

### **III. Trends in Introductory Technology and Computer-Related Coursetaking**

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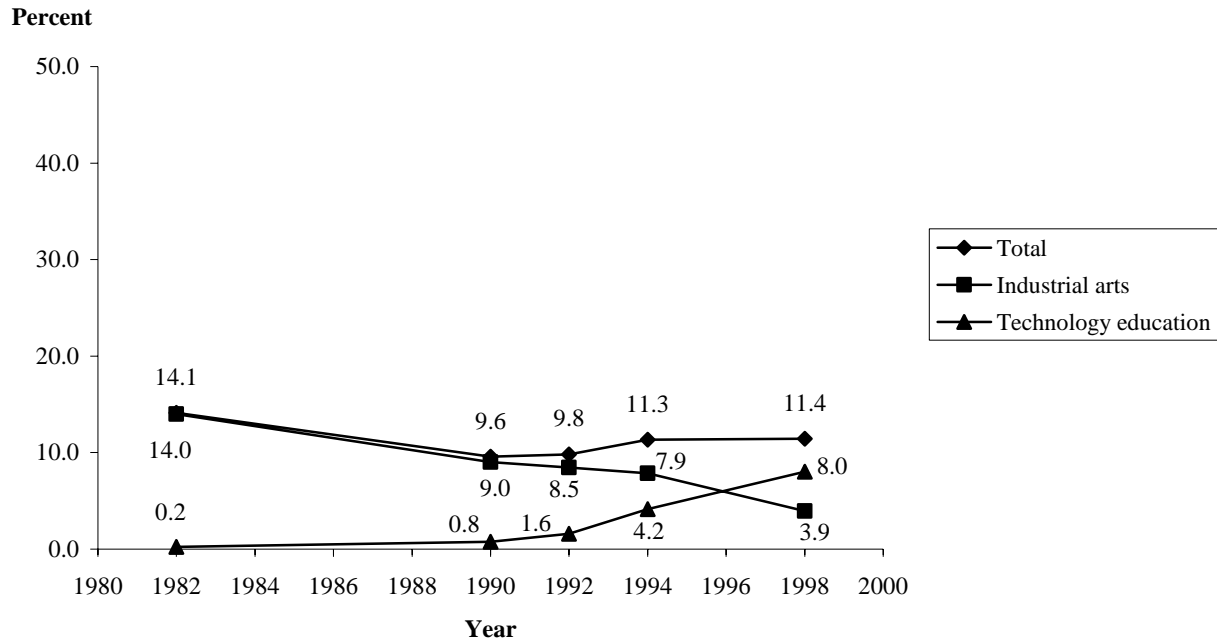
Many high school courses incorporate the use of technology. Students use the Internet to conduct research and use computers to type and design reports. Students also use various technologies in the vocational/technical curriculum, including computerized and other “high-technology” production techniques in agriculture, instrumentation in health care, and machinery in trade and industrial program areas. However, it is not usually possible to determine from transcript records what kinds of specific technology and equipment are being used in a course. Consequently, this chapter focuses on courses whose *primary objective* is to teach students particular technologies or technology principles in general. It is not possible to determine how technology was used in these courses, nor is the intent here to imply that technology-related learning only takes place in these courses. With that caveat, this chapter examines two main technology-related areas: introductory technology and computer-related coursetaking. These two curricular areas are defined and discussed below.

#### **Trends in Introductory Technology Coursetaking**

Within the vocational/technical curriculum, general labor market preparation consists of basic typewriting/keyboarding, career preparation/general work experience, and technology education/industrial arts courses. In this section, technology education and industrial arts courses are referred to collectively as “introductory technology” courses. The 1998 public high school graduates earned 0.12 credits on average in these introductory technology courses in high school, which constituted about 20 percent of the 0.61 general labor market preparation credits they earned (figure 10 and table A3). These 0.12 credits are the equivalent of about one in four graduates taking a half-year technology education/industrial arts course in high school.

No significant difference was detected in the percentages of 1982 and 1998 public high school graduates who took introductory technology coursework in high school (14.1 percent and 11.4 percent, respectively) (figure 31). In contrast, the amount of introductory technology coursework that graduates took declined over the period, although—in keeping with the overall declines in vocational/technical coursetaking cited in chapter II—most of this decline had occurred by 1990. The average number of credits that graduates earned in introductory technology

**Figure 31. Percentage of public high school graduates taking introductory technology courses, by area: Various years, 1982–98**



NOTE: Details may sum to greater than the totals because some graduates took both industrial arts and technology education courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

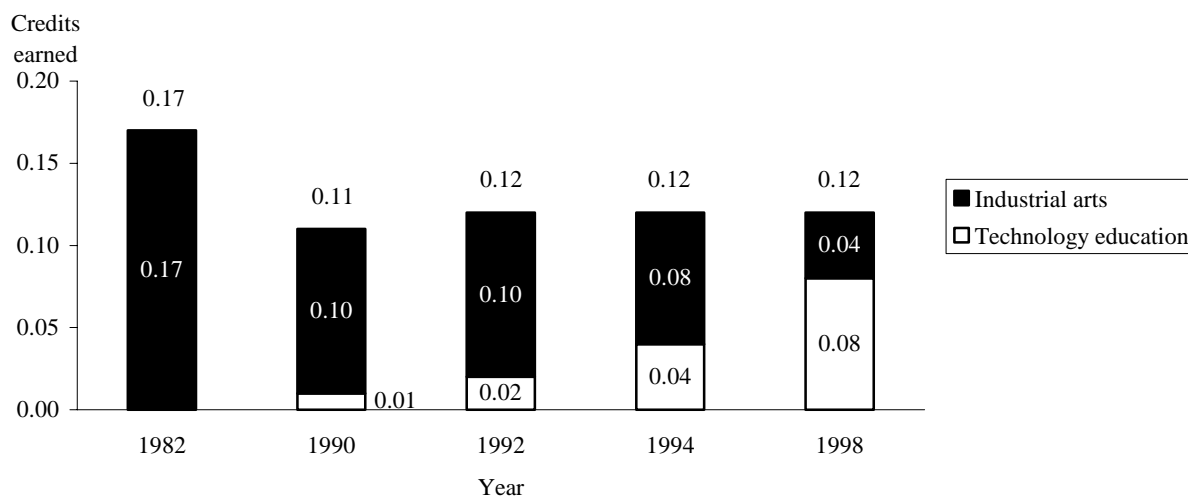
courses declined from 0.17 credits for 1982 graduates to 0.11 credits for 1990 graduates (figure 32). As of 1998, graduates earned 0.12 introductory technology credits on average in high school.<sup>50</sup>

### *The Shift From Industrial Arts to Technology Education*

Industrial arts grew out of the manual training movement in the late 1800s and rested on the belief that all students—at least, all male students—should learn to work with their hands as well as their minds (Gallinelli 1979). During much of the 20th century, industrial arts courses served to introduce students to the equipment and practices of mechanized industry. During the 1980s and 1990s, many schools began replacing industrial arts with technology education, which

<sup>50</sup>The difference in introductory technology credits earned by 1990 and 1998 graduates was not statistically significant.

**Figure 32. Average number of credits earned in introductory technology courses by public high school graduates, by area: Various years, 1982–98**



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

emphasizes introducing students to the “high technology” of the information age.<sup>51</sup> While some technology education courses are intended as an introduction to technology for all students, others are configured as pre-engineering courses for a more select group of students. It is not usually possible to determine from transcript records the particular orientation of the technology education courses that students took during the period studied.<sup>52</sup>

Previous research showed that between 1982 and 1994, industrial arts coursetaking declined while technology education coursetaking increased (Levesque et al. 2000). Specifically, the percentage of public high school graduates who took industrial arts courses declined by 6.1 percentage points, from 14.0 percent for 1982 graduates to 7.9 percent for 1994 graduates (figure 31). In addition, the average number of credits that graduates earned in industrial arts declined by about half, from 0.17 credits for the class of 1982 to 0.08 credits for the class of 1994 (figure 32). In contrast, the percentage of public high school graduates who took technology education courses increased by 4.0 percentage points, from 0.2 percent for 1982 graduates to 4.2 percent for

<sup>51</sup>The International Technology Education Association (ITEA) defines technology education as “problem-based learning utilizing math, science, and technology principles” (see <http://www.itea.org>).

<sup>52</sup>However, the Center for Occupational Research and Development’s Principles of Technology course is included under physics rather than under technology education in the taxonomy used for this report, because the course is configured as an applied physics course (Bradby and Hoachlander 1999).

1994 graduates (figure 31). The average number of credits that graduates earned in technology education also increased, from virtually no credits (0.00 credits) for the class of 1982 to 0.04 credits for the class of 1994 (figure 32).

The 4 years between 1994 and 1998 followed earlier trends, with industrial arts coursetaking continuing to decline and technology education coursetaking continuing to increase. In fact, between 1994 and 1998, industrial arts and technology education were almost perfect substitutes. Between the 2 years, the percentage of public high school graduates taking industrial arts courses declined by 3.9 percentage points, while the percentage of graduates taking technology education increased by 3.9 percentage points (figure 31). Similarly, between 1994 and 1998, the average number of credits that public high school graduates earned in industrial arts in high school declined by 0.04 credits, while the average number earned in technology education increased by 0.04 credits (figure 32). In 1998, about twice as many graduates took courses in technology education as took courses in industrial arts (8.0 percent versus 3.9 percent) (figure 31), and graduates earned about twice as many credits in technology education as in industrial arts (0.08 credits versus 0.04 credits) (figure 32). However, it is not possible to determine from the available data to what extent the shift from industrial arts to technology education reflected real changes in course content and methodology or a relabeling of industrial arts courses.

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

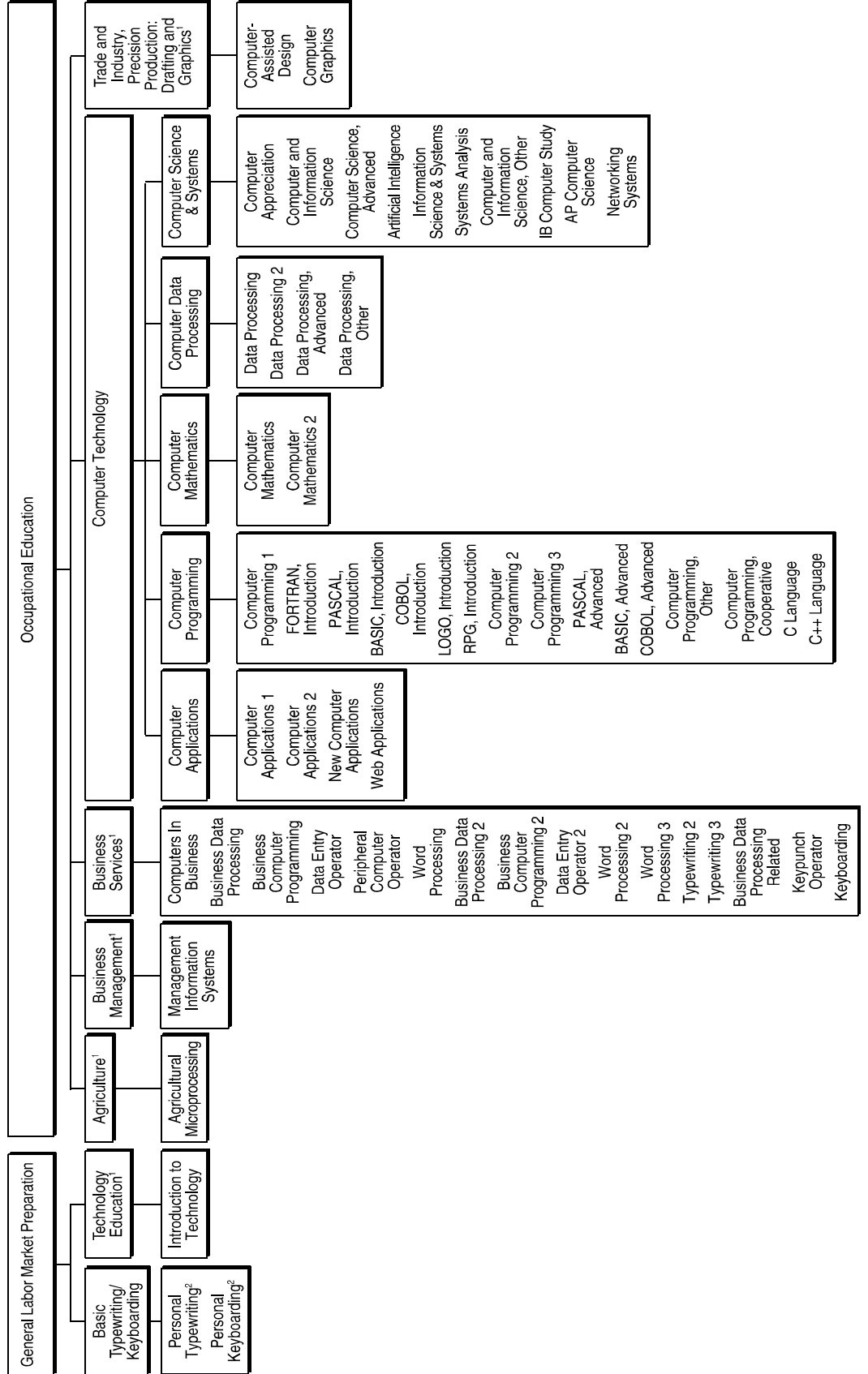
### *Classification of Computer-Related Courses*

The standard NCES procedures for transcript studies currently include all computer-related courses under the vocational/technical curriculum (Alt and Bradby 1999). Although some of these courses are included in general labor market preparation (under basic typewriting/keyboarding and under technology education), most computer-related courses are included in occupational education. Most of these courses are included under the business services and computer technology program areas, while some are included under the agriculture, business management, and drafting/graphics program areas. Figure 33 summarizes the location of all computer-related courses in the Secondary School Taxonomy (SST). Only a subset of courses in technology education, agriculture, business management, business services, and drafting/graphics areas were classified as computer related.<sup>53</sup> In contrast, virtually all courses in basic typewriting/keyboarding and computer technology were so classified.

