and 1994 (table 22). Students with GPAs of less than 1.6 were about equally likely to concentrate in vocational education during all of the years studied, with approximately one-third concentrating in vocational education in each year. In 1994, 15 percent of students with GPAs of 3.3 or higher concentrated in vocational education, and 3 percent of such students were vocational specialists. These rates of concentration and specialization were significantly lower than the rates for students earning lower GPAs. For example, in 1994, 32 percent of students with

[55]The difference in specialization rates for Asians/Pacific Islanders and Hispanics was not statistically significant.

GPAs between 1.6 and 2.59 concentrated in vocational education, and 10 percent of such students were vocational specialists.

- In all 3 years studied, students graduating from rural public high schools were more likely to concentrate in vocational education than students graduating from suburban and urban schools (table 22).[56] In 1994, about 32 percent of rural graduates in comparison with 22 percent of suburban and 19 percent of urban graduates concentrated in vocational education.

ACADEMIC COURSETAKING AND ACHIEVEMENT

Academic Course-Taking Trends

The academic preparation of students participating in vocational education increased between 1982 and 1994, in both absolute and relative terms. While public high school graduates in general increased their coursetaking in the core academic subjects (English, mathematics, science, and social studies), the rate of increase over the period studied was greater for vocational concentrators than for either college preparatory or other/general students. However, in 1994, vocational concentrators still completed fewer total credits in each of the core academic subjects than did either college preparatory or other/general students. Vocational concentrators also generally increased the rigor of their academic coursework, particularly in mathematics, science, and social studies.

- The percentage of public high school graduates meeting the "New Basics"[57] core academic standards increased from 13 percent in 1982 to 38 percent in 1990, and then to 50 percent in 1994 (table 23).[58]

[56]In 1990, however, the difference in concentration rates between students in rural and suburban schools was not statistically significant.

[57]In the 1983 publication *A Nation at Risk*, the National Commission on Excellence in Education recommended that high school graduation requirements be strengthened, and that, at a minimum, all students take 4 years of English; 3 years each of mathematics, science, and social studies; and one-half year of computer science. The "core academic standards" referred to in this report include the recommendations for English, mathematics, science, and social studies.

[58]Research on the integration of academic and vocational education indicates that academic knowledge and skills can also be learned via vocational programs—particularly through authentic, real-world applications—as well as via academic coursework. See C. Stasz, T. Kaganoff, and R.A. Eden, *Integrating Academic and Vocational Education: A Review of the Literature, 1987–1992* (MDS-1034) (Berkeley: National Center for Research in Vocational Education, March 1995).

Table 23—Percentage of public high school graduates meeting the New Basics core academic standards,[1] by curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization and New Basics core academic standards	1982	1990	1994
All graduates			
New Basics core academics total	13.0	38.1	50.2
English - 4 years	62.7	83.6	88.6
Mathematics - 3 years	46.1	72.2	81.0
Science - 3 years	29.3	52.0	63.9
Social studies - 3 years	67.8	85.8	89.4
Vocational concentrators total[2]			
New Basics core academics total	5.0	18.5	33.2
English - 4 years	57.7	78.7	88.7
Mathematics - 3 years	29.3	57.1	70.7
Science - 3 years	13.2	29.5	45.1
Social studies - 3 years	62.1	77.4	84.1
Vocational concentrators only			
New Basics core academics total	4.5	12.2	21.7
English - 4 years	56.9	76.3	86.3
Mathematics - 3 years	28.1	52.3	64.3
Science - 3 years	12.5	23.0	34.4
Social studies - 3 years	61.9	76.5	82.5
Both vocational concentration and college preparatory			
New Basics core academics total	38.3	74.3	86.0
English - 4 years	100.0	100.0	100.0
Mathematics - 3 years	100.0	100.0	100.0
Science - 3 years	54.1	86.7	94.4
Social studies - 3 years	76.0	84.8	91.4
College preparatory			
New Basics core academics total	65.4	84.1	90.2
English - 4 years	100.0	100.0	100.0
Mathematics - 3 years	100.0	100.0	100.0
Science - 3 years	86.0	91.5	95.1
Social studies - 3 years	76.8	91.0	94.8
Other/general			
New Basics core academics total	10.3	24.2	30.1
English - 4 years	60.4	77.3	79.9
Mathematics - 3 years	48.3	65.6	72.8
Science - 3 years	30.6	43.5	51.4
Social studies - 3 years	69.9	87.9	88.6

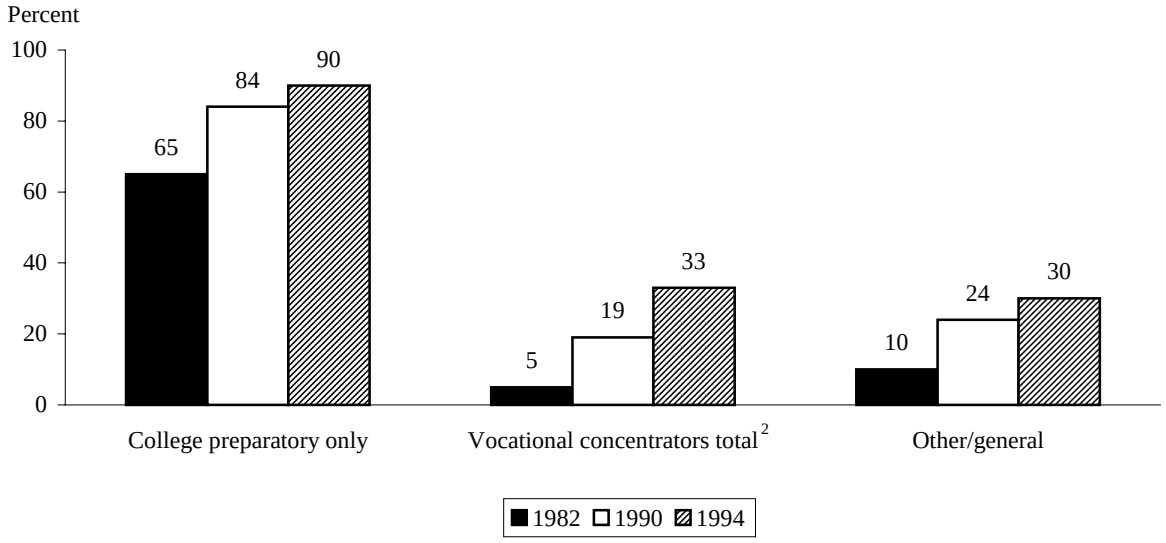
[1]The New Basics core academic standards include 4 years of English and 3 years each of mathematics, science, and social studies.

[2]This category includes some vocational concentrators who also completed a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- In 1994, vocational concentrators were less likely than graduates completing a college preparatory curriculum to meet the core academic standards (33 versus 90 percent), but were just as likely as graduates completing general coursework to do so (33 versus 30 percent) (table 23; figure 16).[59] The percentage of vocational concentrators meeting these standards increased from 5 percent in 1982. The percentage of vocational concentrators meeting the core academic standards in 1994 was about six times the percentage in 1982, compared with an increase of about three times for other/general students and of about 38 percent for college preparatory students.

Figure 16—Percentage of public high school graduates meeting the New Basics core academic standards,[1] by curriculum specialization in high school: 1982, 1990, and 1994



[1]The New Basics core academic standards include 4 years of English and 3 years each of mathematics, science, and social studies.

[2]Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

[59]It should be remembered that these three high school groups were classified based on their high school course-taking histories. While the "New Basics" academic standards and college preparatory criteria used in this publication were similar, the overlap between them was not complete (90 percent of college preparatory students fulfilled the New Basics standards). (See the college preparatory criteria described at the beginning of this chapter.) Since students who met both the vocational concentrator and college preparatory criteria were included in the vocational group, all vocational concentrators could meet the New Basics standards, at least theoretically. However, since the general group was the residual group that met neither the vocational nor college preparatory criteria, this group might be less likely to meet the New Basics academic standards.

- The percentage of vocational concentrators completing the science standard increased from 13 to 45 percent between 1982 and 1994 (table 23). However, vocational concentrators were least likely to meet the science standard than any other core academic standard in 1994. While 45 percent of vocational concentrators met the science standard in 1994, 71 percent met the mathematics standard, 84 percent the social studies standard, and 89 percent the English standard. Students who completed general coursework in high school were also least likely to meet the science standard versus other standards.

- The percentage of public high school graduates completing both a vocational concentration and a college preparatory curriculum increased seven and a half times, from 0.6 in 1982 to 4.5 percent in 1994 (table 24). The percentage of graduates completing neither a vocational concentration nor a college preparatory curriculum decreased from about 58 percent in 1982 to 42 percent in 1994. In 1994, more students still completed general coursework in high school than completed either a vocational concentration or a college preparatory curriculum.

Table 24—Percentage distribution of public high school graduates according to curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization	1982	1990	1994
Total	100.0	100.0	100.0
College preparatory only	8.1	25.9	32.2
Vocational concentrators total*	33.7	27.8	25.4
Vocational concentration only	33.1	25.0	20.9
Both vocational concentration and college preparatory	0.6	2.8	4.5
Other/general	58.2	46.3	42.4

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- The average number of credits vocational concentrators earned in English increased from 3.8 to 4.2 between 1982 and 1994, an increase of about 10 percent (table 25). However, the share of all English credits vocational concentrators earned in low-level courses also increased over this period.

Table 25—Average number of credits earned by public high school graduates in English, and the percentage of total English coursework earned in low-level courses (language skills, functional, and basic English), by curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization	Total English credits	Low-level English credits	Percent of total English credits that are low-level[1]
		1982	
All graduates	3.93	0.36	8.8
Vocational concentrators total[2]	3.79	0.40	10.5
Vocational concentrators only	3.79	0.41	10.6
Both vocational concentration and college preparatory	4.21	0.16	3.4
College preparatory	4.43	0.20	4.4
Other/general	3.95	0.35	8.5
		1990	
All graduates	4.19	0.40	9.2
Vocational concentrators total[2]	4.02	0.57	13.8
Vocational concentrators only	4.00	0.63	5.6
Both vocational concentration and college preparatory	4.21	0.07	0.8
College preparatory	4.37	0.06	1.4
Other/general	4.19	0.48	10.7
		1994	
All graduates	4.29	0.40	8.9
Vocational concentrators total[2]	4.16	0.51	11.9
Vocational concentrators only	4.13	0.60	13.9
Both vocational concentration and college preparatory	4.26	0.12	2.8
College preparatory	4.42	0.15	3.3
Other/general	4.26	0.52	11.4

[1]These percentages are the average rates calculated for each student in the population.

[2]This category includes some vocational concentrators who also completed a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- The number of credits vocational concentrators earned in U.S. and World History increased from 1.4 in 1982 to 1.7 in 1994, an increase of about 24 percent (table 26).

Table 26—Average number of Carnegie units accumulated by public high school graduates in social studies, by curriculum specialization in high school and type of social studies coursework: 1982, 1990, and 1994

Curriculum specialization and type of coursework	1982	1990	1994
All graduates			
Total social studies	3.14	3.47	3.55
U.S./world history	1.41	1.68	1.74
Vocational concentrators total*			
Total social studies	3.00	3.19	3.30
U.S./world history	1.35	1.62	1.67
Vocational concentrators only			
Total social studies	3.00	3.18	3.26
U.S./world history	1.34	1.59	1.64
Both vocational concentration and college preparatory			
Total social studies	3.18	3.33	3.47
U.S./world history	1.59	1.89	1.79
College preparatory			
Total social studies	3.37	3.61	3.69
U.S./world history	1.73	1.87	1.86
Other/general			
Total social studies	3.19	3.57	3.60
U.S./world history	1.41	1.61	1.69

*This category includes some vocational concentrators who also completed a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- The percentage of all graduates taking Algebra 1 in high school increased from 59 percent in 1982 to 69 percent in 1994, an increase of 17 percent (table 27). Over the same period, the percentage of vocational concentrators taking this subject increased from 52 to 67 percent, an increase of 29 percent. The total number of credits vocational concentrators earned in mathematics increased steadily from 2.3 in 1982 to 3.0 in 1994 (table 28). The number of credits earned in courses below the Algebra 1 level increased from .95 in 1982 to 1.2 in 1990, and then fell again to .95 in 1994. The share of total mathematics credits that these below-algebra credits represented fell steadily from 47 percent in 1982, to 44 percent in 1990, to 35 percent in 1994.