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<sup>53</sup>In all years studied, there was no detectable computer-related coursetaking in agriculture and business management. Therefore, these program areas are dropped from the rest of the discussion.

Figure 33. Classification of computer-related courses in the Secondary School Taxonomy



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

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

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

Although virtually all basic typewriting/keyboarding and computer technology courses were classified as computer related, there was one main exception to this rule. According to recommendations made by experts during revision of the SST, all basic typewriting/keyboarding courses in 1982 were assumed *not* to be computer related (Alt and Bradby 1999). In contrast, in 1990 and subsequent years, all of these courses were classified as computer related. These courses were classified in this way because it is not usually possible to determine from transcript records what kind of equipment—whether a standard electric typewriter, an electric typewriter with computerized memory, or a computer—was used in a basic typewriting/keyboarding course. This decision may have resulted in an undercount of computer-related coursetaking in 1982 and an overcount in the 1990s, particularly in the early 1990s. The magnitude of these potential miscounts is not known. Because of the difficulty of determining the computer-related nature of basic typewriting/keyboarding courses, discussion of trends in overall computer-related coursetaking in this report focuses on the years 1990 to 1998. In contrast, to describe trends in computer-related occupational coursetaking and in computer technology coursetaking, the report covers the entire period from 1982 to 1998.

It also was decided during the 1998 revision of the SST to categorize all computer-related courses according to content rather than pedagogy. This revision involved shifting six courses that had previously been categorized under applied mathematics to the computer technology program area within occupational education.<sup>54</sup> Consequently, all computer-related courses taught in mathematics departments or computer education departments are currently included under the computer technology program area, which encompasses courses in five subareas: computer applications, computer data processing, computer programming, computer science and systems, and computer mathematics (figure 33).<sup>55</sup> This revision was applied to all years in the analysis.

Overall trends in the computer technology program area were discussed in the context of trends in all occupational program areas in chapter II. In contrast, this chapter discusses trends in computer technology within the context of all computer-related coursetaking—of which computer technology coursetaking is only a part. In addition, this chapter examines trends in the subareas within computer technology.

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<sup>54</sup>The six courses included Introduction to Computers, Computer Mathematics 1 and 2, Other Information Sciences and Systems, Other Systems Analysis, and Other Computer and Information Sciences (Bradby and Hoachlander 1999, p. 29).

<sup>55</sup>One consequence of this decision is that the courses classified under computer technology may not constitute planned sequences of courses to the same extent that courses in other occupational program areas do. In particular, computer technology students may be less likely than those in other occupational areas to complete three or more courses in computer technology (the standard that many states use to identify vocational/technical completers). In addition, computer technology teachers may be less likely to arrange cooperative education experiences, so that students taking computer technology courses may be less likely to participate in cooperative education as part of that coursework.

### ***An Overview of Computer-Related Coursetaking in 1998***

The 1998 public high school graduates earned on average 1.05 credits in computer-related courses in high school—equivalent to about one full-year computer-related course (figure 34 and table A16). Most of these credits (0.70 credits) were earned in the occupational curriculum, while the rest (0.35 credits) were earned in general labor market preparation. Within the general labor market curriculum, 1998 public high school graduates earned more credits in basic typewriting/keyboarding courses than in technology education (0.29 credits versus 0.06 credits). Within the occupational curriculum, 1998 public high school graduates earned more computer-related credits on average in the business services and the computer technology program areas (0.33 credits and 0.31 credits, respectively) than in computer-related drafting/graphics courses (0.06 credits).<sup>56</sup> The largest proportions of computer-related credits earned in high school by 1998 graduates were in basic typewriting/keyboarding (33.5 percent), business services (30.5 percent), and computer technology (27.2 percent) (figure 35 and table A17).<sup>57</sup>

Within the computer technology program area, 1998 graduates earned more credits on average in computer applications courses than in any other area. Specifically, 1998 public high school graduates earned 0.16 credits in computer applications courses, compared with 0.09 credits in computer science and systems, 0.04 credits in computer programming, and 0.01 credits each in data processing and computer mathematics (figure 34 and table A16).

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

During the 1990s, overall computer-related coursetaking was relatively stable. Specifically, no significant change was detected in the average credits earned by 1990 and 1998 public high school graduates in computer-related courses in high school (1.03 credits and 1.05 credits, respectively) (figure 36 and table A16). Throughout the 1990s, computer-related coursetaking represented at least 4 percent of the total number of credits that public high school graduates earned in high school (table 13).

Computer-related coursetaking within the occupational curriculum was also relatively stable. There was no significant difference between the 1990 and 1998 graduates in the average number of computer-related credits they earned in occupational education in high school (figure 36 and table A16).<sup>58</sup> Computer-related occupational coursetaking represented between 31 and 35 percent of total occupational coursetaking during this same period (figure 37 and table A18).<sup>59</sup>

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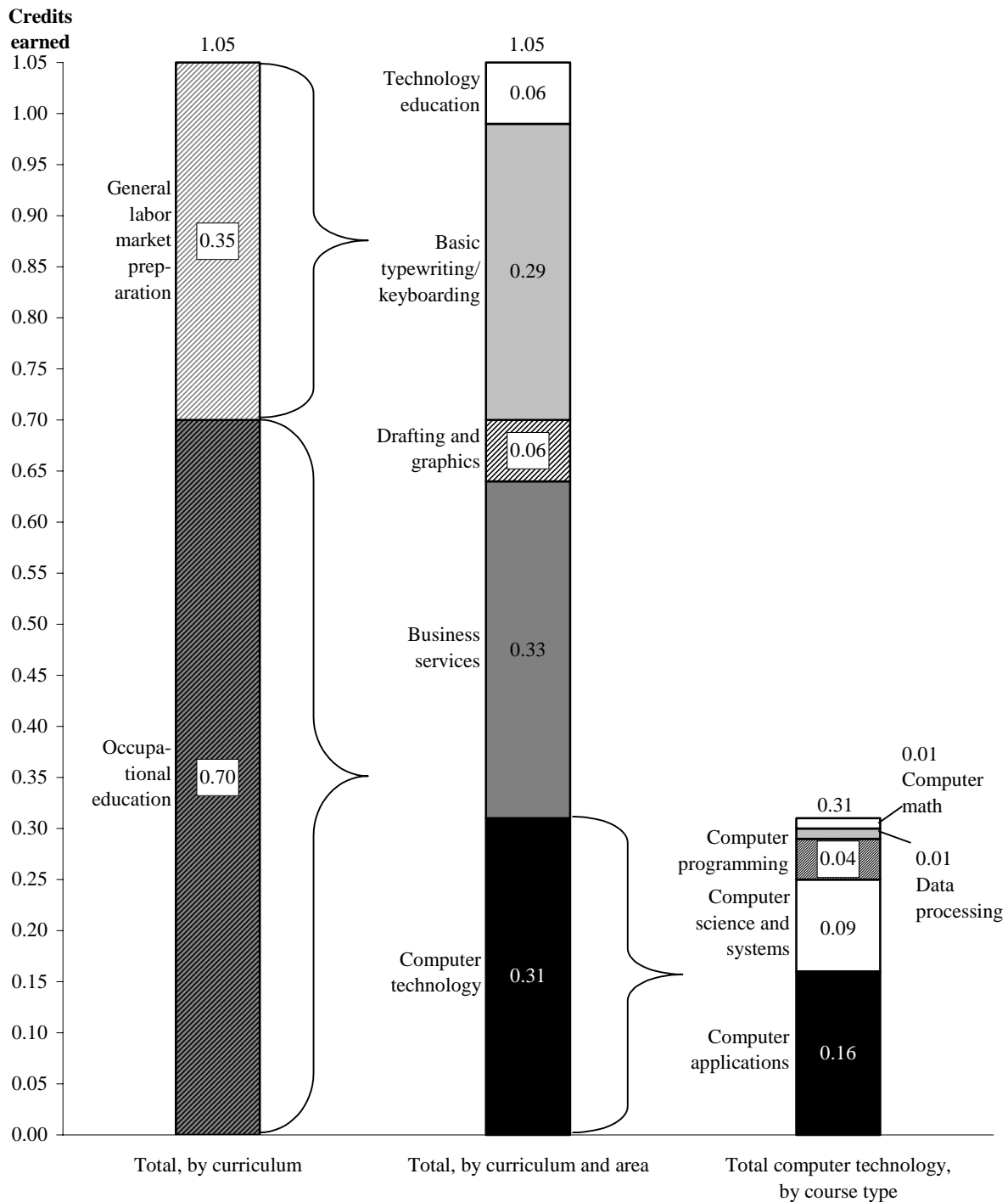
<sup>56</sup>The slight difference between business services and computer technology was not statistically significant.

<sup>57</sup>There were no statistically significant differences among these three computer-related areas.

<sup>58</sup>Although the increase between 1990 and 1992 was statistically significant, the difference between 1990 and 1998 was not.

<sup>59</sup>Again, although the increase between 1990 and 1992 was statistically significant, the difference between 1990 and 1998 was not.

**Figure 34. Average number of computer-related credits earned by public high school graduates, by vocational/technical area: 1998**

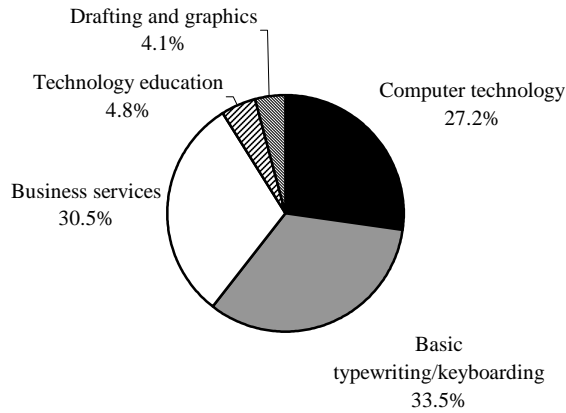


NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.



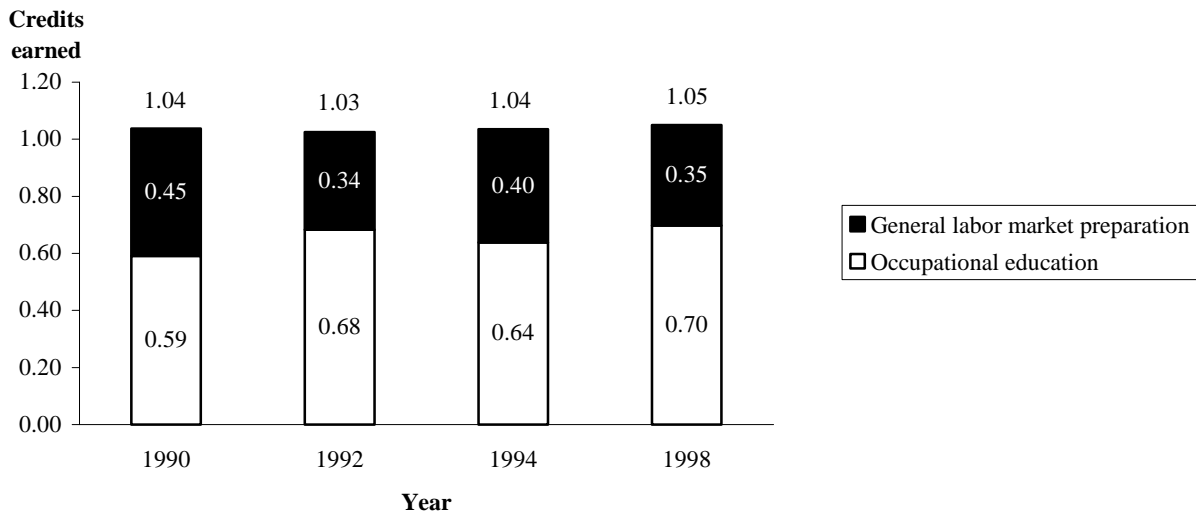
**Figure 35. Percentage distribution of computer-related credits earned by public high school graduates, by computer-related area: 1998**



NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Figure 36. Average number of computer-related credits earned by public high school graduates, by general labor market preparation and occupational education curricula: Various years, 1990–98**



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table 13. Percentage distribution of total credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98**

	1982 <sup>1</sup>	1990	1992	1994	1998
Total	†	100.0	100.0	100.0	100.0
Noncomputer-related	†	95.6	95.7	95.7	95.8
Computer-related, total	†	4.4	4.3	4.3	4.2

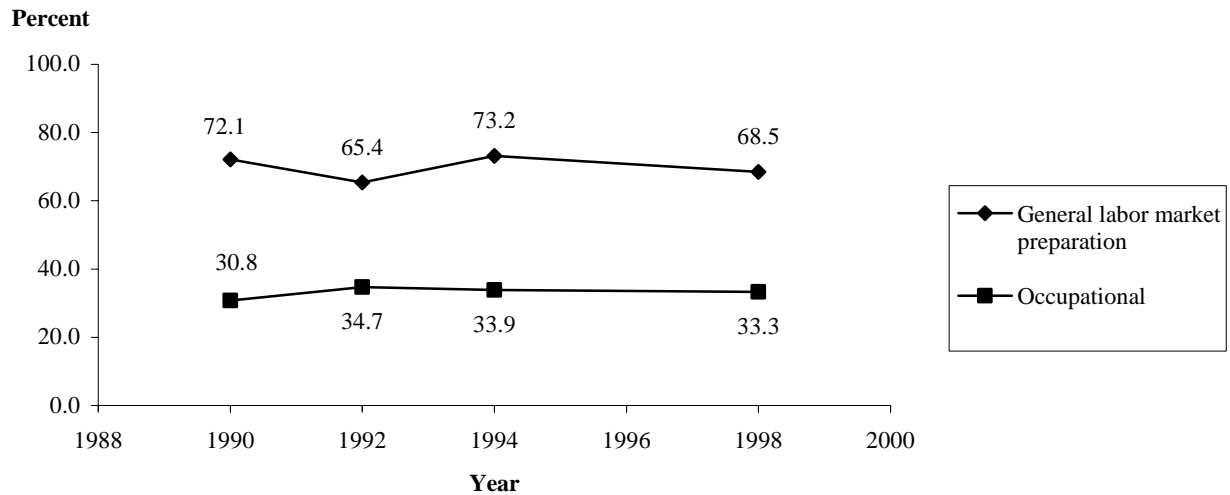
†Not applicable.

<sup>1</sup>In 1982, all basic typewriting/keyboarding courses were assumed not to be computer-related, while in subsequent years all of these courses were classified as computer-related. Therefore, 1982 estimates for basic typewriting/keyboarding, total general labor market preparation and total computer-related courses are not comparable with other years.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Figure 37. Percentage of total general labor market preparation credits and total occupational credits earned by public high school graduates that were computer-related: Various years, 1990–98**



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Computer-related coursetaking within the general labor market preparation curriculum declined, however, from an average of 0.45 credits for 1990 graduates to 0.35 credits for 1998 graduates (figure 36 and table A16).<sup>60</sup> This decline was due primarily to a decrease in basic typewriting/keyboarding coursework. The number of credits that public high school graduates earned on average in basic typewriting/keyboarding courses in high school (all of which were considered to be computer related during the 1990s) declined from 0.45 credits for 1990 graduates to 0.29 credits for 1998 graduates (table A16). In comparison, computer-related technology education coursetaking was first detected in 1994. The 1994 public high school graduates earned on average 0.03 credits in computer-related technology education, after which the average number of credits that 1998 graduates earned in these courses increased to 0.06 credits (table A16).

### ***Trends in Computer-Related Coursetaking Within the Occupational Curriculum***

As explained earlier, the discussion of trends in the rest of this chapter covers the entire period from 1982 to 1998. Over this time period, computer-related coursetaking within the occupational curriculum increased. Comparing the classes of 1982 and 1998, graduates earned on average 0.58 more computer-related occupational credits in high school, equivalent to more than one additional half-year course (table A16).

The largest growth in computer-related occupational credits earned by graduates over the period studied was in the business services program area. Comparing the classes of 1982 and 1998, public high school graduates earned on average 0.32 more computer-related credits in business services, compared with 0.20 more credits in computer technology and 0.06 more credits in drafting/graphics (figure 38 and table A16).

Computer-related business services coursetaking increased between 1982 and 1990, although no significant difference was detected between 1990 and 1998.<sup>61</sup> Between 1982 and 1990, public high school graduates earned on average 0.27 more computer-related credits in business services, increasing from 0.01 credits for 1982 graduates to 0.28 credits for 1990 graduates (figure 38 and table A16). As of 1998, graduates earned 0.33 such credits.

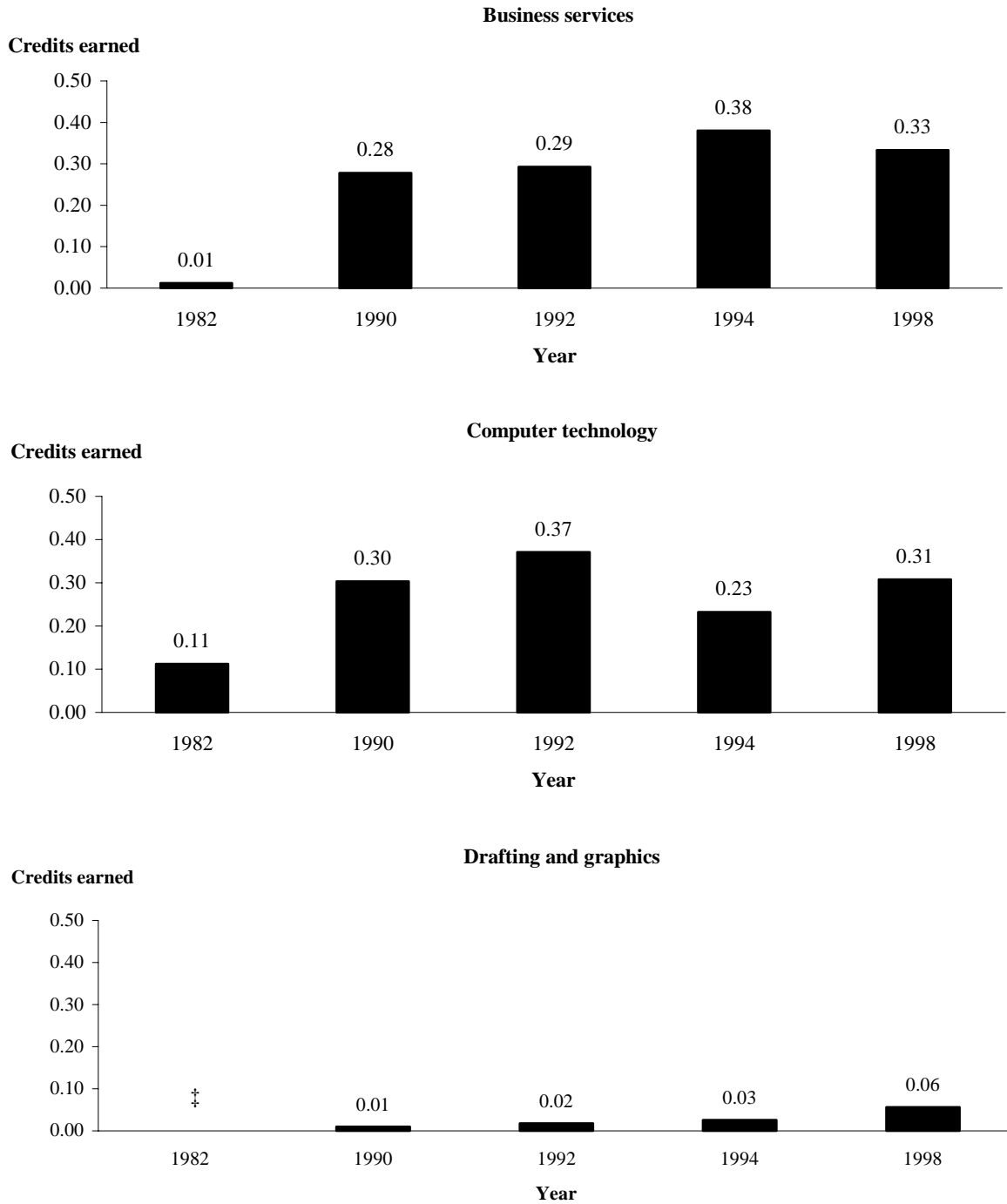
Computer-related drafting/graphics coursetaking also increased over the period studied, although half of this increase occurred between 1994 and 1998. Specifically, between 1982 and 1994, public high school graduates earned 0.03 more credits in computer-related drafting/graphics in high school, increasing from 0.00 credits for 1982 graduates to 0.03 credits for

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<sup>60</sup>The apparent increase between 1992 and 1994 was not statistically significant.

<sup>61</sup>Although the average credits earned by graduates in these courses increased significantly between 1992 and 1994, the difference between 1990 and 1998 graduates was not statistically significant.

**Figure 38. Average number of computer-related credits earned in occupational education by public high school graduates, by occupational program area: Various years, 1982–98**



‡Reporting standards not met. (Too few cases.).

NOTE: Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

1994 graduates (figure 38 and table A16). The average number of credits that graduates earned in computer-related drafting/graphics then increased by another 0.03 credits to 0.06 credits for 1998 graduates.

Similar to computer-related business services, coursetaking in computer technology in high school increased between 1982 and 1990, although no significant difference was detected between 1990 and 1998.<sup>62</sup> The average number of credits that public high school graduates earned in computer technology increased by 0.19 credits, from 0.11 credits for 1982 graduates to 0.30 credits for 1990 graduates (figure 38 and table A16). There was no significant difference in the average number of computer technology credits earned by 1990 and 1998 graduates (0.30 credits and 0.31 credits, respectively).

### ***Trends Within the Computer Technology Program Area***

Trends in coursetaking also varied among the five computer technology subareas. Although virtually no 1982 graduates took computer applications courses in high school, 1998 graduates earned more credits in computer applications than in any other computer technology field (figure 39 and table A16). The 1982 public high school graduates earned 0.00 credits on average in computer applications, in contrast with 0.05 credits for 1990 graduates. As of the class of 1998, graduates had increased the average number of credits they earned in computer applications courses in high school to 0.16 credits.

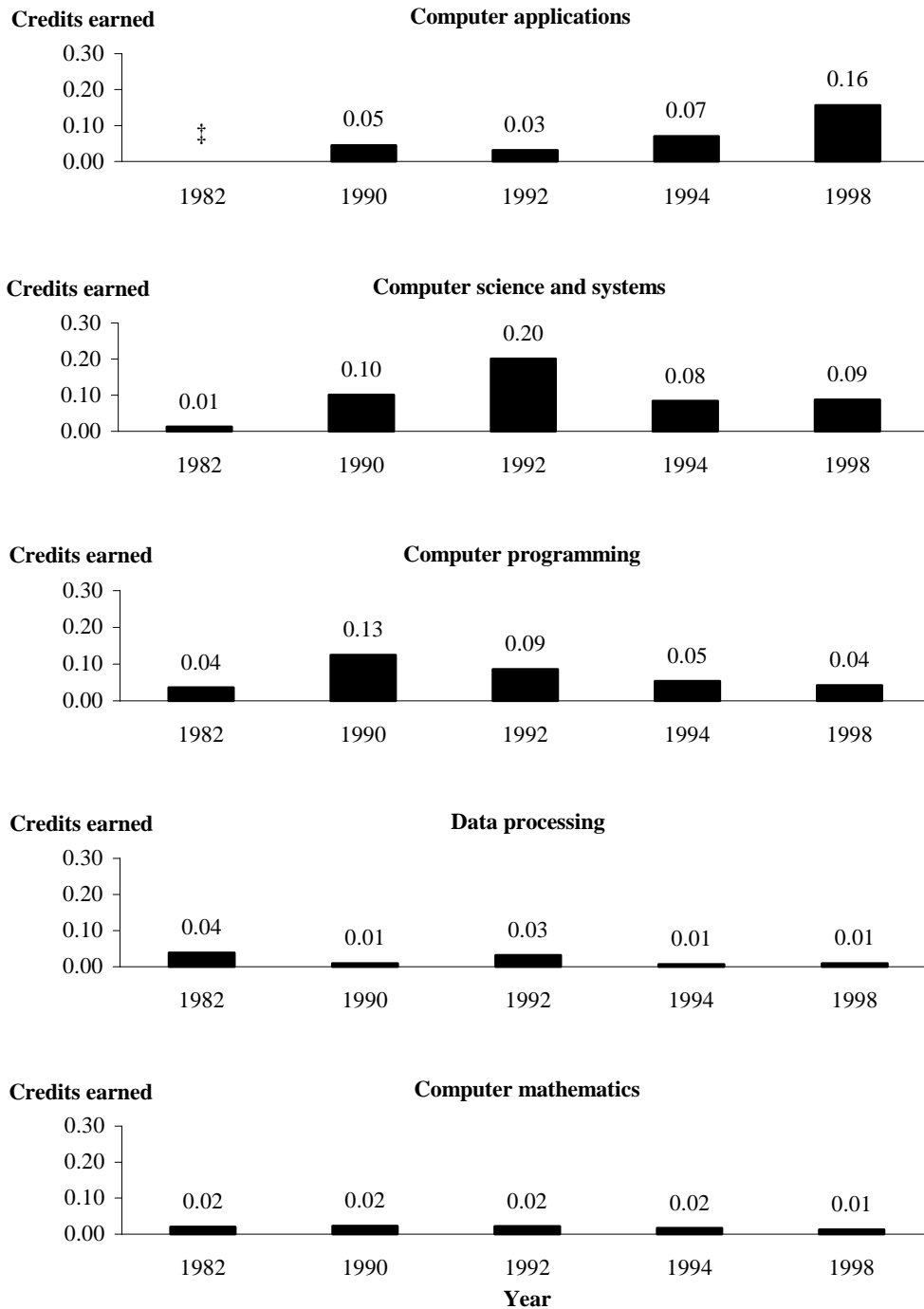
Graduates also earned more credits in computer science and systems courses in the 1990s than in 1982. The average number of credits that public high school graduates earned in computer science and systems courses increased from 0.01 credits for 1982 graduates to 0.10 credits for 1990 graduates, and then to 0.20 credits for 1992 graduates (figure 39 and table A16). After 1992, the average number of such credits earned by graduates declined to between 0.08 and 0.09 credits for the classes of 1994 and 1998, respectively. However, the average number of computer science and systems credits that 1994 and 1998 graduates earned was still higher than the average number of such credits earned by 1982 graduates.

Computer programming coursetaking increased between 1982 and 1990 and then returned to the same level of coursetaking as that in 1982. Specifically, public high school graduates earned 0.09 more credits in computer programming courses in high school between 1982 and 1990, increasing from 0.04 credits for 1982 graduates to 0.13 credits for 1990 graduates (figure

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<sup>62</sup>Although average credits earned in computer technology increased between 1990 and 1992, they decreased again by 1994 to a level that was not statistically different from 1998, and the overall change between 1990 and 1998 was not statistically significant.

**Figure 39. Average number of computer-related credits earned in the computer technology program area by public high school graduates, by course type: Various years, 1982–98**



‡Reporting standards not met. (Too few cases.).

NOTE: Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

39 and table A16). The average number of credits that graduates earned in computer programming courses declined back to 0.04 credits for 1998 graduates.<sup>63</sup>

Finally, comparing the classes of 1982 and 1998, data processing coursetaking showed a slight decline, while there was no significant difference in computer mathematics coursetaking (figure 39 and table A16). Public high school graduates generally earned small numbers of credits (0.04 or fewer credits) on average in each of these areas over the entire period studied.

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<sup>63</sup>The decline between 1994 and 1998 was not statistically significant, although the declines between 1990 and 1992, between 1992 and 1994, and overall between 1990 and 1998 were statistically significant.

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## IV. Trends in Combining Academic and Vocational/Technical Coursetaking

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As discussed in chapter I, several pieces of federal legislation in the 1990s focused attention on increasing the academic achievement of participants in vocational/technical education. The Carl D. Perkins Vocational and Applied Technology Act Amendments of 1990 (Perkins II) required that states implement a performance measure of the academic achievement gains of vocational/technical participants, as well as introduced the concepts of integration of academic and vocational/technical education and of tech-prep education. The School-to-Work Opportunities Act of 1994 continued the emphasis on academic achievement, calling for preparing all students for both college *and* work and further encouraging the integration of academic and vocational/technical education and linkages between secondary and postsecondary education.