Table 27—Percentage of high school graduates completing coursework in mathematics, by curriculum specialization in high school and type of mathematics coursework: 1982, 1990, and 1994

Curriculum specialization and type of coursework	1982	1990	1994
All graduates			
Total mathematics	99.7	100.0	100.0
Algebra I	58.5	66.0	69.0
Vocational concentrators total*			
Total mathematics	99.5	100.0	99.9
Algebra I	51.8	58.8	66.6
Vocational concentration only			
Total mathematics	99.5	100.0	99.9
Algebra I	51.3	56.6	64.6
Both vocational concentration and college preparatory			
Total mathematics	100.0	100.0	100.0
Algebra I	81.5	77.7	75.7
College preparatory			
Total mathematics	100.0	100.0	100.0
Algebra I	73.7	72.6	71.2
Other/general			
Total mathematics	99.7	100.0	100.0
Algebra I	60.2	66.6	68.8

*This category includes some vocational concentrators who also completed a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Table 28—Average number of credits earned by public high school graduates in mathematics, and the percentage of total mathematics coursework earned in below-algebra courses, by curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization	Total mathematics credits	Below-algebra credits	Percent of total mathematics credits that are below-algebra[1]
		1982	
All graduates	2.62	0.83	37.3
Vocational concentrators total[2]	2.25	0.95	46.8
Vocational concentration only	2.23	0.97	47.6
Both vocational concentration and college preparatory	3.52	0.13	3.2
College preparatory	3.84	0.15	3.4
Other/general	2.66	0.85	36.6
		1990	
All graduates	3.15	0.81	29.5
Vocational concentrators total[2]	2.80	1.15	44.4
Vocational concentration only	2.70	1.26	49.0
Both vocational concentration and college preparatory	3.67	0.15	3.7
College preparatory	3.79	0.12	2.9
Other/general	3.00	0.99	35.3
		1994	
All graduates	3.33	0.68	23.4
Vocational concentrators total[2]	3.01	0.95	34.6
Vocational concentration only	2.87	1.14	41.6
Both vocational concentration and college preparatory	3.70	0.10	2.5
College preparatory	3.86	0.11	2.6
Other/general	3.12	0.96	32.5

[1]These percentages are the average rates calculated for each student in the population.

[2]This category includes some vocational concentrators who also completed a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- During this same period, the number of credits vocational concentrators earned in biology, chemistry, and physics rose from .96 to 1.6, an increase of 68 percent (table 29). In 1994, vocational concentrators completed, on average, one biology course. In addition, about one in three vocational concentrators completed a chemistry course in 1994, and one in eight, a physics course (table 30). The proportion of science credits vocational concentrators earned that were at the basic level decreased steadily from 37 percent in 1982, to 24 percent in 1990, to 21 percent in 1994 (table 29).

Academic Achievement Gains

As discussed in the Introduction to this report, the purpose of vocational education has broadened over the last 15 years to include increasing the academic achievement of students participating in vocational programs. In addition to improving the rigor of the academic courses that students in vocational programs take, education reformers advocate strengthening the academic content of vocational coursework.[60] This section of the report examines the academic achievement gains of 1992 public high school graduates. These gains were measured using mathematics, reading, and science test scores in the 8th, 10th, and 12th grades. Composite test results combining scores for all three subjects were also examined.

Since the relationship between academic achievement and participation in the vocational curriculum is complex, results must be interpreted cautiously. Descriptive analyses typically find that increased vocational coursetaking is associated with lower academic achievement.[61] However, attributing this lower achievement to participation in the vocational curriculum could be misleading. An alternate explanation for the inverse association between achievement and vocational program participation is that, at least historically, lower-achieving students have opted or been encouraged to follow a vocational program of study in high school. Thus, the gap in academic achievement between vocational concentrators and other students may be attributed, at least partly, to their initial differences in achievement. Moreover, these initially low-achieving students are likely to complete less rigorous academic coursework during high school than their

[60]Education research has shown that applied learning can contribute to academic achievement. For example, in a regression analysis using HS&B data, Meyer found that courses incorporating applied mathematics content, including mathematically relevant vocational courses, contributed positively to students' mathematics achievement gains between the 10th and 12th grades. Rasinski, on the other hand, did not find that vocational coursework contributed to academic gains, although he used different equation specifications than Meyer. See R. Meyer, "Applied Versus Traditional Mathematics: New Econometric Models of the Contribution of High School Courses to Mathematics Proficiency" (Discussion paper no. 966-92) (Madison: University of Wisconsin-Madison, 1992); K. Rasinski and S. Pedlow, "Using Transcripts to Study the Effectiveness of Vocational Education," *Journal of Vocational Education Research* 19 (3) (1994): 23–44.

[61]See, for example, A. McCormick, J. Tuma, and J. Houser, *Vocational Course Taking and Achievement: An Analysis of High School Transcripts and 1990 NAEP Assessment Scores* (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1995).

Table 29—Average number of credits earned by public high school graduates in science, and the percentage of total science coursework earned at the basic level, by curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization and type of coursework	Total science credits	Biology, chemistry, physics credits	Biology credits	Basic-level science credits	Percent of total science credits earned at basic level[1]
			1982		
All graduates	2.17	1.42	0.93	0.62	32.0
Vocational concentrators total[2]	1.74	0.96	0.73	0.59	36.5
Vocational concentration only	1.72	0.93	0.73	0.59	36.8
Both vocational concentration and college preparatory	2.81	2.41	1.18	0.64	20.8
College preparatory	3.56	2.95	1.37	0.72	20.6
Other/general	2.23	1.48	0.98	0.62	31.1
			1990		
All graduates	2.75	1.90	1.14	0.45	18.7
Vocational concentrators total[2]	2.26	1.34	1.00	0.50	23.8
Vocational concentration only	2.15	1.19	0.97	0.51	25.1
Both vocational concentration and college preparatory	3.30	2.63	1.24	0.39	11.9
College preparatory	3.56	2.91	1.33	0.30	8.7
Other/general	2.60	1.67	1.12	0.50	21.2
			1994		
All graduates	3.04	2.15	1.26	0.46	16.9
Vocational concentrators total[2]	2.59	1.61	1.13	0.50	20.9
Vocational concentration only	2.39	1.38	1.09	0.54	23.3
Both vocational concentration and college preparatory	3.49	2.68	1.32	0.35	9.8
College preparatory	3.78	3.07	1.46	0.35	9.6
Other/general	2.76	1.78	1.18	0.51	20.0

[1]These percentages are the average rates calculated for each student in the population.

[2]This category includes some vocational concentrators who also completed a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Table 30—Percentage of public high school graduates completing coursework in chemistry and physics, by curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization and type of coursework	1982	1990	1994
All graduates			
Chemistry	31.5	49.7	57.4
Physics	16.7	23.1	27.4
Vocational concentrators total*			
Chemistry	15.0	24.6	34.6
Physics	7.8	9.7	13.0
Vocational concentrators only			
Chemistry	13.7	17.0	22.7
Physics	7.4	6.6	7.6
Both vocational concentration and college preparatory			
Chemistry	88.8	92.0	89.6
Physics	29.8	37.4	38.0
College preparatory			
Chemistry	89.2	94.9	94.1
Physics	53.7	50.4	52.3
Other/general			
Chemistry	32.9	39.5	43.1
Physics	16.8	16.0	17.1

*This category includes some vocational concentrators who also completed a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

higher-achieving peers, thereby compounding their academic disadvantage and possibly widening the achievement gap.

Using the National Education Longitudinal Study of 1988 (NELS:88), it was possible to examine the relationship between students' achievement in the 8th grade and their subsequent coursetaking in high school. The analysis found that lower-achieving 8th graders were more likely to become vocational concentrators in high school than their higher-achieving counterparts. For example, 33 percent of 1992 public high school graduates who scored in the lowest composite test quartile in the 8th grade became vocational concentrators only (not also completing the college preparatory criteria), in comparison with 8 percent of graduates who scored in the highest 8th-grade composite test quartile—a difference of a factor of 4 (table 31). Thus, there is

Table 31—Percentage distribution of 1988 8th graders according to subsequent specialization in high school, by 8th-grade composite test score quartiles: 1992

Test score quartile	College preparatory only	Vocational concentrators			Other/ general
		Total*	Vocational concentration only	Vocational concentration and college preparatory	
Total	28.5	25.0	21.7	3.4	46.4
1st quartile (lowest)	5.3	33.7	33.2	0.5	61.0
2nd quartile	14.8	29.3	26.6	2.7	55.8
3rd quartile	32.6	26.1	21.9	4.3	41.3
4th quartile (highest)	55.7	12.3	7.6	4.7	32.0

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

some evidence that lower-achieving students were, in fact, more likely than higher-achieving students to concentrate in vocational education in high school, at least as of 1992.

There is also evidence that these initial 8th-grade differences in achievement may have been compounded by differential course-taking patterns in high school. Variations exist in the amount and rigor of academic courses taken by students completing different types of curricula. These differences were reflected in the NELS:88 data for 1992 graduates. Vocational concentrators had academic course-taking patterns that were more like those of graduates who completed general coursework in high school than like those of college preparatory graduates.

For example, vocational concentrators and other/general students were more likely than their college preparatory peers to take lower-level English courses (such as language skills and functional and basic courses) (table 32a). Vocational concentrators also completed more mathematics courses at a level lower than Algebra 1 than did both college preparatory and other/general students (table 32b). Even when controlling for prior achievement—as measured by 8th-grade mathematics test score quartiles—lower-level mathematics coursetaking was generally dissimilar for these groups of students (figure 17).[62]

[62]The difference between vocational concentrators and the general group in terms of the percentage of low-level mathematics courses taken was not statistically significant for the highest 8th-grade test quartile.

Table 32a—Average number of credits earned by 1992 public high school graduates in various English courses and average number and percentage of credits earned in low-level courses,[1] by curriculum specialization in high school

Curriculum specialization	Average number of total credits	Average number of advanced credits	Average number of low-level credits	Percent of total credits that are low-level[2]
Total	4.23	0.52	0.37	8.5
College preparatory only	4.40	1.15	0.08	1.7
Vocational concentrators total[3]	4.10	0.24	0.60	14.5
Vocational concentration only	4.07	0.15	0.67	16.1
Both vocational concentration and college preparatory	4.35	0.88	0.19	4.0
Other/general	4.20	0.28	0.41	9.4

[1]These include language skills and functional and basic English courses.

[2]These percentages are the average rates calculated for each student in the population.