It is important to remember that almost all high school students take some vocational/technical education, although students take varying amounts and types of these courses and take them for different purposes. Similarly, students combine academic and vocational/technical education in different ways and for different purposes. This chapter examines the various ways that public high school graduates combined academic and vocational/technical education between 1982 and 1998, focusing primarily—although not exclusively—on the academic coursetaking of occupational concentrators. This group is the main focus of federal and state accountability for vocational/technical education.

### **The Context: Overall Academic Coursetaking Trends in Brief**

Between 1982 and 1998, public high school graduates increased both the number and rigor of the academic courses they took in high school. On average, 1998 graduates earned 3.98 more credits in academic courses in high school—equivalent to about four full-year academic courses—and they earned more credits in each academic subject than did 1982 graduates (table 14). In addition, more graduates took advanced coursework in mathematics, science, and English over the period studied (figure 40 and tables A19, A20, A21) (see also Chen et al. forthcoming).<sup>64</sup>

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<sup>64</sup>Advanced mathematics coursework includes algebra 3, trigonometry, analytical geometry, linear algebra, probability, statistics, pre-calculus, introduction to analysis, and/or calculus. Advanced science coursework includes some combination of chemistry and/or physics, other than consumer or introductory chemistry. Advanced English coursework includes at least some honors English courses. See the appendix D for a more detailed explanation of these measures.

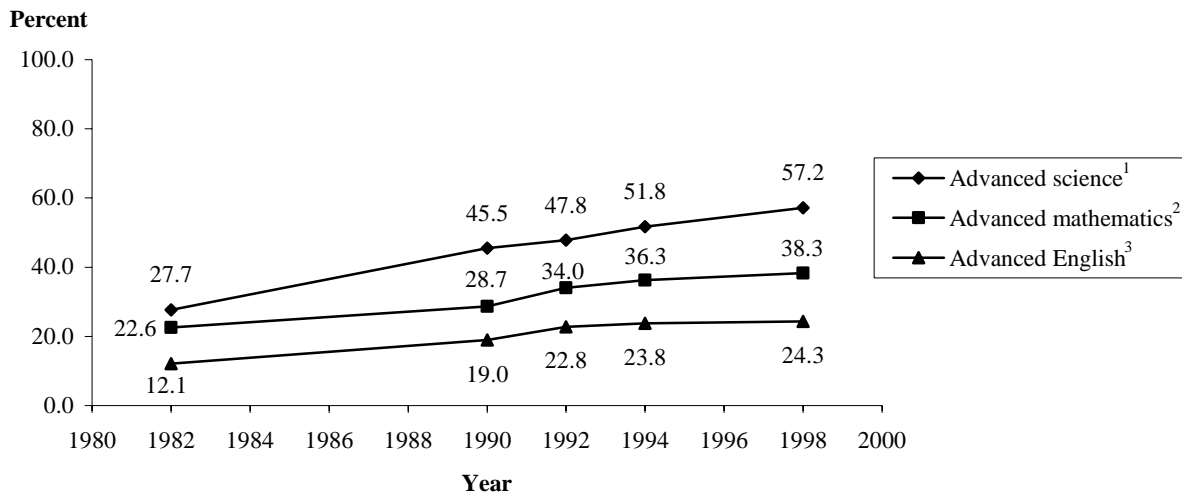
**Table 14. Average number of credits earned in academic subjects by public high school graduates, by subject: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	14.28	16.66	17.22	17.58	18.26
Core academics, total	11.87	13.57	13.88	14.21	14.51
English	3.93	4.19	4.24	4.29	4.25
Mathematics	2.62	3.15	3.23	3.33	3.40
Science	2.17	2.76	2.89	3.04	3.12
Social studies	3.14	3.48	3.53	3.55	3.74
Foreign languages	0.95	1.54	1.67	1.71	1.85
Fine arts	1.46	1.55	1.67	1.66	1.90

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Figure 40. Percentage of public high school graduates taking advanced academic coursework, by academic subject: Various years, 1982–98**



<sup>1</sup>Includes chemistry 1 and 2 and physics 1 and 2.

<sup>2</sup>Includes algebra 3, trigonometry, analytical geometry, linear algebra, probability, statistics, pre-calculus, introduction to analysis, and calculus.

<sup>3</sup>Includes at least some English coursework in honors courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Was this increased academic coursetaking associated with a decline in vocational/technical coursetaking among students between 1982 and 1998?<sup>65</sup> How did students combine academic and vocational/technical coursetaking over the period studied? To what extent did the academic coursetaking of participants in vocational/technical education increase compared with that of other students? To what extent did students take academic coursework related to their vocational/technical coursework? This chapter addresses these questions.

## The Relationship Between Academic and Vocational/Technical Coursetaking

Graduates decreased their average vocational/technical coursetaking by a relatively small amount while taking additional academic coursework over the period studied. In general, students made room for additional academic courses primarily by increasing the total number of credits they earned in high school rather than by reducing their vocational/technical coursetaking. As reported in chapter II, the average number of credits that public high school graduates earned in vocational/technical education decreased from 4.68 credits for 1982 graduates to 4.19 credits for 1990 graduates, with 1998 graduates earning 3.99 vocational/technical credits on average in high school.<sup>66</sup> Thus, 1998 graduates earned 0.69 fewer vocational/technical credits on average than 1982 graduates, while they earned 3.98 more academic credits and 0.25 more enrichment/other credits than their 1982 counterparts (figure 8). Consequently, the total number of credits earned by public high school graduates increased by 3.54 credits on average, from 21.60 credits for 1982 graduates to 25.14 credits for 1998 graduates.

For each graduating class, participants in vocational/technical education earned fewer *core* academic credits in high school than nonparticipants, regardless of the particular measure of participation (table 15).<sup>67, 68</sup> For example, among 1998 graduates, occupational coursetakers earned 1.02 fewer core academic credits on average than graduates taking no occupational courses (14.42 credits versus 15.43 credits). Toward the other end of the participation spectrum, advanced occupational concentrators earned 0.87 fewer core academic credits than 1998 graduates who were not advanced occupational concentrators (13.77 credits versus 14.64 credits).

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<sup>65</sup>This is a different question than that examined in chapter I, which examined whether changes in states' high school graduation requirements were associated with changes in vocational/technical coursetaking between 1990 and 1998.

<sup>66</sup>No significant changes in average vocational/technical credits earned were detected after 1990.

<sup>67</sup>The Secondary School Taxonomy includes non-English (foreign) languages and fine arts under the academic curriculum. However, many states consider these subjects as electives (Snyder and Hoffman 2001, table 154). The rest of this chapter, therefore, focuses primarily—although not exclusively—on the four core academic subjects of English, mathematics, science, and social studies.

<sup>68</sup>There was one exception to this overall pattern. The difference between advanced occupational concentrators with cooperative education and all other 1998 graduates in the number of core academic credits earned was not statistically significant.

**Table 15. Average number of credits earned in core academic subjects by public high school graduates, by selected participation measures: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	11.87	13.57	13.88	14.21	14.51
Vocational/technical participation measures					
Vocational/technical coursetakers <sup>1</sup>	11.82	13.54	13.85	14.17	14.47
Occupational coursetakers <sup>2</sup>	11.65	13.46	13.79	14.11	14.42
Vocational/technical investors <sup>3</sup>	11.21	12.91	13.27	13.60	14.00
Occupational investors <sup>4</sup>	10.89	12.58	13.02	13.33	13.88
Occupational concentrators <sup>5</sup>	10.78	12.28	12.73	13.06	13.68
Advanced occupational concentrators <sup>6</sup>	10.79	12.31	12.69	13.01	13.77
Advanced occupational concentrators with cooperative education <sup>7</sup>	10.82	12.25	12.40	12.75	14.08
Vocational/technical nonparticipation measures					
All graduates except vocational/technical coursetakers	14.13	15.00	15.26	15.62	15.81
All graduates except occupational coursetakers	13.57	14.68	14.99	15.22	15.43
All graduates except vocational investors	13.50	14.72	14.88	15.19	15.33
All graduates except occupational investors	12.70	14.32	14.51	14.85	15.01
All graduates except occupational concentrators	12.42	14.07	14.26	14.61	14.79
All graduates except advanced occupational concentrators	12.21	13.81	14.11	14.42	14.64
All graduates except advanced occupational concentrators with cooperative education	11.91	13.63	13.94	14.29	14.53

<sup>1</sup>Graduates earning greater than 0.0 credits in vocational/technical education.

<sup>2</sup>Graduates earning greater than 0.0 credits in occupational education.

<sup>3</sup>Graduates earning 3.0 or more credits in vocational/technical education.

<sup>4</sup>Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

<sup>5</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>6</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

<sup>7</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

NOTE: Core academic subjects include English, mathematics, science, and social studies.

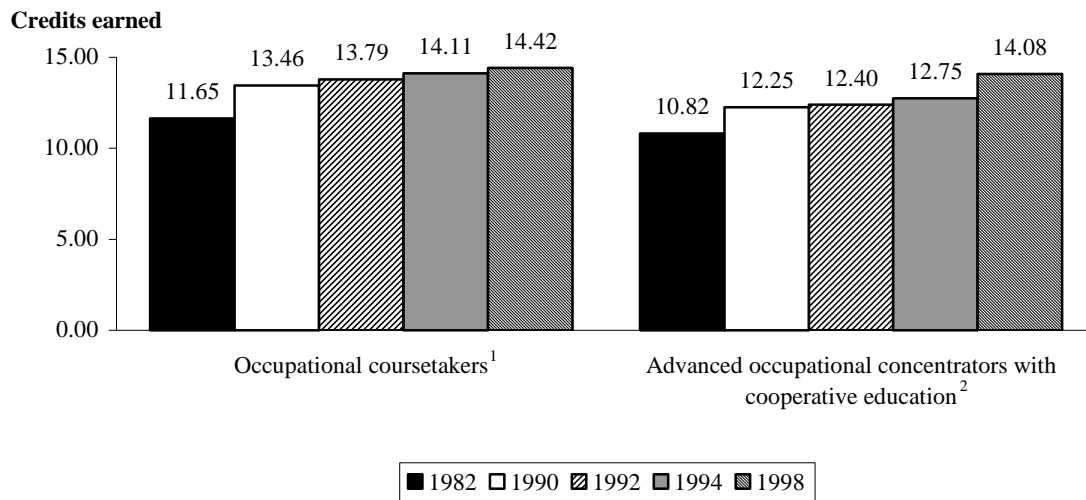
SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

In addition, the average number of core academic credits earned by graduates decreased—up to a point—as their involvement in the vocational/technical curriculum increased. For example, for the class of 1998, occupational concentrators earned 0.79 fewer core academic credits than vocational/technical coursetakers (13.68 credits versus 14.47 credits) (table 15). However,

the average number of core academic credits earned by vocational/technical participants appeared to increase with advanced occupational coursetaking,<sup>69</sup> such that the difference in core academic credits earned by 1998 graduates who were vocational/technical coursetakers and those who were advanced occupational concentrators with cooperative education was not statistically significant.

Like graduates in general, participants in vocational/technical education increased their academic coursetaking in high school over the period studied. According to all measures of vocational/technical participation presented in table 15, 1998 graduates earned more core academic credits than their 1982 counterparts. For example, occupational coursetakers earned 2.77 more core academic credits over the period, increasing from 11.65 credits for 1982 graduates to 14.42 credits for 1998 graduates (figure 41 and table 15). Similarly, at the other end of the vocational/technical participation spectrum, advanced occupational concentrators with 1.0 or more

**Figure 41. Average number of credits earned in core academic subjects by public high school graduates, by selected vocational/technical coursetaking measures: Various years, 1982–98**



<sup>1</sup>Graduates earning greater than 0.0 credits in occupational education.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: Core academic subjects include English, mathematics, science, and social studies.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

<sup>69</sup>However, the difference in average number of core academic credits earned between occupational concentrators and advanced concentrators with cooperative education was not statistically significant.

credits of cooperative education in their area of concentration earned 3.26 more core academic credits, increasing from 10.82 credits for 1982 graduates to 14.08 credits for 1998 graduates.

## **Trends in the Academic Coursetaking of Occupational Concentrators**

### *Overview*

Both occupational concentrators (graduates earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 3) and nonconcentrators (all graduates except occupational concentrators) increased the number and rigor of the academic courses they took between 1982 and 1998. In some instances, the rate of increase was greater for occupational concentrators, possibly because they took fewer and less rigorous academic courses than nonconcentrators at the beginning of the period. Nevertheless, among 1998 graduates, occupational concentrators still took fewer and less rigorous academic courses in high school than nonconcentrators.

However, differences between occupational concentrators and nonconcentrators in mathematics, English, and social studies coursetaking were fairly small, and the level of coursetaking for both groups was fairly high in these subjects, compared with the level of science coursetaking. For example, among 1998 graduates, differences between occupational concentrators and nonconcentrators in the number of credits earned in English, mathematics, and social studies were less than 0.40 credits (ranging from 0.18 credits to 0.27 credits), while the difference between these two groups in science was 0.40 credits (table 16). Similarly, among 1998 graduates, more than 75 percent of both occupational concentrators and nonconcentrators met the New Basics core academic standards<sup>70</sup> in mathematics, English, and social studies, while less than 75 percent of these groups met the standard in science (table 17).<sup>71</sup> In addition, the gap between occupational concentrators and nonconcentrators in the percentage of graduates meeting the New Basics standards was larger in science than in English or social studies (15.2 percentage points versus 3.7 percentage points and 4.4 percentage points, respectively) (table 17).<sup>72</sup> The gap between concentrators and nonconcentrators in science coursetaking was larger in chemistry than in biology (see the section on trends in specific academic coursetaking below).

These general findings are reviewed in more detail in the remainder of this section.

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<sup>70</sup>The New Basics core academic standards include 4 years of English, and 3 years each of mathematics, science, and social studies (National Commission on Excellence in Education 1983).

<sup>71</sup>The 73.7 percent of nonconcentrators meeting the science standard was not statistically different from 75 percent.

<sup>72</sup>The 6.8 percentage point gap between occupational concentrators and nonconcentrators in mathematics was not statistically different from the corresponding science gap of 15.2 percentage points.

**Table 16. Average number of credits earned in core academic subjects by public high school graduates, by occupational concentration status and subject area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	11.87	13.57	13.88	14.21	14.51
Occupational concentrators <sup>1</sup>					
All core academic subjects	10.78	12.28	12.73	13.06	13.68
English	3.79	4.02	4.11	4.16	4.12
Mathematics	2.25	2.80	2.87	3.02	3.21
Science	1.74	2.26	2.47	2.59	2.82
Social studies	3.00	3.19	3.28	3.30	3.54
Nonconcentrators <sup>2</sup>					
All core academic subjects	12.42	14.07	14.26	14.61	14.79
English	4.01	4.26	4.28	4.33	4.29
Mathematics	2.80	3.29	3.35	3.44	3.46
Science	2.39	2.94	3.03	3.20	3.23
Social studies	3.22	3.58	3.61	3.64	3.81

<sup>1</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>2</sup>All graduates except occupational concentrators.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table 17. Percentage of public high school graduates meeting New Basics standards in core academic subjects, by occupational concentration status and academic subject area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	13.1	38.1	42.1	50.2	56.0
Occupational concentrators <sup>1</sup>					
All core academic subjects	5.0	18.5	24.4	33.2	45.7
English	57.7	78.7	82.1	88.7	82.0
Mathematics	29.4	57.1	59.5	70.7	78.7
Science	13.2	29.5	36.8	45.1	58.4
Social studies	62.1	77.4	82.3	84.1	90.9
Nonconcentrators <sup>2</sup>					
All core academic subjects	17.1	45.7	47.9	56.0	59.4
English	65.5	85.5	86.6	88.6	85.8
Mathematics	54.7	78.0	80.6	84.5	85.5
Science	37.4	60.7	62.6	70.3	73.7
Social studies	70.8	89.0	88.6	91.3	95.3

<sup>1</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>2</sup>All graduates except occupational concentrators.

NOTE: New Basics core academic standards include 4 years of English and 3 years each of mathematics, science, and social studies.

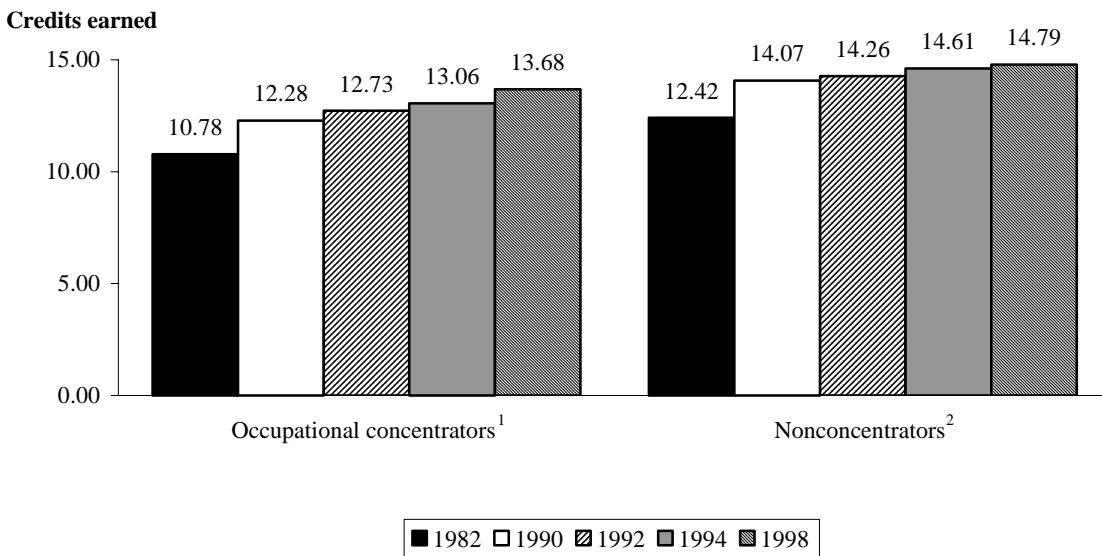
SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

### Overall Academic Coursetaking

Occupational concentrators who were members of the class of 1998 earned 2.90 more credits in core academic subjects (English, mathematics, science, and social studies) than their 1982 counterparts, a larger increase than the 2.37 additional core academic credits earned by nonconcentrators over the same period (figure 42 and table 16). However, as of 1998, occupational concentrators still earned 1.11 fewer credits—equivalent to about one less full-year course—in core academic subjects in high school than nonconcentrators. Among 1998 graduates, occupational concentrators earned 13.68 credits in core academic subjects, compared with 14.79 credits for nonconcentrators.

Comparing the classes of 1982 and 1998, the percentages of occupational concentrators and nonconcentrators meeting all of the New Basics core academic standards increased by *amounts*

**Figure 42. Average number of credits earned in core academic subjects by public high school graduates, by occupational concentration status: Various years, 1982–98**



<sup>1</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>2</sup>Includes all graduates except occupational concentrators.

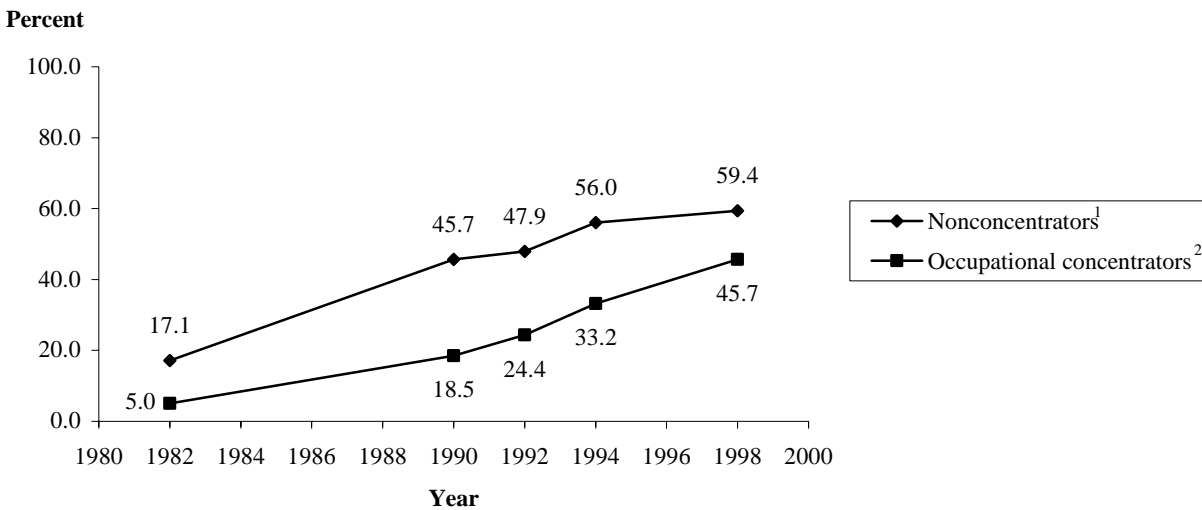
NOTE: Core academic subjects include English, mathematics, science, and social studies.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.



that were not statistically different from each other (by about 41 to 42 percentage points) (figure 43 and table 17). However, the *rates* of increase differed because occupational concentrators were less likely than nonconcentrators to meet the New Basics core academic standards in 1982. The percentage of occupational concentrators who met all of the New Basics core academic standards increased by 800 percent between the classes of 1982 and 1998, compared with an increase of about 250 percent for nonconcentrators. Nevertheless, among 1998 graduates, occupational concentrators were still less likely than nonconcentrators to meet all of the New Basics core academic standards (45.7 percent versus 59.4 percent).

**Figure 43. Percentage of public high school graduates meeting the New Basics standards in core academic subjects, by occupational concentration status: Various years, 1982–98**



<sup>1</sup>Includes all graduates except occupational concentrators.

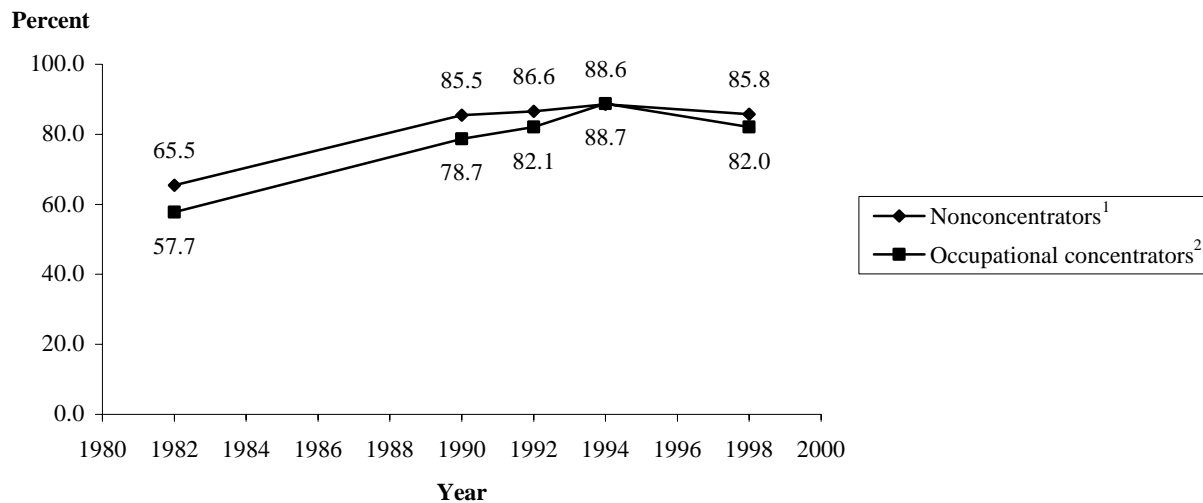
<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: New Basics core academic standards include 4 years of English and 3 years each of mathematics, science, and social studies.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Patterns were similar when examining trends in mathematics and science coursetaking. That is, increases between 1982 and 1998 in average credits earned (table 16) and in the percentage of graduates meeting New Basics standards (table 17 and figures 44–47) were greater for occupational concentrators than for nonconcentrators in these two subjects.<sup>73</sup> In addition, among 1998 public high school graduates, occupational concentrators generally earned fewer credits on average and were less likely to meet the New Basics standard in each core academic subject compared to nonconcentrators.<sup>74</sup>

**Figure 44. Percentage of public high school graduates earning 4.0 or more credits in English, by occupational concentration status: Various years, 1982–98**



<sup>1</sup>Includes all graduates except occupational concentrators.

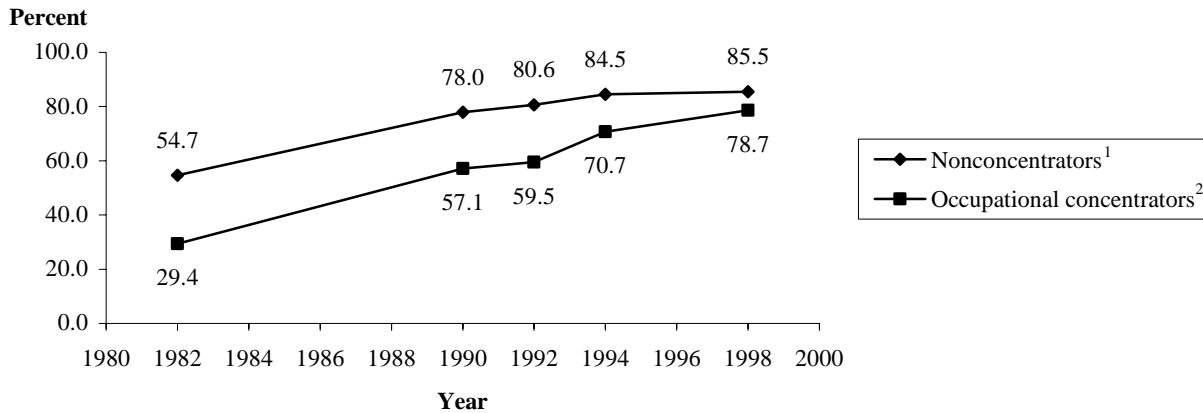
<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

<sup>73</sup>Apparent differences between occupational concentrators and nonconcentrators in English and in social studies were not statistically significant.

<sup>74</sup>One exception was that the difference between occupational concentrators and nonconcentrators in the percentage of 1998 graduates meeting the New Basics standard in English was not statistically significant.