[3]Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

Table 32b—Average number of credits earned by 1992 public high school graduates in various mathematics courses and average number and percentage of credits earned in low-level courses,[1] by curriculum specialization in high school

Curriculum specialization	Average number of total credits	Average number of precalculus credits	Average number of low-level credits	Percent of total credits that are low-level[2]
Total	3.22	0.82	0.71	25.2
College preparatory only	3.84	1.57	0.10	2.4
Vocational concentrators total[3]	2.86	0.49	1.02	39.4
Vocational concentration only	2.73	0.33	1.16	45.2
Both vocational concentration and college preparatory	3.71	1.53	0.10	2.4
Other/general	3.04	0.54	0.91	31.6

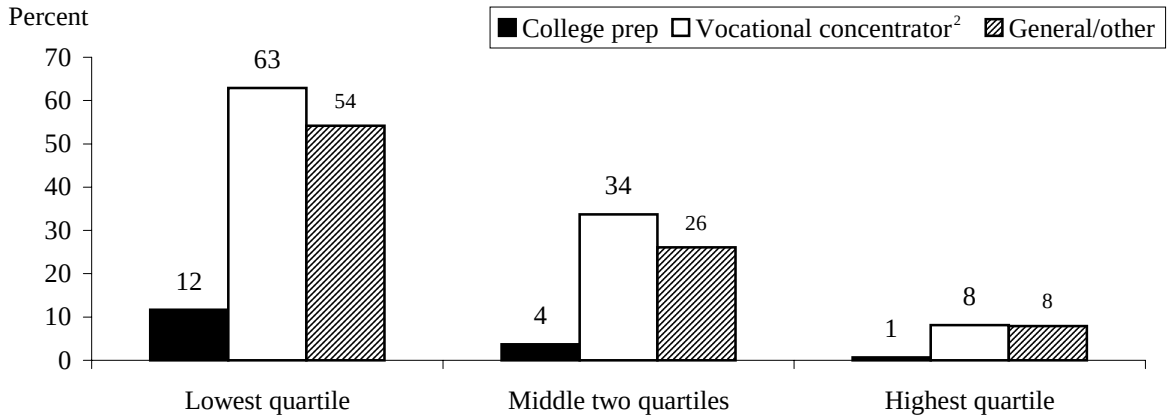
[1]These include general and consumer mathematics and pre-algebra courses.

[2]These percentages are the averages rates calculated for each student in the population.

[3]Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

Figure 17—Average percentage of credits earned in low-level[1] mathematics courses according to 8th-grade mathematics test quartiles, by curriculum specialization in high school: 1992



[1]These include general and consumer mathematics and pre-algebra courses.

[2]Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

In contrast, college preparatory students were more likely to complete more and higher-level courses in English, mathematics, and science than their vocational and other/general peers (tables 32a–c). On average, college preparatory students took 3.8 credits in mathematics, 4.4 credits in English, and 3.7 credits in science, while their vocational peers completed 2.9 credits in mathematics, 4.1 credits in English, and 2.5 credits in science. Furthermore, college preparatory students earned, on average, 1.6 credits in precalculus, 0.5 credits in physics, and 1.2 credits in advanced English, whereas vocational concentrators completed 0.5 credits in precalculus, 0.1 credits in physics, and 0.2 credits in advanced English.

Given these differences in initial achievement and academic coursework in high school, a gap in academic gains would not be unexpected, particularly between the vocational concentrator and college preparatory groups. In fact, 1992 vocational concentrators did exhibit lower test score gains in reading, mathematics, and science than their college preparatory peers, but more similar gains to graduates who completed general coursework in high school (table 33). This was generally true for 8th- to 10th-grade gains, 10th- to 12th-grade gains, and 8th- to 12th-grade gains.[63]

[63]The difference between vocational concentrators and the college preparatory group in terms of test score gains was not statistically significant for reading gains between the 10th and 12th grades. Differences between vocational concentrators and the other/general group were statistically different for 8th- to 10th-grade and 8th- to 12th-grade gains in reading and 10th- to 12th-grade and 8th- to 12th-grade gains in mathematics. Vocational concentrator gains in science were statistically indistinguishable from gains in science for the other/general group for all gain years.

Table 32c—Average number of credits earned by 1992 public high school graduates in science and physics courses, by curriculum specialization in high school

Curriculum specialization	Average number of science credits	Average number of physics credits
Total	2.89	0.26
College preparatory only	3.66	0.54
Vocational concentrators total*	2.47	0.13
Vocational concentration only	2.30	0.08
Both vocational concentration and college preparatory	3.53	0.44
Other/general	2.63	0.16

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

Table 33—Average 8–10th, 10–12th, and 8–12th grade test score gains in reading, mathematics, and science for 1992 public high school graduates, by curriculum specialization in high school

	8–10th			10–12th			8–12th		
Curriculum specialization	Reading	Math	Science	Reading	Math	Science	Reading	Math	Science
Total	8.5	14.2	0.2	11.5	11.4	9.3	20.0	25.6	9.4
College preparatory only	10.3	16.7	0.7	12.8	13.2	10.0	23.1	29.8	10.6
Vocational concentrators total*	7.3	12.8	-0.2	10.5	10.2	8.9	17.9	23.0	8.7
Vocational concentration only	6.9	12.3	-0.4	10.3	9.7	8.8	17.2	22.0	8.5
Both vocational concentration and college preparatory	9.8	15.9	0.7	11.6	12.8	9.3	21.6	28.5	10.1
Other/general	8.0	13.3	0.0	11.0	10.9	9.0	19.0	24.1	9.1

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

NOTE: Estimates appearing as 0.0 may be nonzero but less than 0.05.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

The usual statistical method for attempting to control for and separate out the various factors contributing to academic achievement—multivariate regression analysis—was beyond the scope of this study. However, this analysis attempted to reduce in two ways the bias that may be due to vocational concentrators having lower initial academic achievement. First, by examining gains at two or more points in time, rather than achievement at a single point in time, the analysis effectively controlled for those characteristics that are consistent over time.[64] Second, the analysis used three-way tables to control for prior academic achievement as measured by the student's 8th-grade test quartile. However, despite this partial control for prior achievement, many differences among the vocational concentrator, college preparatory, and other/general groups remained statistically significant (tables 34–36). For example, among students who were in the middle two test quartiles in the 8th grade, vocational concentrators gained 18 test score points in reading and 23 in mathematics by the 12th grade, in comparison with 19 and 24 points for other/general students and 22 and 29 points for college preparatory students, in reading and mathematics, respectively (figure 18).[65]

Table 34—Average 8–10th, 10–12th, and 8–12th grade test score gains in mathematics for 1992 public high school graduates according to 8th-grade mathematics test score quartiles, by curriculum specialization in high school

	Lowest quartile			Middle two quartiles			Highest quartile		
Curriculum specialization	8–10th	10–12th	8–12th	8–10th	10–12th	8–12th	8–10th	10–12th	8–12th
Total	11.9	9.0	20.8	14.0	11.0	25.1	15.9	13.5	29.2
College preparatory only	16.0	11.6	27.6	17.0	11.9	29.2	16.4	14.2	30.5
Vocational concentrators total*	10.7	8.6	19.3	12.9	10.2	22.9	14.9	12.4	27.6
Vocational concentration only	10.6	8.5	19.0	12.5	9.9	22.3	14.4	11.6	26.4
Both vocational concentration and college preparatory	—	—	—	15.9	12.0	27.4	16.0	13.7	29.8
Other/general	12.0	8.9	20.7	13.2	11.0	24.3	15.3	12.9	27.5

—Too few sample observations for a reliable estimate.

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

[64]For example, a gains analysis should control for initial academic achievement differences. However, it does not control for effects that might accrue over time due to those initial differences—such as different high school course-taking patterns resulting from 8th-grade achievement differences.

[65]The 18-point reading gain for vocational concentrators and the 19-point reading gain for other/general students were not statistically different.

Table 35—Average 8–10th, 10–12th, and 8–12th grade test score gains in reading for 1992 public high school graduates according to 8th-grade reading test score quartiles, by curriculum specialization in high school

	Lowest quartile			Middle two quartiles			Highest quartile		
Curriculum specialization	8–10th	10–12th	8–12th	8–10th	10–12th	8–12th	8–10th	10–12th	8–12th
Total	6.9	9.4	16.6	8.2	11.2	19.5	10.1	13.2	23.0
College preparatory only	9.2	10.4	19.9	9.9	12.0	21.9	10.8	13.6	24.4
Vocational concentrators total*	6.6	8.8	15.7	7.3	10.8	18.0	8.5	12.4	21.0
Vocational concentration only	6.4	8.8	15.5	7.0	10.7	17.6	7.7	12.2	19.9
Both vocational concentration and college preparatory	12.8	—	19.9	8.8	11.2	20.5	10.4	13.0	23.6
Other/general	6.9	9.7	16.7	7.8	11.0	19.0	9.7	12.8	21.7

—Too few sample observations for a reliable estimate.

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

Table 36—Average 8–10th, 10–12th, and 8–12th grade test score gains in science for 1992 public high school graduates according to 8th-grade science test score quartiles, by curriculum specialization in high school

	Lowest quartile			Middle two quartiles			Highest quartile		
Curriculum specialization	8–10th	10–12th	8–12th	8–10th	10–12th	8–12th	8–10th	10–12th	8–12th
Total	1.3	8.3	9.5	0.2	9.2	9.3	-0.6	10.2	9.6
College preparatory only	2.4	8.2	10.5	1.0	10.1	10.9	0.1	10.3	10.3
Vocational concentrators total*	1.1	8.2	9.3	-0.4	8.8	8.5	-1.4	9.7	8.5
Vocational concentration only	1.0	8.2	9.3	-0.6	8.8	8.2	-1.9	9.7	8.0
Both vocational concentration and college preparatory	—	—	—	0.8	8.9	9.9	0.1	9.9	10.2
Other/general	1.1	8.4	9.5	0.0	8.8	8.8	-1.0	10.3	9.1

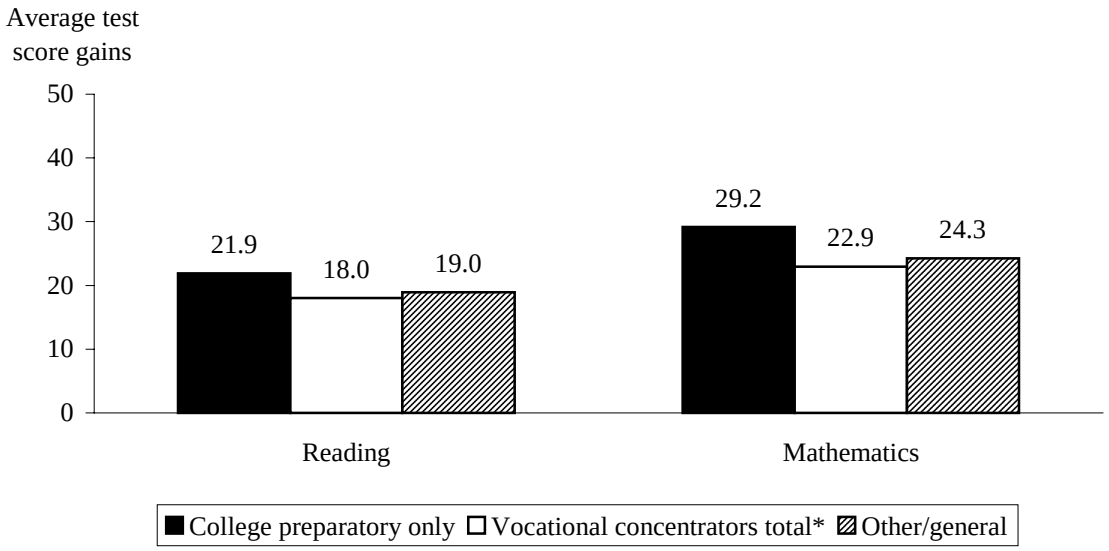
—Too few sample observations for a reliable estimate.