**Figure 45. Percentage of public high school graduates earning 3.0 or more credits in mathematics, by occupational concentration status: Various years, 1982–98**

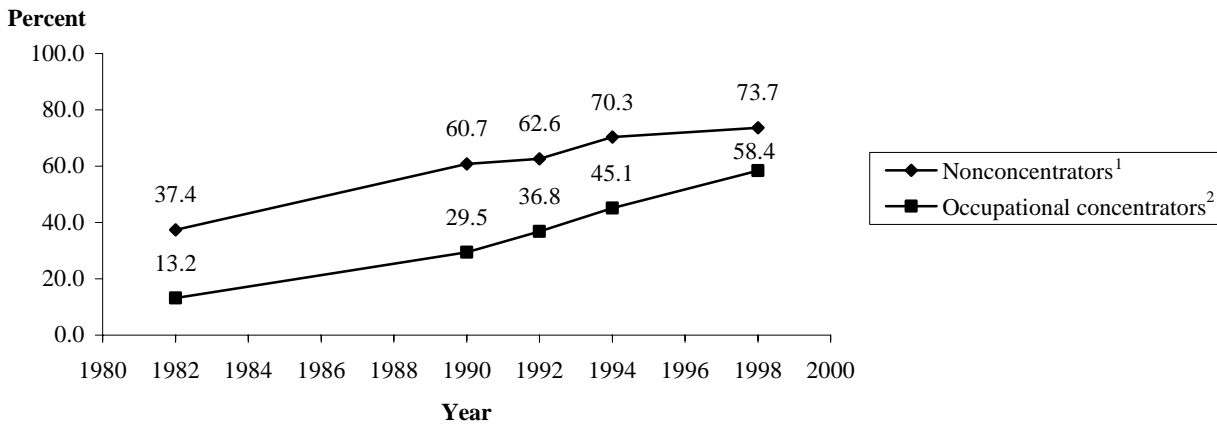


<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Figure 46. Percentage of public high school graduates earning 3.0 or more credits in science, by occupational concentration status: Various years, 1982–98**

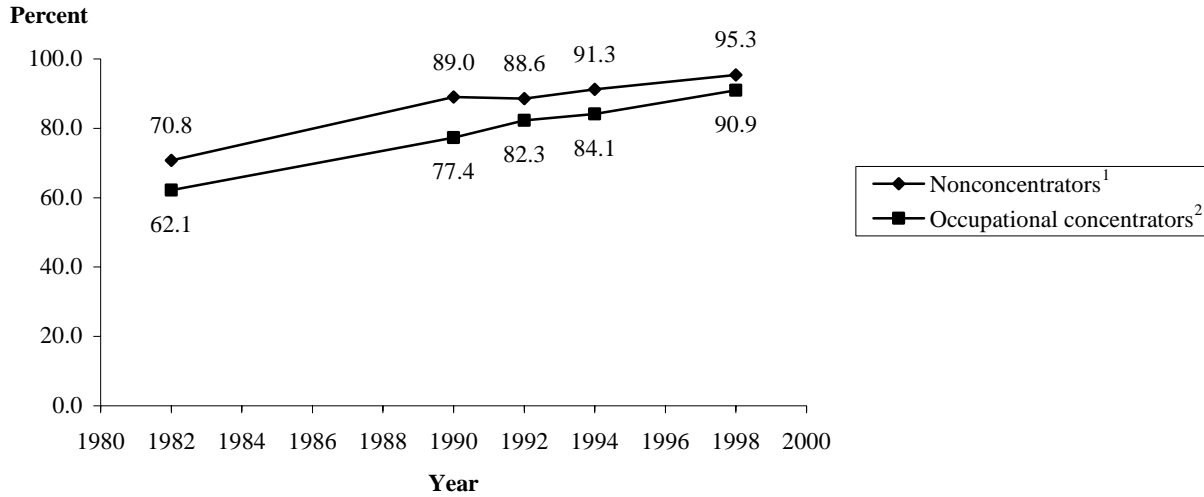


<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Figure 47. Percentage of public high school graduates earning 3.0 or more credits in social studies, by occupational concentration status: Various years, 1982–98**



<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

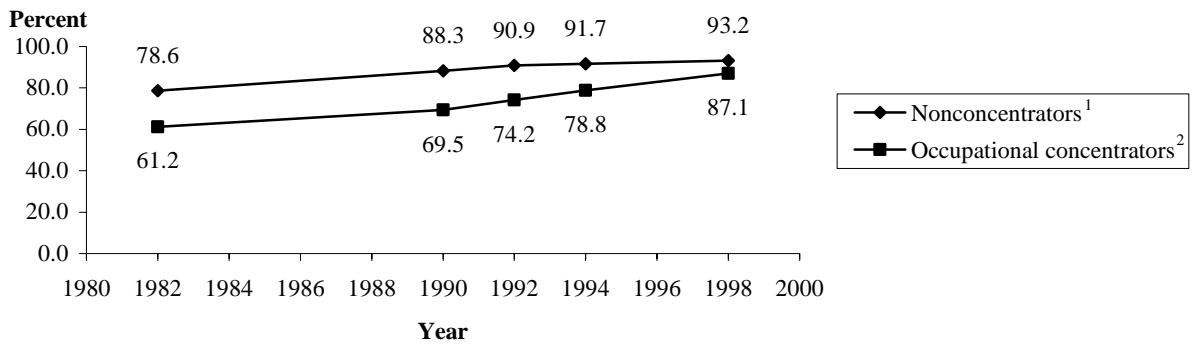
### *Trends in Specific Academic Coursetaking*

This section examines coursetaking trends for specific courses within the mathematics, science, and social studies subject areas.

Trends in specific mathematics and science coursetaking generally followed the above patterns. The percentage of occupational concentrators who took algebra 1 or higher mathematics and who took biology increased at higher rates between 1982 and 1998 than the percentage of nonconcentrators who took these courses (figures 48 and 49 and table A22).<sup>75</sup> In addition, although the increase was larger for occupational concentrators than for nonconcentrators, among 1998 graduates, concentrators were still less likely than nonconcentrators to take these courses in high school. As of 1998, occupational concentrators were also less likely than nonconcentrators to take chemistry and physics courses. The largest increase in science coursetaking for both concentrators and nonconcentrators over the period studied was in chemistry. Despite this increase,

<sup>75</sup>Apparent differences between occupational concentrators and nonconcentrators in chemistry and in physics were not statistically significant.

**Figure 48. Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status: Various years, 1982–98**

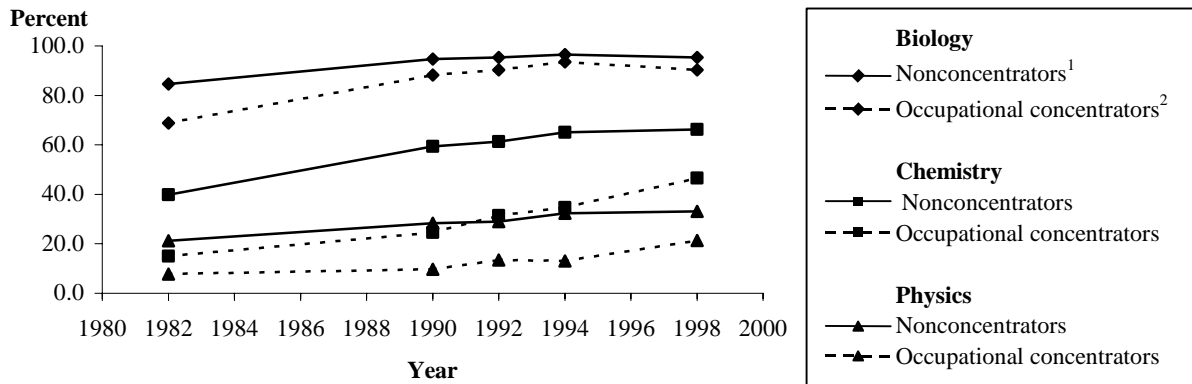


<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Figure 49. Percentage of public high school graduates completing specific science courses, by occupational concentration status: Various years, 1982–98**



<sup>1</sup>Includes all graduates except occupational concentrators.

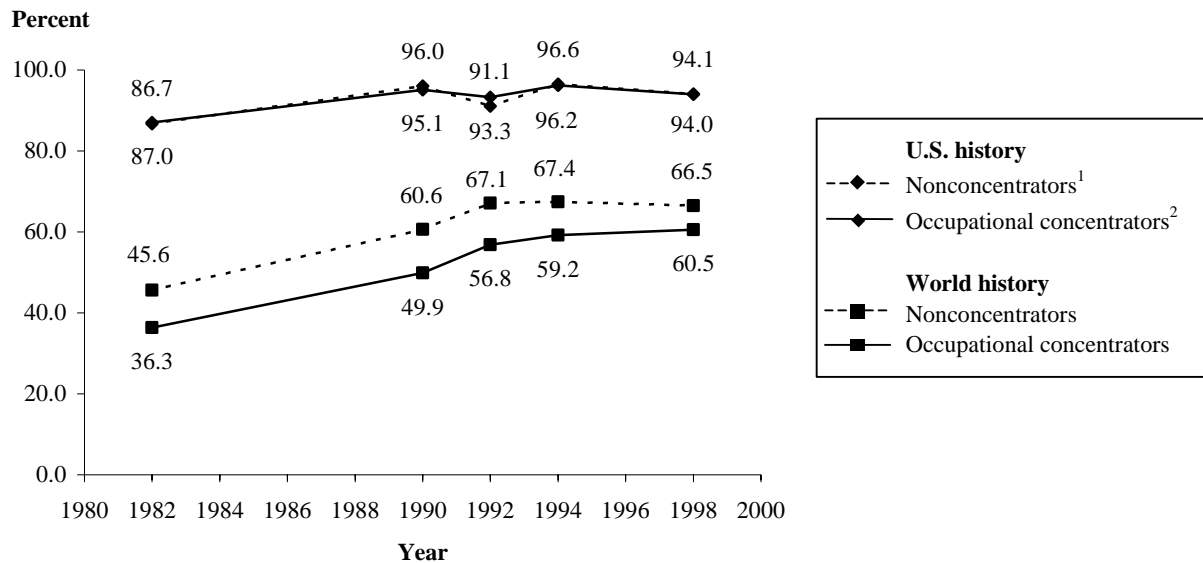
<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

the gap between occupational concentrators and nonconcentrators as of 1998 was significantly larger in chemistry than in biology.<sup>76</sup>

With regard to social studies coursetaking, both occupational concentrators and nonconcentrators increased their coursetaking in both U.S. history and world history over the period studied. Moreover, occupational concentrators and nonconcentrators increased their U.S. history and world history coursetaking by statistically similar amounts between 1982 and 1998. As of 1998, there was no significant difference in the percentage of occupational concentrators and nonconcentrators who took either type of history in high school (figure 50 and table A23).<sup>77</sup>

**Figure 50. Percentage of public high school graduates completing specific history courses, by occupational concentration status: Various years, 1982–98**



<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

<sup>76</sup>The gap as of 1998 between occupational concentrators and nonconcentrators in physics was not statistically significant from the corresponding gap in chemistry.

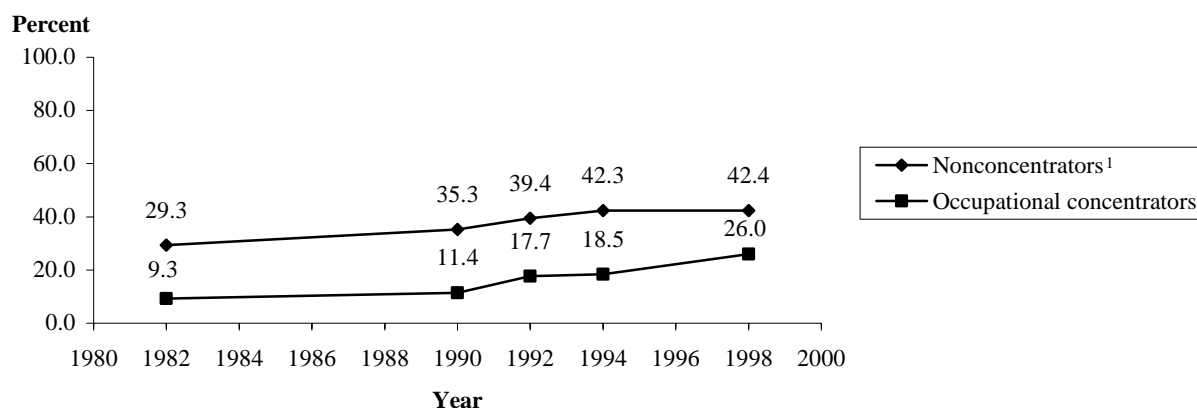
<sup>77</sup>The apparent difference as of 1998 between occupational concentrators and nonconcentrators in world history was not statistically significant.

### Trends in Advanced Academic Coursetaking

Finally, with regard to advanced academic coursetaking, the percentage of occupational concentrators and nonconcentrators who completed advanced coursework in mathematics (coursework beyond algebra 2), science (chemistry and/or physics), and English (at least some honors-level English coursework) increased by statistically similar amounts (figures 51, 52, and 53 and tables A19–A21). However, among 1998 graduates, occupational concentrators were less likely than nonconcentrators to complete advanced coursework in each of these subjects in high school.

Finally, the gap in mathematics coursetaking between occupational concentrators and nonconcentrators was larger in terms of the rigor of this coursetaking than in the number of courses these graduates took. Specifically, the gap between occupational concentrators and nonconcentrators in the percentage of 1998 graduates completing advanced coursework in mathematics (including mathematics above algebra 2) was greater than the gap in the percentage of these graduates taking 3 years of mathematics (16.5 percentage points versus 6.8 percentage points) (table A19 and table 17). In contrast, the gaps between occupational concentrators and nonconcentrators in the percentage of 1998 graduates completing advanced coursework in English and

**Figure 51. Percentage of public high school graduates completing advanced mathematics coursework, by occupational concentration status: Various years, 1982–98**



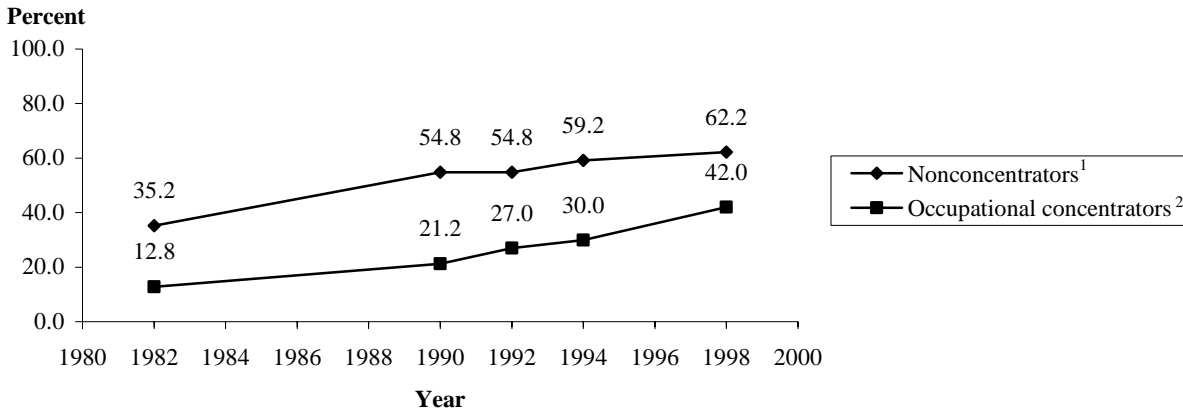
<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: Advanced mathematics coursework includes algebra 3, trigonometry, analytic geometry, linear algebra, probability and statistics, precalculus, introduction to analysis, and/or calculus.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Figure 52. Percentage of public high school graduates completing advanced science coursework, by occupational concentration status: Various years, 1982–98**