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

NOTE: Estimates appearing as 0.0 may be nonzero but less than 0.05.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

Figure 18—Average 8–12th grade test score gains in reading and mathematics for 1992 public high school graduates who scored in the middle two quartiles on the 8th-grade reading and mathematics tests, by curriculum specialization in high school



*Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

One finding of this analysis was that the academic coursework of vocational concentrators who also completed a college preparatory curriculum was more like the coursework of the college preparatory group than like that of other vocational concentrators. For example, this academically oriented group of vocational concentrators earned fewer low-level mathematics and English credits than their strictly vocational counterparts (tables 32a,b and 37). In keeping with this similarity in coursetaking, the test score gains for vocational concentrators who also completed a college preparatory curriculum were generally statistically indistinguishable from those of the college preparatory group, and these vocational concentrators generally outperformed their vocational peers who did not complete a college preparatory curriculum (tables 33–36).

Table 37—Average number of credits earned by 1992 public high school graduates in various mathematics and precalculus courses and average number and percentage of credits earned in low-level mathematics courses[1] according to 8th-grade mathematics test score quartiles, by curriculum specialization in high school

Curriculum specialization	Average number of math credits	Average number of precalculus credits	Average number of low-level math credits	Percent of total math credits that are low-level[2]
		Lowest quartile		
Total	2.88	0.23	1.49	54.0
College preparatory only	3.80	1.10	0.46	11.0
Vocational concentrators total[3]	2.73	0.13	1.67	62.9
Vocational concentration only	2.71	0.10	1.71	64.3
Both vocational concentration and college preparatory	—	—	—	—
Other/general	2.85	0.19	1.51	54.2
		Middle two quartiles		
Total	3.17	0.74	0.65	22.8
College preparatory only	3.75	1.45	0.15	3.7
Vocational concentrators total[3]	2.84	0.47	0.87	33.7
Vocational concentration only	2.73	0.34	0.97	38.0
Both vocational concentration and college preparatory	3.62	1.39	0.15	3.6
Other/general	3.07	0.53	0.77	26.1
		Highest quartile		
Total	3.62	4.02	0.12	4.0
College preparatory only	3.90	1.69	0.03	0.7
Vocational concentrators total[3]	3.29	1.21	0.22	8.1
Vocational concentration only	3.01	0.97	0.31	11.8
Both vocational concentration and college preparatory	3.84	1.69	0.03	0.7
Other/general	3.28	1.14	0.24	7.9

—Too few sample observations for a reliable estimate.

[1]These include general and consumer mathematics and pre-algebra courses.

[2]These percentages are the average rates calculated for each student in the population.

[3]Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

This suggests that the achievement gap may be narrowed by providing students in vocational programs with a challenging academic curriculum. However, it may also be that vocational concentrators who also take a college preparatory curriculum are different from other vocational concentrators in ways that impact academic achievement. For example, as 8th-grade achievement increased, so did the likelihood that students would meet both the vocational concentrator and college preparatory criteria in high school. In contrast, 8th-grade achievement was inversely related to the likelihood of students meeting only the vocational concentrator criteria (table 31). The direct impact of vocational concentrators taking more rigorous academic coursework cannot be determined by these descriptive data.

SCHOOL REFORM EFFORTS

By 1997, public comprehensive high schools reported implementing some vocational education-related reforms, although the quality and specific forms of these efforts were not discernible from the available survey data.[66] About half of these schools reported integrating academic and vocational education, and a similar proportion reported offering tech prep. Fewer schools reported having block scheduling, career majors, school-based enterprises, skill standards, or skill or occupational certificates. Generally, schools with career academies and larger schools were more likely to report these reforms, while rural schools were less likely to do so.

- In 1997, 90 percent of public high schools reported that teachers attended conferences on integrating academic and vocational education, and almost half (45 percent) reported actually integrating these curricula (table 38; figure 19). Schools with career academies were more likely than other schools to report that academic and vocational curricula were being integrated, with 78 percent of career academy schools reporting such activity. Rural schools were less likely to implement integration, as were smaller schools. As mentioned above, it is not possible from the available data to discern the quality and specific forms of the integration activities reported.

[66]NLSY provided information on public schools with a 12th grade. For simplicity's sake, this section refers to these schools as public high schools. Because vocational schools were mistakenly excluded from the sample, the survey generally describes comprehensive high schools, rather than all high schools, which may provide a conservative estimate of local reform efforts. Also, survey respondents were not asked to describe their reform efforts in any detail; therefore, it is not possible to know what activities they classified as integration, tech-prep, and other reform efforts.

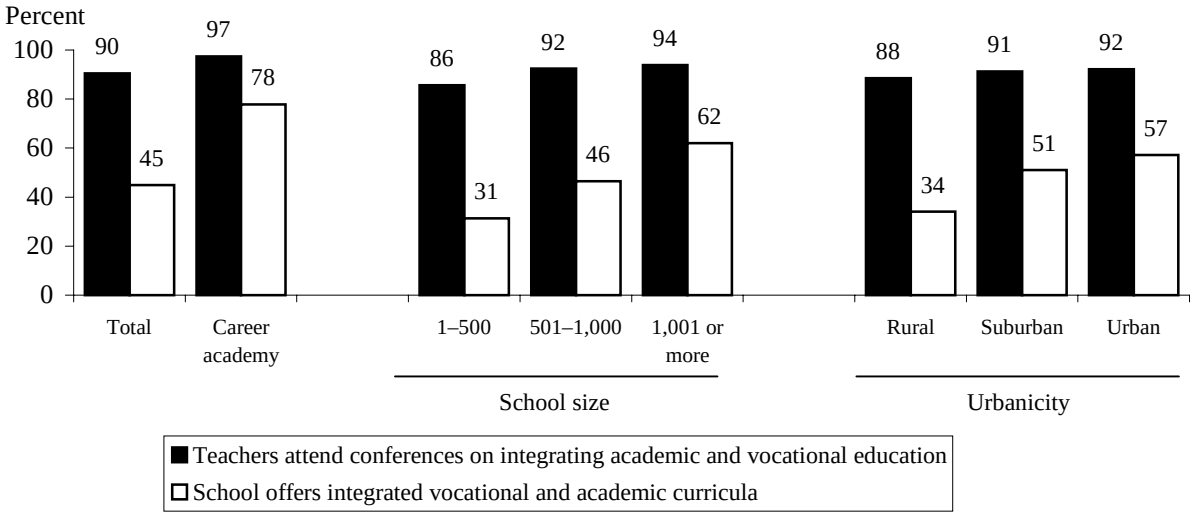
Table 38—Percentage of public schools reporting various efforts to integrate academic and vocational education, by selected school characteristics: 1997

Selected school characteristics	Teachers attend conferences on integrating academic and vocational education	School offers integrated academic and vocational curricula
Total	90.4	45.0
Student enrollment		
1–500	85.7	31.3
501–1,000	92.4	46.4
1,001 or more	93.9	62.0
Urbanicity		
Urban	92.2	57.1
Suburban	91.3	51.0
Rural	88.4	34.1
Career academy		
Yes	97.3	77.8
No	90.3	45.2

NOTE: The sample is made up of public schools with a 12th grade. Schools that were identified by school district officials as primarily vocational in nature were not included in the sampling frame.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, National Longitudinal Survey of Youth, 1996–97.

Figure 19—Percentage of public schools reporting various efforts to integrate academic and vocational education, by selected school characteristics: 1997



NOTE: The sample is made up of public schools with a 12th grade. Schools that were identified by school district officials as primarily vocational in nature were not included in the sampling frame.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, National Longitudinal Survey of Youth, 1996–97.

- About 50 percent of public high schools offered tech prep (table 39; figure 20).[67] Schools more likely to offer this program included schools in the Midwest and West (versus those in the Northeast and South); suburban schools (with urban schools second and rural schools last); schools with a career academy (versus those without); and larger schools.

Table 39—Percentage of public schools offering tech-prep education, by selected characteristics: 1997

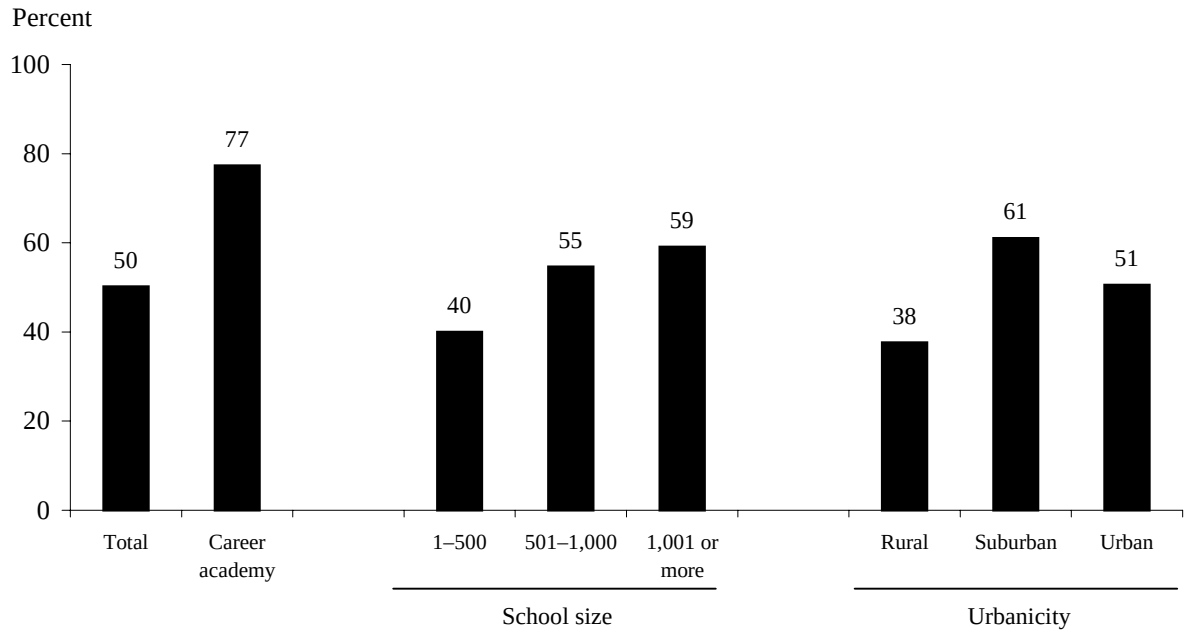
Selected characteristics	Tech-prep education
Total	50.1
Student enrollment	
1–500	40.0
501–1,000	54.6
1,001 or more	59.1
Urbanicity	
Urban	50.5
Suburban	61.0
Rural	37.6
Career academy	
Yes	77.3
No	51.7
Region	
Northeast	37.8
Midwest	61.9
West	60.3
South	43.2

NOTE: The sample is made up of public schools with a 12th grade. Schools that were identified by school district officials as primarily vocational in nature were not included in the sampling frame.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, National Longitudinal Survey of Youth, 1996–97.

[67]The national tech-prep evaluation conducted by Mathematica found that by fall 1995, more than 1,000 education consortia in the country—encompassing about 70 percent of U.S. school districts serving about 90 percent of all high school students—offered tech prep. This finding is not incompatible with the above finding that 50 percent of public high schools offered tech prep. The national tech-prep evaluation surveyed state-level tech prep coordinators and local tech-prep consortium coordinators, rather than high school administrators, who represented the survey universe for the 1997 findings presented in this report. It is possible for a local education consortium to offer tech prep, but not all of the high schools in the school districts participating in that consortium do so. See A. Hershey et al., *Focus for the Future: The Final Report of the National Tech-Prep Evaluation* (Princeton, NJ: Mathematica Policy Research, 1998), p. xv.

Figure 20—Percentage of public schools offering tech-prep education, by selected school characteristics: 1997



NOTE: The sample is made up of public schools with a 12th grade. Schools that were identified by school district officials as primarily vocational in nature were not included in the sampling frame.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, National Longitudinal Survey of Youth, 1996–97.

- Thirty-nine percent of public high schools reported offering some form of block scheduling that allows for longer class periods (table 40; figure 21). About one in five public high schools offered career majors or school-based enterprises to their students.

- Among public high schools, 28 percent reported having skill standards, 20 percent reported offering skill certificates, and 20 percent occupational certificates (table 41). Large schools and urban schools were more likely than small and rural schools to offer these types of standards and certificates. Also, schools with higher percentages of minority students were more likely to have skill certificates and standards. For example, 51 percent of high-minority schools (those with more than 75 percent minority students) had skill standards.

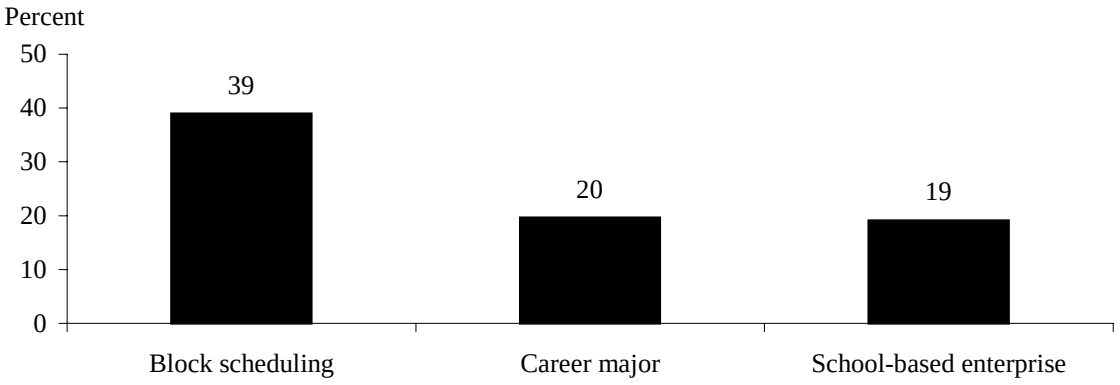
Table 40—Percentage of public schools offering various school-based activities, by selected characteristics: 1997

	Block scheduling	Career major	School-based enterprise
Total	38.9	19.6	19.1
Student enrollment			
1–500	32.7	12.5	14.3
501–1,000	39.9	19.2	15.5
1,001 or more	46.5	29.8	29.2
Urbanicity			
Urban	48.0	25.8	24.7
Suburban	44.1	25.1	25.4
Rural	29.8	12.7	9.2
Career academy			
Yes	64.2	71.5	50.8
No	39.7	19.4	19.1
Region			
Northeast	35.2	20.8	23.1
Midwest	35.6	14.3	22.0
West	41.0	17.5	23.4
South	39.2	26.3	13.5

NOTE: The sample is made up of public schools with a 12th grade. Schools that were identified by school district officials as primarily vocational in nature were not included in the sampling frame.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, National Longitudinal Survey of Youth, 1996–97.

Figure 21—Percentage of public schools offering various school-based activities: 1997



NOTE: The sample is made up of public schools with a 12th grade. Schools that were identified by school district officials as primarily vocational in nature were not included in the sampling frame.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, National Longitudinal Survey of Youth, 1996–97.

Table 41—Percentage of public schools offering skill standards, skill certificates, and occupational certificates, by selected school characteristics: 1997

Selected school characteristics	Skill standards	Skill certificates	Occupational certificates
Total	27.5	19.9	19.7
Region			
Northeast	29.3	20.8	19.2
Midwest	27.6	20.5	22.2
West	30.4	25.2	16.5
South	27.3	17.1	21.7
Public school type			
Comprehensive public	27.9	20.4	19.1
Public choice	15.0	12.8	19.4
Public magnet	30.2	22.3	15.2
Other public	24.9	13.1	21.2
Percent minority students			
0–25	24.3	16.6	17.9
26–50	34.4	25.6	25.1
51–75	26.2	21.4	19.8
76–100	51.1	42.3	29.6
Grade span			
K–12	30.1	8.9	11.5
7–12	14.1	11.0	9.0
9–12	29.2	22.0	21.2
10–12	28.7	22.7	35.0
Percent taking SAT or ACT			
0–25	30.3	22.2	20.9
26–50	28.2	18.3	18.4
51–75	27.9	26.7	21.3
76–100	24.9	9.5	17.8
Student enrollment			
1–500	15.8	9.4	7.2
501–1,000	26.0	17.8	20.3
1,001 or more	44.6	35.7	35.8
Urbanicity			
Urban	41.4	31.6	33.6
Suburban	34.1	26.8	23.4
Rural	15.3	7.9	10.5
Career academy			
Yes	60.8	54.3	53.9
No	26.4	18.7	18.6

NOTE: The sample is made up of public schools with a 12th grade. Schools that were identified by school district officials as primarily vocational in nature were not included in the sampling frame.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, National Longitudinal Survey of Youth, 1996–97.

WORK EXPERIENCE AND WORK-BASED LEARNING

Most public high school graduates work during their senior year of high school, although most of these students work part time.[68] In addition to student-found employment, many schools offer work-based learning experiences, with cooperative education being the most common form of work-based learning, followed by job shadowing, internships, and mentoring. Although participation in occupational education decreased between 1982 and 1994, the percentage of public high school graduates earning cooperative education credits increased somewhat over the same time period.[69] By 1994, about one in ten graduates participated in cooperative education.

- Most 1992 public high school graduates (71 percent) worked during their senior year of high school (table 42). Of these, most worked 20 or fewer hours per week. While vocational concentrators were only slightly more likely than college preparatory and other/general students to work during their senior year, they were significantly more likely than these two groups to work more than 20 hours per week.[70]

Table 42—Percentage distribution of 1992 public high school graduates according to their work status during their senior year in high school, by curriculum specialization in high school

Curriculum specialization	Never worked	Any work	Hours worked	
			20 or fewer hours	More than 20 hours
Total	29.2	70.8	67.7	32.3
College preparatory only	31.8	68.2	79.9	20.1
Vocational concentrators total*	25.3	74.7	55.8	44.2
Vocational concentration only	24.5	75.5	53.8	46.3
Both vocational concentration and college preparatory	29.5	70.5	68.6	31.4
Other/general	29.6	70.4	66.4	33.6

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988, Second Follow-up and High School Transcript Study.

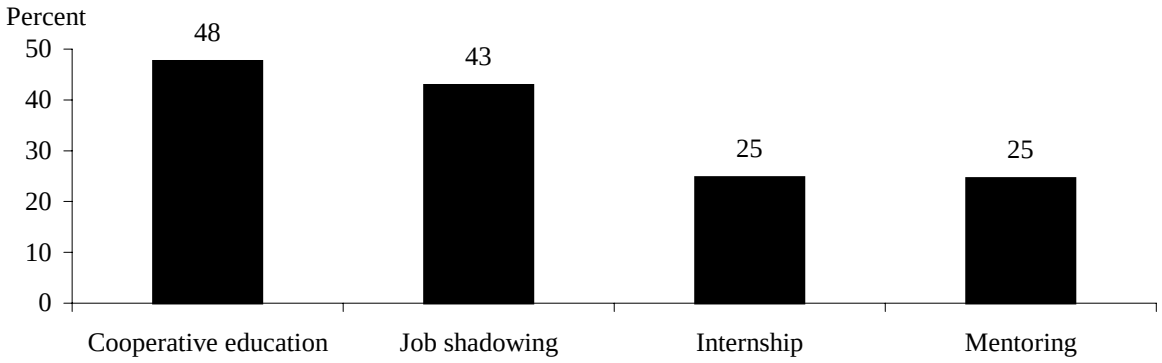
[68]Some of this student-reported employment may include school-organized work experiences.

[69]In this section, cooperative education describes programs that allow students to earn school credit for paid or unpaid employment that is related to a specific occupational program of study. In contrast, general work experience is not connected to a specific occupational program.

[70]The difference in overall work rates for vocational concentrators and other/general students was not statistically significant.

- Between 25 and 50 percent of public high schools offered each type of work-based learning activity in 1997 (figure 22). Cooperative education and job shadowing were more prevalent than mentoring or internships, with 48 and 43 percent of public schools offering cooperative education and job shadowing, respectively, and 25 percent of public schools offering mentoring and 25 percent internships.

Figure 22—Percentage of public schools offering various work-based activities: 1997



NOTE: The sample is made up of public schools with a 12th grade. Schools that were identified by school district officials as primarily vocational in nature were not included in the sampling frame.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, National Longitudinal Survey of Youth, 1996–97.

- The percentage of public high school graduates taking cooperative education courses increased from 8.0 percent in 1982 to 9.4 percent in 1994 (table 43). Given that the average number of specific occupational credits earned by graduates decreased over the same period, this means that the share of occupationally specific credits that were cooperative education credits increased, from 3.5 percent in 1982 to 4.5 percent in 1994 (table 44).

- Vocational concentrators exhibited the highest rates of participation in cooperative education courses in all the years studied (tables 43 and 44). Twenty-three percent of vocational concentrators earned credits in this area in 1994, compared with 3 percent of college preparatory students and 6 percent of students completing general coursework in high school. Similarly, vocational concentrators earned a greater share of their specific occupational credits in cooperative education coursework than did college preparatory or other/general students in 1994.

Table 43—Percentage of public high school graduates completing cooperative education or work experience coursework in a specific occupational area, by curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization	1982	1990	1994
Total	8.0	7.4	9.4
Vocational concentrators total*	14.9	17.6	23.1
Vocational concentration only	15.0	17.9	23.8
Both vocational concentration and college preparatory	8.0	15.4	20.4
College preparatory	0.1	1.6	3.0
Other/general	5.1	4.4	6.0

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Table 44—Average percentage of specific labor market preparation (SLMP) credits earned through cooperative education or work experience coursework in a specific occupational area, by curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization	1982	1990	1994
Total	3.5	3.2	4.5
Vocational concentrators total*	5.8	7.8	11.4
Vocational concentration only	5.8	7.8	11.5
Both vocational concentration and college preparatory	4.0	8.5	10.9
College preparatory	0.1	0.8	1.4
Other/general	2.4	1.8	2.7

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- Both vocational concentrators and college preparatory students increased their cooperative education coursetaking between 1982 and 1994 (tables 43 and 44). While 15 percent of vocational concentrators completed cooperative education courses in 1982, 23 percent did so in 1994. Course completion rates for college preparatory students increased from less than 1 percent in 1982 to 3 percent in 1994. Both groups also increased their share of specific occupational credits earned in cooperative education coursework over the years studied. However, vocational concentrators increased their absolute and relative participation in cooperative education at a faster rate than did college preparatory students.

- In 1994, graduates earned more cooperative education credits in business and in marketing and distribution than in other program areas (table 45). The average number of cooperative education credits earned in these program areas remained relatively unchanged from 1982.

- The percentage of all graduates completing career preparation and general work experience courses that were not associated with a specific occupational program decreased from 17 to 13 percent between 1982 and 1994 (table 46).

TECHNOLOGY LITERACY

The percentage of public high school graduates taking at least one computer education course increased substantially between 1982 and 1990, and then remained relatively steady through 1994. In that year, about 80 percent of graduates had completed at least one semester of computer education. Participation in the more traditional "industrial arts" declined over the 1982–1994 period, while participation in the newer "technology education" increased. However, it is not possible to determine from the available data the extent to which this shift reflects relabeling, rather than a change in course objectives or content. In 1994, fewer graduates completed coursework in the combined introductory technology fields than in 1982.

- The percentage of public high school graduates who completed at least one semester of computer education increased sixfold from 13 percent in 1982 to 78 percent in 1990, and then remained relatively constant between 1990 and 1994 (table 47).[71]

[71]In 1990, the definition of computer education in the survey was expanded to include former "typewriting" courses, since these were increasingly becoming "computer keyboarding" courses.