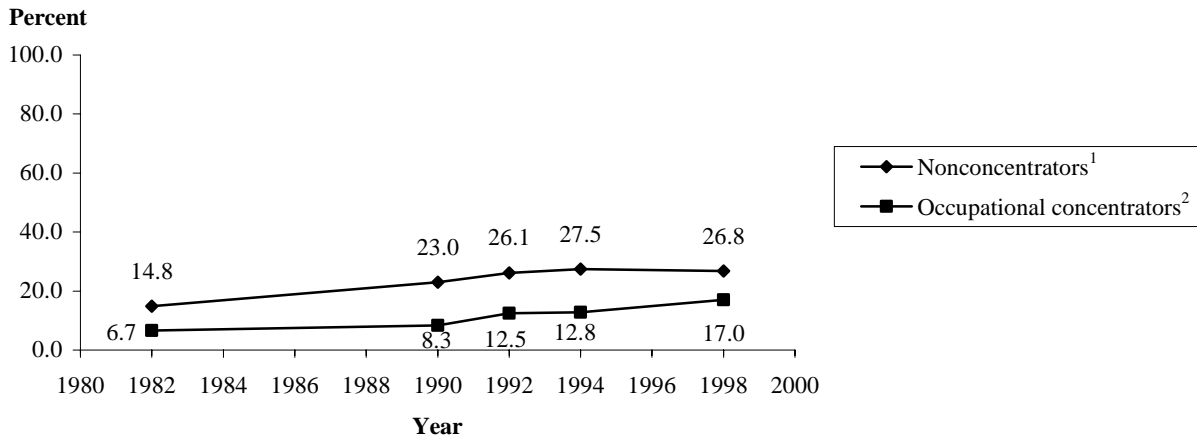
<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: Advanced science coursework includes chemistry 1 and 2 and physics 1 and 2.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Figure 53. Percentage of public high school graduates completing advanced English coursework, by occupational concentration status: Various years, 1982–98**



<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: Advanced English coursework includes at least some honors courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

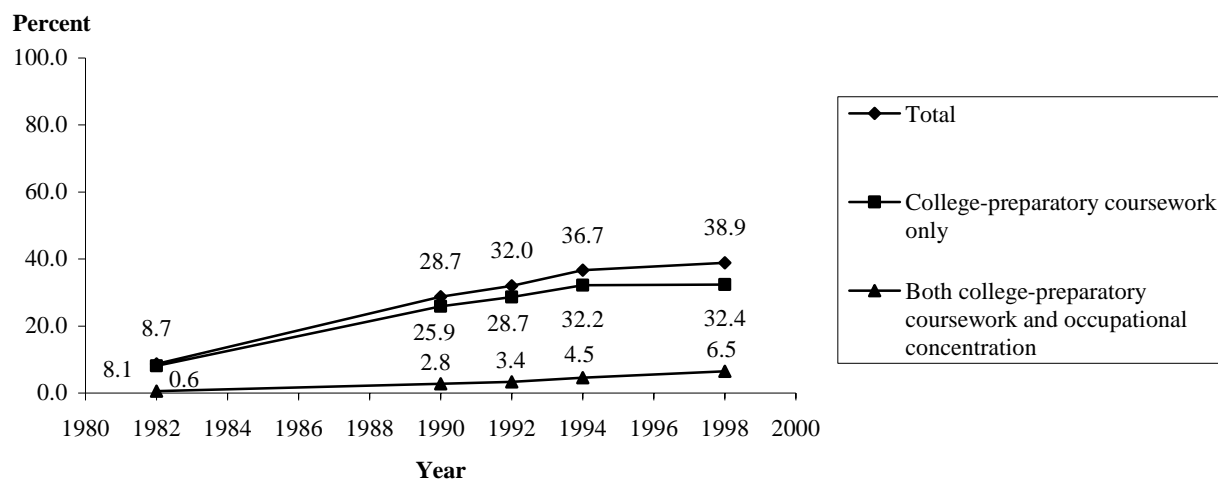


science were not statistically different from the corresponding gaps in the percentage of these graduates meeting the New Basics standards in these two subjects (tables A20–A21 and table 17).

## Combining College-Preparatory and Occupational Coursework

In keeping with increasing academic coursetaking in general, high school students were more likely to complete college-preparatory coursework over the period studied.<sup>78</sup> The percentage of public high school graduates completing college-preparatory coursework in high school increased by about 4.5 times over this period, from 8.7 percent for 1982 graduates to 38.9 percent for 1998 graduates (figure 54 and table A24). The 1998 graduates were also more likely to com-

**Figure 54. Percentage of public high school graduates completing a college-preparatory course of study, by whether graduates completed college-preparatory coursework only or also an occupational concentration: Various years, 1982–98**



NOTE: Detail may not sum to totals because of rounding. College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. Concentrating in occupational education refers to earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

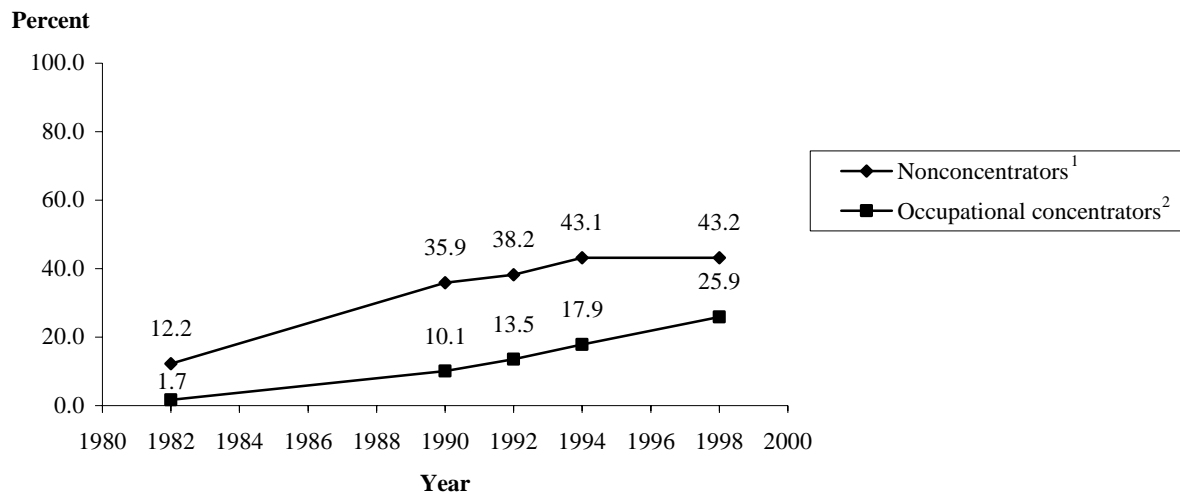
<sup>78</sup>College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. These criteria were based on a review of entrance requirements at public 4-year postsecondary institutions in Flanagan (1992) and were first used in Levesque et al. (2000).

bine college-preparatory and occupational coursework than their 1982 counterparts. Specifically, the percentage of public high school graduates completing both college-preparatory coursework and an occupational concentration increased by about 11 times, from 0.6 percent for 1982 graduates to 6.5 percent for 1998 graduates (figure 54 and table A25).

### ***Occupational Concentrators and College-Preparatory Coursework***

The percentage of occupational concentrators (graduates earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 3) who completed college-preparatory coursework increased about 15 fold over the period studied, from 1.7 percent for 1982 graduates to 25.9 percent for 1998 graduates (figure 55 and table A24). Among the five relevant academic subjects, occupational concentrators who were members of the class of 1998 were most likely to

**Figure 55. Percentage of public high school graduates completing college-preparatory coursework, by occupational concentration status: Various years, 1982–98**



<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

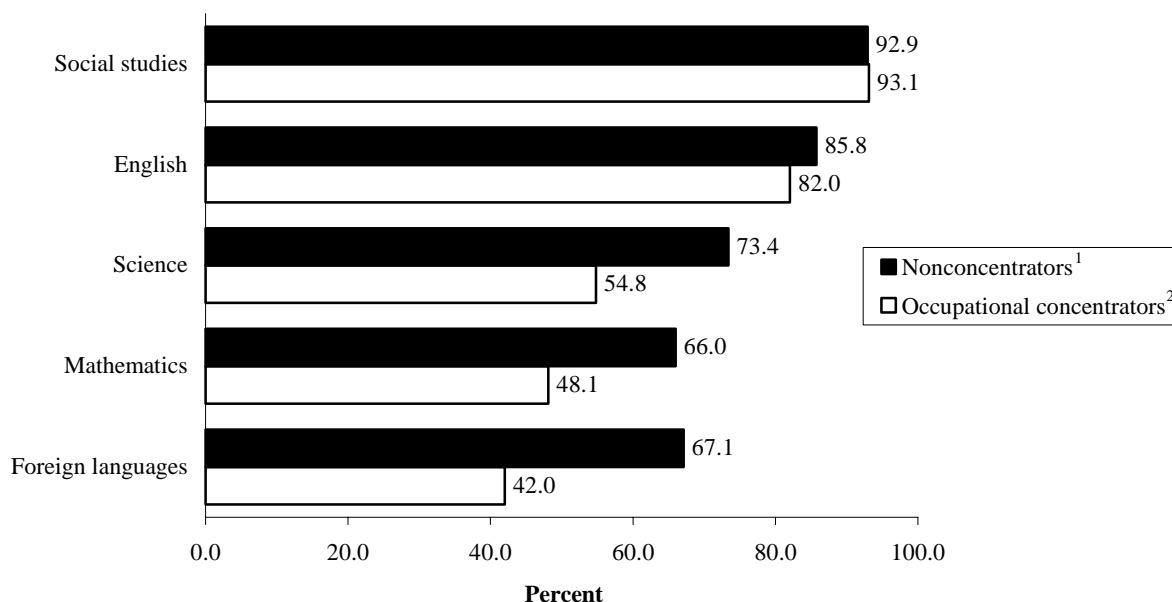
NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

meet the college-preparatory criteria in social studies (figure 56 and table A26). In contrast, they were less likely to meet the college-preparatory criteria in foreign languages than in social studies, English, or science.<sup>79</sup>

Occupational concentrators were less likely than nonconcentrators to complete college-preparatory coursework. Among 1998 graduates, 25.9 percent of occupational concentrators completed college-preparatory coursework, compared with 43.2 percent of nonconcentrators (figure 55 and table A26). Occupational concentrators were also less likely than nonconcentrators to complete the college-preparatory criteria in foreign languages, science, and mathematics (figure 56 and table A26).

**Figure 56. Percentage of public high school graduates completing college-preparatory coursework, by academic subject and occupational concentration status: 1998**



<sup>1</sup>Includes all graduates except occupational concentrators.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

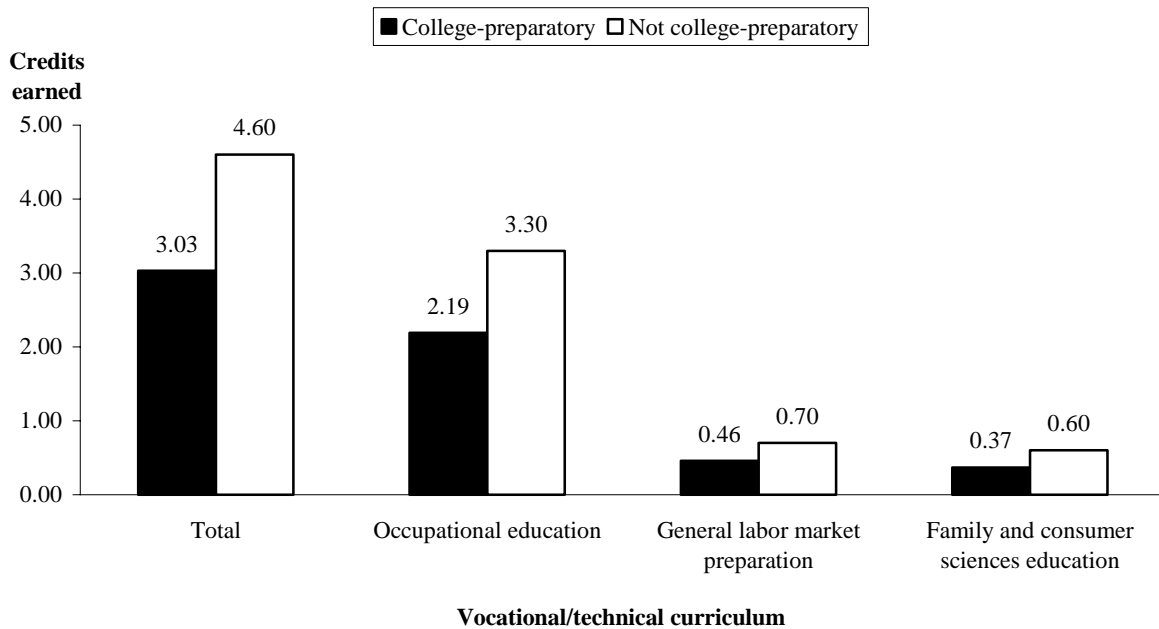
<sup>79</sup>The apparent difference between foreign languages and mathematics was not statistically significant.

### College-Preparatory Completers and Vocational/Technical Coursetaking

As mentioned in chapter I, high school students take varying amounts and types of vocational/technical courses and take these courses for different purposes. This section briefly examines the vocational/technical coursetaking of public high school graduates who completed college-preparatory coursework.