Table 45—Average number of Carnegie units accumulated by public high school graduates in cooperative education and work experience coursework in a specific occupational area: 1982, 1990, and 1994

Curriculum specialization	Total	Agri-culture and renewable resources	Business	Marketing and distri-bution	Health care	Public and protective services	Trade and industry	Tech-nology and communi-cations	Personal and other services	Food service and hospitality	Child care and education	Occu-pational home economics[1]
						1982						
Total	0.15	0.01	0.07	0.04	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01
Vocational concentrators total[2]	0.34	0.02	0.17	0.09	0.02	0.00	0.03	0.00	0.00	0.01	0.00	0.01
Vocational concentration only	0.34	0.02	0.17	0.09	0.02	0.00	0.03	0.00	0.00	0.01	0.00	0.01
Both vocational concentration and college preparatory	0.16	0.00	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
College preparatory	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other/general	0.06	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
						1990						
Total	0.15	0.01	0.05	0.04	0.01	0.00	0.03	0.00	0.01	0.00	0.00	0.02
Vocational concentrators total[2]	0.45	0.04	0.14	0.10	0.02	0.00	0.11	0.00	0.04	0.00	0.01	0.05
Vocational concentration only	0.46	0.05	0.13	0.10	0.02	0.00	0.11	0.00	0.04	0.00	0.01	0.05
Both vocational concentration and college preparatory	0.40	0.00	0.22	0.08	0.03	0.00	0.03	0.00	0.03	0.00	0.00	0.03
College preparatory	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other/general	0.05	0.00	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
						1994						
Total	0.21	0.01	0.06	0.06	0.02	0.00	0.03	0.00	0.02	0.01	0.01	0.03
Vocational concentrators total[2]	0.64	0.05	0.19	0.17	0.05	0.00	0.11	0.00	0.05	0.01	0.02	0.08
Vocational concentration only	0.67	0.06	0.19	0.19	0.03	0.00	0.12	0.00	0.05	0.02	0.02	0.08
Both vocational concentration and college preparatory	0.51	0.02	0.22	0.11	0.07	0.00	0.04	0.00	0.04	0.00	0.01	0.05
College preparatory	0.03	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Other/general	0.08	0.00	0.02	0.03	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01

[1]Occupational home economics combines personal and other services, food service and hospitality, and child care and education.

[2]Includes students who completed both a vocational concentration and a college preparatory curriculum.

NOTE: Averages may not add to totals due to rounding. Estimates appearing as 0.00 may be nonzero but less than 0.005.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Table 46—Percentage of graduates completing career preparation and general work experience courses not in a specific occupational area, by curriculum specialization in high school: 1982, 1990, and 1994

Curriculum specialization	1982	1990	1994
Total	17.1	17.6	13.3
Vocational concentrators total*	15.5	17.3	14.3
Vocational concentration only	15.6	17.8	15.3
Both vocational concentration and college preparatory	6.5	12.8	9.7
College preparatory	5.2	9.8	7.7
Other/general	19.6	22.0	16.9

*Includes students who completed both a vocational concentration and a college preparatory curriculum.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

Table 47—Percentage of public high school graduates completing at least .5 credits of computer education coursework: 1982, 1990, and 1994

Year	1982	1990*	1994
Total	13.2	78.4	79.9
Gender			
Male	14.0	70.5	75.1
Female	12.5	85.5	84.5
Race–ethnicity			
American Indian/Alaskan Native	6.1	74.7	75.1
Asian/Pacific Islander	18.1	74.8	78.5
Black, non-Hispanic	12.8	78.3	77.9
Hispanic	8.0	79.2	80.5
White, non-Hispanic	14.2	78.7	80.7

*In 1990, the definition of computer education in the survey was expanded to include former "typewriting" courses, since these were increasingly becoming "computer keyboarding" courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

- Although male and female graduates completed computer education coursework at similar rates in 1982, females were more likely than males to take such coursework in later years (table 47). In 1994, 85 percent of female graduates versus 75 percent of male graduates took at least one semester of computer education. By contrast, earlier differences among racial–ethnic groups in completing computer coursework disappeared in later years. In 1982, American Indians/Alaskan Natives and Hispanics were less likely

than other racial–ethnic groups to take at least one semester of computer education.[72] In 1990 and 1994, however, all race–ethnicities completed computer education coursework at similar rates. For example, in 1994, between 75 and 81 percent of students in the different racial–ethnic groups completed at least one semester of computer education.[73]

- The percentage of public high school graduates completing at least one course in technology education jumped between 1990 and 1994, from 0.8 percent to 4.2 percent (table 48). The percentage in 1982 was 0.2. Over the same period, the percentage of graduates completing at least one course in industrial arts declined from 14 percent in 1982 to 8 percent in 1994. Combining the more traditional industrial arts with the newer technology education, fewer graduates completed coursework in introductory technology fields in 1994 than in 1982.[74]

- Female public high school graduates were less likely than their male peers to complete introductory technology coursework in all years studied (table 48). In 1994, 3 percent of female graduates versus 20 percent of male graduates completed introductory technology coursework. In the same year, Asian/Pacific Islander graduates were less likely than white and black graduates to complete introductory technology coursework.

VOCATIONAL TEACHERS

The available teacher trend data were for school years 1990–91 and 1993–94, and the changes noted were generally small for the 3-year period. However, these changes included a teaching force that grew older and accrued more years of teaching experience. This trend held for vocational and academic teachers alike.

Vocational and academic teachers were similar in a number of ways: about the same proportions held bachelor's degrees, and similar percentages held either standard or advanced certification. However, about 8 percent of vocational teachers had less than a bachelor's degree, in comparison with less than 1 percent of academic teachers. Also, vocational teachers were generally older than academic teachers, which may be due to the fact that vocational teachers entered the teaching profession at an older age, possibly after obtaining industry experience. There were

[72]The difference in course completion rates between American Indians/Alaskan Natives and blacks in 1982 was not statistically significant.

[73]These differences were not statistically significant.

[74]It is not possible to determine from the available data the extent to which the shift from industrial arts to technology education represents relabeling versus a change in course content or objectives.

Table 48—Percentage of public high school graduates completing introductory technology coursework, by type of course: 1982, 1990, and 1994

	Introductory technology		
Year	Total	Industrial arts	Technology education
1982	14.1	14.0	0.2
Gender			
Male	24.7	24.5	0.4
Female	4.3	4.2	0.1
Race–ethnicity			
American Indian/Alaskan Native	25.2	24.6	1.5
Asian/Pacific Islander	11.2	11.2	0.0
Black, non-Hispanic	11.4	11.1	0.3
Hispanic	20.0	19.9	0.2
White, non-Hispanic	13.6	13.5	0.2
1990	9.6	9.0	0.8
Gender			
Male	16.8	15.7	1.5
Female	3.1	2.9	0.1
Race–ethnicity			
American Indian/Alaskan Native	11.0	9.9	1.0
Asian/Pacific Islander	6.8	6.7	0.1
Black, non-Hispanic	9.6	8.9	0.7
Hispanic	7.3	6.8	0.5
White, non-Hispanic	9.9	9.3	0.8
1994	11.3	7.9	4.2
Gender			
Male	19.9	13.8	7.4
Female	3.1	2.1	1.0
Race–ethnicity			
American Indian/Alaska Native	15.6	11.0	4.6
Asian/Pacific Islander	5.6	4.3	1.6
Black, non-Hispanic	11.1	6.8	4.6
Hispanic	9.0	5.7	3.7
White, non-Hispanic	12.0	8.5	4.2

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond Sophomore Cohort 1982 High School Transcript Study and 1990 and 1994 National Assessment of Educational Progress High School Transcript Studies.

some variations among vocational teachers who taught in different program areas and school settings. For example, trade and industry and technical teachers and those teaching in more than one vocational field were generally least likely to have a bachelor's or advanced degree than other vocational teachers.

Qualifications and Experience

- The educational attainment of vocational teachers as a group remained about the same in 1990–91 and 1993–94 (table 49). Although there was a small decrease in the percentage of teachers with a master's degree, the percentage of vocational teachers with a doctorate or first-professional degree increased slightly.[75] In both 1990–91 and 1993–94, about 8 percent of vocational teachers had less than a bachelor's degree; 47 percent had a bachelor's degree; and the rest (about 45–46 percent) had some type of advanced degree.

- About the same proportion (47 percent) of vocational and academic teachers held bachelor's degrees as their highest degree in 1993–94 (table 49; figure 23). Vocational teachers were more likely to have less than a bachelor's degree (8.3 versus 0.5 percent), while academic teachers were more likely to have a master's or doctorate/first-professional degree.

- Educational attainment varied markedly by vocational program area. Trade and industry and technical teachers and those teaching in more than one vocational field were generally least likely to have a bachelor's or advanced degree in 1993–94 (table 49). About 39 percent of trade and industry teachers, 32 percent of "mixed" vocational teachers, and 16 percent of technical teachers held less than a bachelor's degree.[76] This may reflect the practice in some states of counting industry experience in place of education in hiring some vocational teachers.[77] In contrast, agriculture, business, career education, home economics, and industrial arts teachers were more like academic teachers in terms of their educational attainment, with less than 6 percent of these groups having less than a bachelor's degree.[78]

[75]The changes in the percentages of vocational teachers with bachelor's and education specialist degrees were not statistically significant.

[76]The only exceptions were that technical teachers were not statistically different from career education, health, and "other" vocational teachers, and "mixed" vocational teachers were not statistically different from health teachers.

[77]See "The State of Certification," *Vocational Education Journal* 68 (6) (September 1993): 30–35.

[78]Health teachers were statistically different from trade and industry teachers, and "other" vocational teachers were statistically different from both trade and industry and "mixed" vocational teachers. "Other" vocational teachers were not statistically different from academic teachers.

Table 49—Percentage distribution of public school teachers of grades 9 through 12 according to highest educational degree, by teaching assignment and vocational program area: 1990–91 and 1993–94

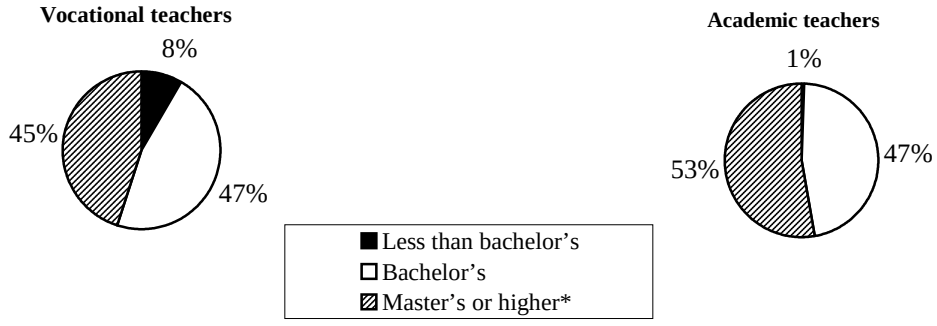
Teaching assignment and vocational program area	1990–91					1993–94				
	Less than bachelor's	Bachelor's	Master's	Educational specialist	Doctorate or first-professional	Less than bachelor's	Bachelor's	Master's	Educational specialist	Doctorate or first-professional
Total	1.7	45.4	46.4	5.3	1.3	1.7	46.3	45.6	5.3	1.1
Teaching assignment										
Vocational education	8.3	45.5	41.4	4.5	0.3	8.3	46.7	38.7	5.6	0.7
Academic education	0.3	45.7	47.4	5.1	1.5	0.5	46.8	46.6	4.9	1.2
Special education	0.2	42.5	47.0	8.4	1.9	0.2	41.3	49.4	8.2	0.9
Vocational program area										
Agriculture	1.5	51.3	42.7	3.9	0.6	1.7	51.9	42.7	2.5	1.2
Business and accounting	0.6	43.1	50.4	5.6	0.3	0.7	48.2	44.5	6.5	0.1
Career education	0.5	42.7	47.5	9.2	0.0	5.5	39.1	42.1	10.6	2.7
Health occupations	17.9	44.4	26.1	11.6	0.0	15.1	49.5	20.4	15.0	0.0
Home economics	0.3	58.8	37.9	2.7	0.4	0.1	59.2	36.3	3.4	1.0
Industrial arts	4.0	46.9	44.8	4.3	0.0	2.4	45.7	45.2	5.1	1.6
Technical	24.7	39.0	33.1	3.2	0.0	16.0	46.3	34.3	0.9	2.5
Trade and industry	45.4	29.3	21.8	3.3	0.2	39.1	29.5	24.6	6.6	0.2
Other	18.1	43.4	32.2	4.8	1.6	12.5	40.0	41.0	6.4	0.1
Mixed*	2.9	41.8	51.7	3.6	0.0	32.2	34.8	25.0	7.1	0.9

*"Mixed" indicates that the teacher taught equal proportions in two or more vocational subjects.

NOTE: Percentages may not add to 100 due to rounding. Estimates appearing as 0.0 may be nonzero but less than 0.05.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1990–91 and 1993–94.

Figure 23—Percentage distribution of public school teachers of grades 9 through 12 according to highest educational degree, by teaching assignment: 1993–94



*Includes master's, educational specialist, doctoral degree, or first-professional degree.

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1993–94.

- Between the 1990–91 and 1993–94 school years, the percentage of vocational teachers whose highest degree was in the broad field of vocational education decreased slightly (by about 3 percent), while the percentage who had an occupationally specific degree increased by about the same amount (table 50). More than half (57 percent) of vocational teachers in 1993–94 held their highest degree in vocational education, while approximately equal percentages of vocational teachers (12–13 percent) held degrees in the specific occupational and general education fields.

Table 50—Percentage distribution of public school teachers of grades 9 through 12 according to major field of highest degree, by teaching assignment: 1990–91 and 1993–94

Teaching assignment	Math and science	Social science	Letters and humanities	General education	Special education	Vocational education	Occupationally specific	Other
				1990–91				
Total	7.0	5.8	9.9	41.6	6.6	11.3	3.7	14.1
Vocational education	0.7	1.3	1.1	13.0	0.9	59.7	9.0	14.2
Academic education	9.3	6.9	12.8	50.7	1.2	1.7	2.9	14.4
Special education	0.8	4.8	2.3	21.4	54.2	3.6	1.4	11.4
				1993–94				
Total	8.2	5.4	10.4	41.1	6.3	10.0	4.3	14.3
Vocational education	0.7	1.0	1.2	12.9	1.0	56.8	11.5	14.8
Academic education	10.5	6.3	13.2	48.8	1.1	2.1	3.3	14.6
Special education	0.8	4.7	1.6	21.4	55.9	2.6	2.2	10.9

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1990–91 and 1993–94.

- In 1993–94, vocational teachers as a group had accrued more years of teaching experience than in 1990–91 (table 51). In particular, the percentage of vocational teachers with 10–20 years of teaching experience decreased, while the percentage with more than 20 years of teaching experience increased.[79] A similar trend was evident for academic teachers.[80] About the same percentage of vocational and academic teachers (37 percent) had taught for more than 20 years by 1993–94.

[79]The percentages of vocational teachers with less than 3 years of experience and 3–9 years of experience remained about the same between 1990–91 and 1993–94.

[80]Unlike the increase in the percentage of vocational teachers with less than 3 years of teaching experience, which was not statistically significant, the increase for academic teachers in this experience group was significant.

Table 51—Percentage distribution of public school teachers of grades 9 through 12 according to years of teaching experience, by teaching assignment: 1990–91 and 1993–94

Teaching assignment	1990–91				1993–94			
	Less than 3 years	3–9 years	10–20 years	More than 20 years	Less than 3 years	3–9 years	10–20 years	More than 20 years
Total	6.1	21.4	40.9	31.6	7.8	21.8	34.6	35.8
Vocational education	5.1	20.5	42.5	31.9	5.9	19.7	37.4	37.1
Academic education	6.3	20.5	39.6	33.6	8.4	21.6	32.6	37.4
Special education	7.0	29.4	47.3	16.3	6.8	26.7	46.4	20.1

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1990–91 and 1993–94.

- In 1993–94, about three-quarters (75 percent) of vocational teachers had a standard teaching credential, and an additional 17 percent had advanced certification (table 52). About 9 percent of vocational teachers—the same proportion as academic teachers—were teaching either without a credential or with a probationary, temporary, provisional, emergency, or alternative certificate.[81]

Table 52—Percentage distribution of public school teachers of grades 9 through 12 according to type of credential in primary assignment field, by teaching assignment: 1990–91 and 1993–94

Teaching assignment	None	Standard	Probationary	Temporary[1]	Alternative[2]	Advanced[2]	Other[2]
			1990–91				
Total	2.2	76.3	2.6	3.1	—	—	15.9
Vocational education	1.0	77.4	2.1	3.9	—	—	15.7
Academic education	2.3	76.6	2.6	2.8	—	—	15.7
Special education	3.7	72.0	2.7	4.5	—	—	17.1
			1993–94				
Total	2.7	74.6	1.6	3.9	1.0	16.1	—
Vocational education	1.2	74.6	0.8	4.7	2.0	16.7	—
Academic education	2.9	75.2	1.8	3.4	0.8	16.0	—
Special education	3.6	70.1	1.7	6.9	1.3	16.4	—

—Not applicable.

[1]In 1993–94, the "temporary" category also included "provisional" and "emergency" credentials.

[2]In 1993–94, rather than including an "other" category, the survey asked about "alternative" and "advanced" credentials.

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1990–91 and 1993–94.

[81]The certification categories were changed between 1990–91 and 1993–94, making it difficult to compare certification patterns between the two years.

Demographic Characteristics

- As might be expected, in addition to gaining more years of teaching experience, the teaching force aged somewhat between 1990–91 and 1993–94 (table 53). Specifically, while 62 percent of all teachers were age 40 or over in 1990–91, 69 percent were in this age group in 1993–94. This aging trend held for both vocational and academic teachers.

- In both school years surveyed, vocational teachers were generally older than academic teachers; however, as mentioned previously, they had similar years of teaching experience (table 53; figure 24). Vocational teachers may have been older than their academic peers because they began teaching at an older age, possibly after obtaining industry experience, or because they alternated teaching spells with other experiences.

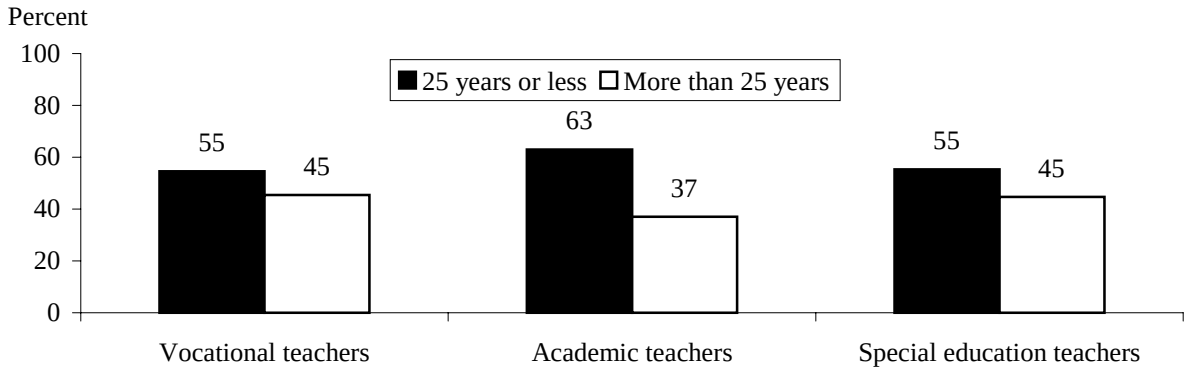
Table 53—Percentage distribution of public school teachers of grades 9 through 12 according to age in current school year and age when began teaching, by teaching assignment: 1990–91 and 1993–94

	Age in current year				Age began teaching				
Teaching assignment	Less than 30 years	30–39 years	40–49 years	50 years or more	25 years or less	26–35 years	36–45 years	46–55 years	More than 55 years
				1990–91					
Total	11.0	26.9	41.1	21.0	69.8	22.9	6.0	1.1	0.1
Vocational education	8.4	24.8	39.6	27.2	62.6	25.4	9.9	1.9	0.3
Academic education	11.5	26.1	42.1	20.3	72.2	21.9	5.0	0.8	0.1
Special education	12.2	36.0	36.2	15.6	64.8	26.0	7.1	2.0	0.1
				1993–94					
Total	9.8	21.6	40.8	27.8	61.0	29.7	7.6	1.5	0.2
Vocational education	6.2	19.8	41.5	32.6	54.6	31.8	11.0	2.4	0.2
Academic education	10.6	21.3	40.7	27.5	63.0	29.1	6.5	1.3	0.1
Special education	8.9	27.8	40.7	22.6	55.3	31.1	10.8	2.3	0.4

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1990–91 and 1993–94.

Figure 24—Percentage distribution of public school teachers of grades 9 through 12 according to age when began teaching, by teaching assignment: 1993–94



SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1993–94.

- About half of academic and vocational teachers were male, and half female (table 54). This was true in both 1990–91 and 1993–94, with no significant change in the gender ratio between the 2 years. In both years, the percentage of vocational teachers who were black was greater than the percentage of academic teachers who were black (table 55). However, the percentage of vocational teachers who were black decreased slightly over the 3-year period.[82]

Table 54—Percentage distribution of public school teachers of grades 9 through 12 according to sex, by teaching assignment: 1990–91 and 1993–94

	1990–91		1993–94	
Teaching assignment	Male	Female	Male	Female
Total	48.6	51.4	48.4	51.6
Vocational education	51.7	48.3	52.1	47.9
Academic education	50.8	49.2	50.1	49.9
Special education	28.3	71.7	27.7	72.3

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1990–91 and 1993–94.

[82]Vocational teachers were slightly less likely than academic teachers to be Hispanic in 1990–91, although this difference was not significant in 1993–94.

Table 55—Percentage distribution of public school teachers of grades 9 through 12 according to race–ethnicity, by teaching assignment: 1990–91 and 1993–94

Teaching assignment	1990–91					1993–94				
	White, non-Hispanic	Black, non-Hispanic	Hispanic	Asian/ Pacific Islander	American Indian/ Alaskan Native	White, non-Hispanic	Black, non-Hispanic	Hispanic	Asian/ Pacific Islander	American Indian/ Alaskan Native
Total	89.1	6.6	2.8	0.8	0.7	89.1	5.8	3.4	0.9	0.7
Vocational education	87.8	8.7	2.0	0.7	0.9	88.7	7.2	2.6	0.8	0.7
Academic education	89.6	5.8	3.1	0.9	0.6	89.4	5.3	3.6	0.9	0.7
Special education	88.3	8.4	1.7	0.7	0.9	87.4	7.7	3.1	0.8	1.0

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1990–91 and 1993–94.

Professional Development Activities

Most teachers—vocational, academic, and special education alike—reported participating in some professional development activity during 1993–94. The professional development activities surveyed included district- and school-sponsored workshops or inservices, postsecondary coursework, professional association activities, and participation in various teaching-related committees. Vocational teachers were generally more likely than other teachers to seek professional development opportunities outside their school or district. This was particularly true for vocational teachers in a vocational school setting. This suggests that schools and districts, particularly vocational schools and the districts that oversee them, may be somewhat less successful at providing their vocational teachers with relevant professional development activities. Alternatively, it may be that these schools and districts offer fewer vocationally relevant activities directly, relying more on outside professional development providers.

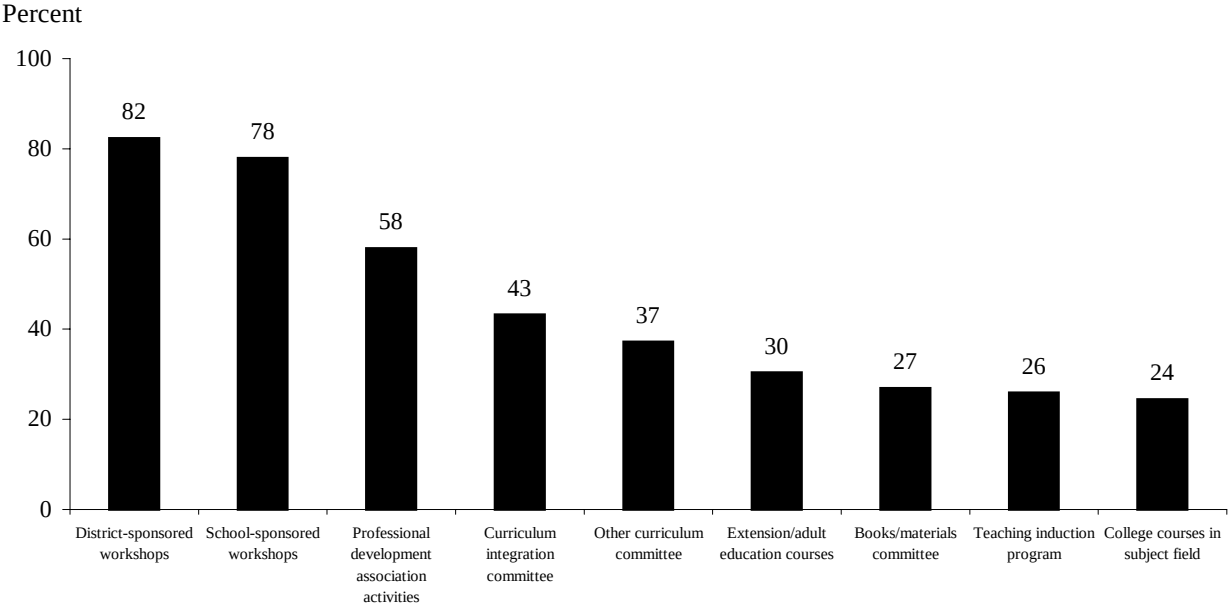
- Most teachers (96 percent) reported participating in at least one type of professional development activity in 1993–94 (table 56; figure 25). This was true for both vocational and academic teachers. However, vocational teachers were twice as likely as other teachers to participate on a curriculum integration committee, and were more likely to participate in professional association activities and take adult education courses. Vocational teachers were slightly less likely than other teachers to participate in district-sponsored workshops.

Table 56—Percentage of public school teachers of grades 9 through 12 who reported participating in various professional development activities, by teaching assignment and vocational teachers by school type: 1993–94

Teaching assignment and vocational teachers by school type	None	All	Professional development activities: Teaching induction program	District-sponsored workshops	School-sponsored workshops	Extension/ adult education courses	College courses in subject field	Professional development association activities	Curriculum integration committee	Other curriculum committee	Books/ materials committee
Total	3.8	1.9	25.9	84.2	78.4	25.6	24.4	52.2	23.6	38.6	29.6
Teaching assignment											
Vocational education	3.6	2.9	25.9	82.3	77.9	30.4	24.4	57.9	43.2	37.2	26.9
Academic education	3.9	1.8	25.8	84.3	78.1	24.7	23.8	51.5	19.4	40.2	32.1
Special education	2.9	1.4	26.0	86.3	81.9	25.0	28.8	47.9	24.6	28.5	14.1
Vocational teachers by school type											
Comprehensive high school	3.6	2.8	24.4	83.8	77.9	29.2	24.1	57.8	43.0	37.6	27.4
Vocational high school	3.4	2.7	36.0	69.2	76.2	41.2	27.7	58.1	43.7	33.9	24.5
Other	4.6	5.1	34.1	81.3	82.1	31.6	24.1	59.3	45.9	36.9	22.2

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1993–94.

Figure 25—Percentage of public school vocational teachers of grades 9 through 12 who reported participating in various professional development activities: 1993–94



SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1993–94.

- Most teachers (85 percent) participated in at least one type of inservice activity in 1993–94 (table 57). The activities surveyed included the following topics: educational technology, student assessment, cooperative learning, various methods of teaching in one's subject field, and an in-depth study in that subject field. Vocational teachers were more likely than other teachers to participate in workshops on the uses of educational technology and to report participating in an in-depth study in their subject field.[83] However, vocational teachers were less likely than other teachers to participate in workshops on methods of teaching in their subject field.

Table 57—Percentage of public school teachers of grades 9 through 12 who reported participating in inservice/professional development activities focusing on various topics, by teaching assignment and vocational teachers by school type: 1993–94

Teaching assignment and vocational teachers by school type	None	All	Inservice/professional development activities: Uses of educational technology	Methods of teaching in subject field	In-depth study in subject field	Student assessment	Cooperative learning in class
Total	14.5	8.6	51.1	54.2	27.4	45.0	48.1
Teaching assignment							
Vocational education	14.4	10.5	58.0	49.0	31.1	43.5	47.6
Academic education	14.7	7.9	50.4	54.7	26.0	44.9	47.8
Special education	13.0	10.8	45.0	59.2	32.0	48.1	51.0
Vocational teachers by school type							
Comprehensive high school	14.0	10.6	59.2	48.3	30.4	43.2	48.0
Vocational high school	17.9	10.0	48.1	51.0	38.8	43.9	43.2
Other	13.9	10.1	54.5	57.5	28.4	49.2	49.7

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1993–94.

- Most teachers (96 percent) reported that their professional development activities had some impact (table 58). Possible types of impacts surveyed included providing new information, changing teaching views, changing teaching practices, seeking further information or training, or being a waste of time. About 84 percent of all teachers were provided with new information, while 59 percent reported that the activities caused them

[83]The survey did not specify what methods were taught or what topic was studied in depth.

Table 58—Percentage of public school teachers of grades 9 through 12 who agreed with various statements about the impact of professional development activities, by teaching assignment: 1993–94

Teaching assignment	Had some impact	Provided new information	Changed views on teaching	Caused to change teaching practices	Caused to seek information/ training	Was a waste of time
Total	96.2	83.5	38.4	59.0	58.7	13.7
Vocational education	96.2	86.1	38.5	58.3	60.4	11.1
Academic education	96.1	82.9	38.6	59.1	57.9	14.5
Special education	96.8	84.3	36.4	59.4	62.5	11.2

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1993–94.

to change their teaching practices.[84] Vocational teachers were more likely than academic teachers to report that professional development activities provided new information and caused them to seek further information or training. Vocational teachers were less likely than their academic counterparts to report that professional development activities were a waste of time.

- Almost three-quarters (73 percent) of all teachers reported receiving some support for in-service or professional development activities (table 59). Types of support included release time, scheduled professional development time, travel and/or per diem expenses, tuition and/or fees, and professional growth credits. Vocational teachers were more likely than other teachers to report receiving travel and/or per diem support. This may be related to the fact that they were generally more likely than other teachers to seek professional development opportunities outside their school or district.

Table 59—Percentage of public school teachers of grades 9 through 12 who reported receiving various types of support for inservice/professional development activities, by teaching assignment: 1993–94

			Types of support				
Teaching assignment	None	All	Release time	Scheduled time	Travel and/ or per diem	Tuition and/ or fees	Professional growth credits
Total	27.2	3.1	43.2	35.2	27.7	20.5	28.8
Vocational education	24.9	3.3	42.8	34.8	37.3	21.3	32.2
Academic education	28.4	2.9	42.5	34.6	26.4	20.1	27.8
Special education	21.2	4.1	49.7	40.2	22.6	22.9	31.1

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1993–94.

[84]The survey did not ask teachers how they changed their teaching practices, only whether they did so.

Vocational teachers reported different professional development experiences depending on their school setting:

- Vocational teachers in vocational schools were significantly less likely than vocational teachers in comprehensive high schools to participate in district-sponsored workshops and were more likely to take extension or adult education courses (table 56).[85] Vocational teachers in comprehensive high schools were significantly less likely than other vocational teachers to have participated in a teaching induction program during their first year of teaching. These findings suggest that regular school districts may be somewhat less successful at meeting the professional development needs of their vocational teachers. It may also be that vocational schools or districts offer fewer activities directly, relying more on outside professional development opportunities.

- Vocational teachers in vocational schools were less likely than vocational teachers in comprehensive and other high schools to participate in inservices on the uses of educational technology, and more likely than these teachers to participate in an in-depth study in their subject field (table 57).[86] This may be due to the different types of vocational programs that are typically offered in vocational and comprehensive schools.[87] Alternatively, this may be due to the possibility of vocational teachers in vocational schools having greater industry experience before entering teaching. Two phenomena suggest that this may be true. First, vocational teachers in vocational schools tended to be older than vocational teachers in comprehensive high schools when they first began to teach (table 60). Second, they were also more likely than these teachers to have less than a bachelor's degree (table 60).[88] As stated previously, some states count industry experience in place of education in hiring some vocational teachers.[89]

[85]The difference in adult education participation between vocational teachers in vocational high schools and those in unspecified "other" high schools was large but not statistically significant; there were small sample sizes and large standard errors for these two groups.

[86]The difference in participation in inservices on the uses of educational technology between vocational teachers in vocational high schools and those in unspecified "other" high schools was somewhat large but not statistically significant; there were small sample sizes and large standard errors for these two groups.

[87]The previous comprehensive NCES publication on vocational education found that vocational teachers in vocational schools were more like than their counterparts in comprehensive high schools to teach in the trade and industry, technical, and health areas. See K. Levesque, et al., *Vocational Education in the United States: The Early 1990s* (NCES 95–024) (Washington, D.C.: U.S. Department of Education, National Center for Education Statistics, 1995) p. 20.

[88]Vocational teachers in vocational schools were also more likely than their vocational colleagues in "other" schools to have less than a bachelor's degree.

[89]See "The State of Certification," *Vocational Education Journal* 68 (6) (September 1993): 30–35.

Table 60—Percentage distribution of public school teachers of grades 9 through 12 according to age when began teaching and highest educational degree, by teaching assignment and vocational teachers by school type: 1993–94

	Age began teaching					Highest educational degree				
	25 years or less	26–35 years	36–45 years	46–55 years	More than 55 years	Less than bachelor's	Bachelor's	Master's	Educational specialist	Doctorate or first-professional
Total	61.0	29.7	7.6	1.5	0.2	1.7	46.3	45.6	5.3	1.1
Teaching assignment										
Vocational education	54.6	31.8	11.0	2.4	0.2	8.3	46.7	38.7	5.6	0.7
Academic education	63.0	29.1	6.5	1.3	0.1	0.5	46.8	46.6	4.9	1.2
Special education	55.3	31.1	10.8	2.3	0.4	0.2	41.3	49.4	8.2	0.9
Vocational teachers by school type										
Comprehensive high school	58.1	30.5	9.6	1.7	0.2	4.8	48.9	39.9	5.7	0.7
Vocational high school	27.5	40.5	21.8	9.8	0.4	38.9	30.1	25.4	4.7	0.9
Other	46.5	37.8	14.5	0.9	0.3	10.9	39.5	43.5	5.3	0.8

NOTE: Percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Schools and Staffing Survey, 1993–94.