High school students completing college-preparatory coursework took fewer vocational/technical courses overall and in each of the three vocational/technical subcurricula than non-college-preparatory students. Among 1998 public high school graduates, those completing college-preparatory coursework earned 1.57 fewer vocational/technical credits on average than other graduates (figure 57 and table A27). Most of this difference was in occupational education, with college-preparatory completers earning 1.11 fewer occupational credits than other 1998 graduates—the equivalent of about one full-year occupational course. However, a majority of

**Figure 57. Average number of credits earned by public high school graduates in vocational/technical education, by vocational/technical curriculum and whether graduates completed college-preparatory coursework: 1998**



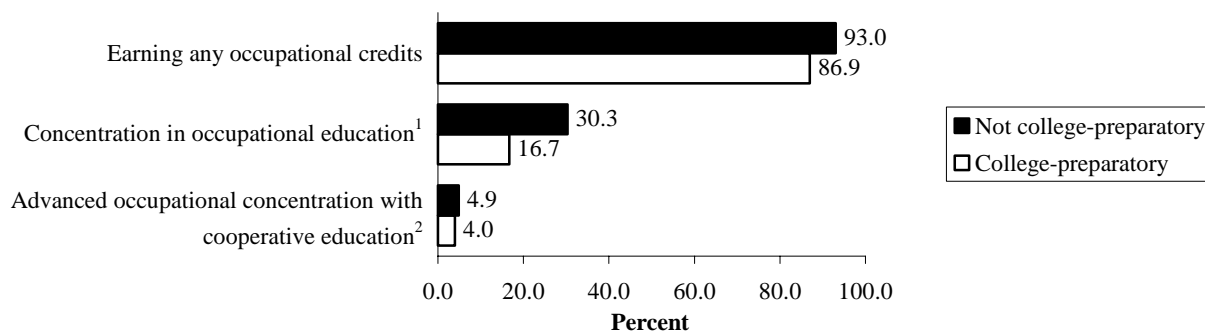
NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

college-preparatory completers (86.9 percent) who were members of the class of 1998 took at least one occupational course (earned at least some occupational credits) (figure 58 and table A28).<sup>80</sup>

Graduates completing college-preparatory coursework were also less likely than other graduates to be occupational concentrators. Among 1998 public high school graduates, 16.7 percent of graduates completing college-preparatory coursework were occupational concentrators, compared with 30.3 percent of graduates who did not complete such coursework (figure 58 and table A28). However, based on the strictest participation measure, there was no significant difference in vocational/technical coursetaking between college-preparatory completers and other graduates. Specifically, there was no significant difference between 1998 graduates who completed college-preparatory coursework and those who did not complete such coursework in their likelihood of completing an advanced occupational concentration with cooperative education (that is, earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 3 with at least 1.0 credit in cooperative education in the area) (4.9 percent versus 4.0 percent).

**Figure 58. Percentage of public high school graduates participating in vocational/technical education, by selected participation measures and whether graduates completed college-preparatory coursework: 1998**



<sup>1</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

<sup>80</sup>This rate of coursetaking was lower than that for all other graduates (93.0 percent).

Looking at specific areas of occupational concentration, graduates completing college-preparatory coursework were more likely than other graduates to concentrate (earn 3.0 or more credits) in the communications technology program area. Specifically, among 1998 graduates, 1.3 percent of college-preparatory completers concentrated in communications technology, compared with 0.6 percent of graduates who did not complete college-preparatory coursework (figure 59 and table A29). In contrast, college-preparatory completers were less likely than other 1998 graduates to concentrate in the program areas of mechanics and repair, construction, agriculture, print production, marketing, food service and hospitality, child care and education, and personal and other services. However, there were no significant differences between the concentration rates of college-preparatory completers and other 1998 graduates in business management, business services, health care, other precision production, transportation, computer technology, and other technology program areas.<sup>81</sup>

### **Related Academic and Occupational Coursetaking**

As described at the beginning of this chapter, both Perkins II and the School-to-Work Opportunities Act called for integrating academic and vocational/technical education. While integration can take many forms, one form that can be examined through transcript studies is whether occupational concentrators took academic courses related to their area of concentration. Table 18 identifies academic courses that were judged to be related to the 18 narrow occupational program areas examined in this report, based on expert advice from members of NCEC's Technical Review Panel for vocational education about the academic knowledge required in high-quality programs in each occupational area. English courses were not included in the table because they were judged to be relevant to all program areas. Because of small sample sizes, only 15 occupational program areas had sufficient data to produce reliable estimates.<sup>82</sup>

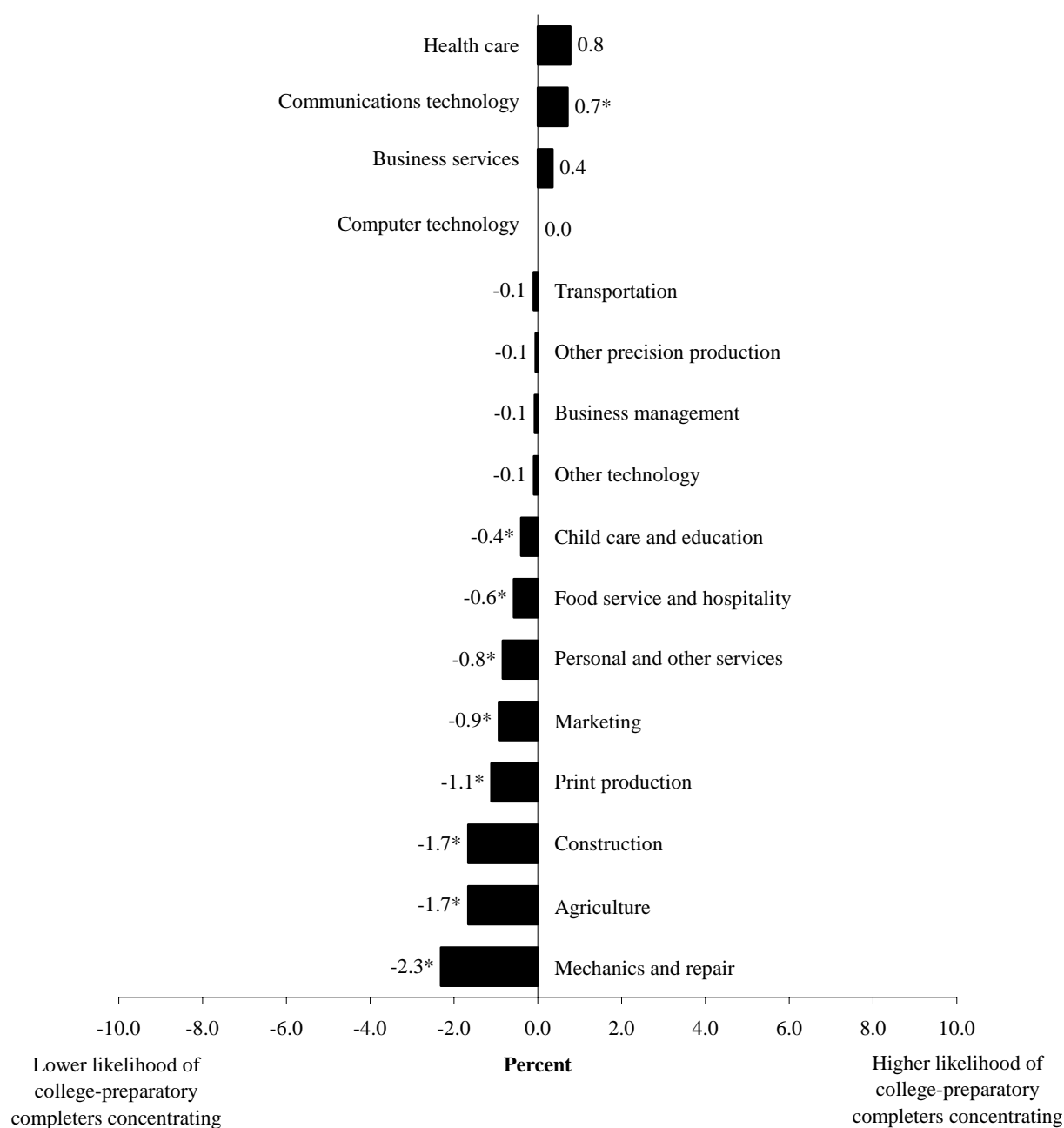
One piece of evidence that occupational concentrators are pursuing an "integrated" vocational/technical and academic program would be above-average rates of coursetaking in related academic subjects. The following analysis compares related academic coursetaking rates for 1998 graduates concentrating (earning 3.0 or more credits) in specific occupational programs in high school with the overall academic coursetaking rate for 1998 public high school graduates. This comparison makes it possible to identify those occupational program areas in which concentrators took related academic courses at above- or below-average rates. It is important to remember, however, that some related academic skills may also be taught within occupational

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<sup>81</sup>There were too few college-preparatory completers concentrating in protective services and in materials production (including metals, woods, and plastics) to produce reliable estimates.

<sup>82</sup>The three program areas with insufficient data included protective services, transportation, and "other" technology. There were not enough graduates concentrating in these areas in the survey samples to produce reliable estimates.

**Figure 59. Difference between college-preparatory completers and other graduates in the percentage of graduates concentrating in occupational education, by program area: 1998**



\*These differences were statistically significant; all others were not statistically significant. Health care was not statistically significant due to large standard errors.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed. Comparisons for protective services and materials production are not listed, because estimates were too small to report in these program areas.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Table 18. Academic coursetaking judged to be related to coursework in specific occupational program areas**

Occupational program area	Mathematics		Science		
	Algebra 1 (or higher)	Geometry	Regular or advanced biology <sup>1</sup>	Regular or advanced chemistry <sup>1</sup>	Physics <sup>2</sup>
Agriculture	✓		✓		
Business management	✓				
Business services	✓				
Marketing	✓				
Health care	✓		✓	✓	
Protective services					
Construction	✓	✓			
Mechanics and repair	✓				✓
Print production	✓	✓			
Materials production	✓				✓
Other precision production	✓				✓
Transportation	✓				✓
Computer technology	✓				✓
Communications technology	✓				✓
Other technology	✓			✓ <sup>3</sup>	✓
Food service and hospitality				✓	
Child care and education					
Personal and other services				✓ <sup>4</sup>	

<sup>1</sup>Because policymakers are concerned about whether students in occupational programs receive high-level related academics, basic biology and basic chemistry courses were excluded from the analysis.

<sup>2</sup>In the Secondary School Taxonomy (SST), the physics category includes Principles of Technology courses.

<sup>3</sup>Chemistry is related to chemical technology coursework.

<sup>4</sup>Chemistry is related to cosmetology coursework.

courses. Because it is not possible to determine the extent of this teaching from transcript studies, the report does not address related academics that are embedded in occupational courses.

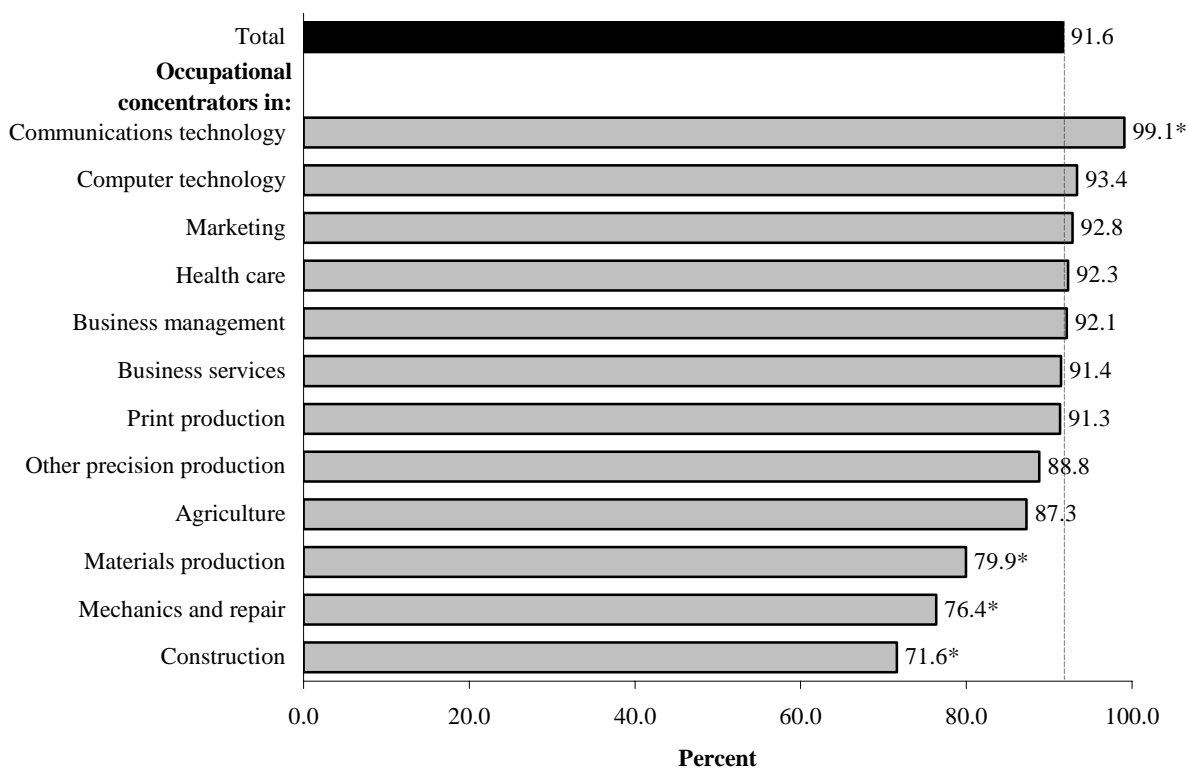
### ***Related Mathematics***

Coursework in algebra 1 or higher mathematics was identified as important for 12 out of the 15 occupational program areas with sufficient data (table 18). Among 1998 graduates, most occupational concentrators (87.1 percent) took algebra 1 or higher mathematics courses (table A30). However, coursetaking varied by program area. Among the 12 program areas in which algebra 1 or higher mathematics was identified as important, 1 exhibited a coursetaking rate that



was above the average for all 1998 graduates (communications technology) (figure 60 and table A30). In contrast, 3 of the 12 program areas exhibited below-average rates (construction, mechanics and repair, and materials production). In the remaining 8 program areas (computer technology, marketing, health care, business management, business services, print production, other precision production, and agriculture), coursetaking rates were not statistically different from the average for all 1998 graduates. For example, 99.1 percent of 1998 graduates concentrating in communications technology took algebra 1 or higher mathematics, a rate that was 7.4 percentage points higher than the average rate of 91.6 percent for all 1998 public high school graduates. In contrast, 71.6 percent of 1998 graduates concentrating in construction took algebra 1 or higher mathematics, a rate that was 20.0 percentage points lower than the average rate for all 1998 graduates.

**Figure 60. Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by related occupational concentration area: 1998**



\*These program areas were statistically different from the total; all others were not statistically different.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

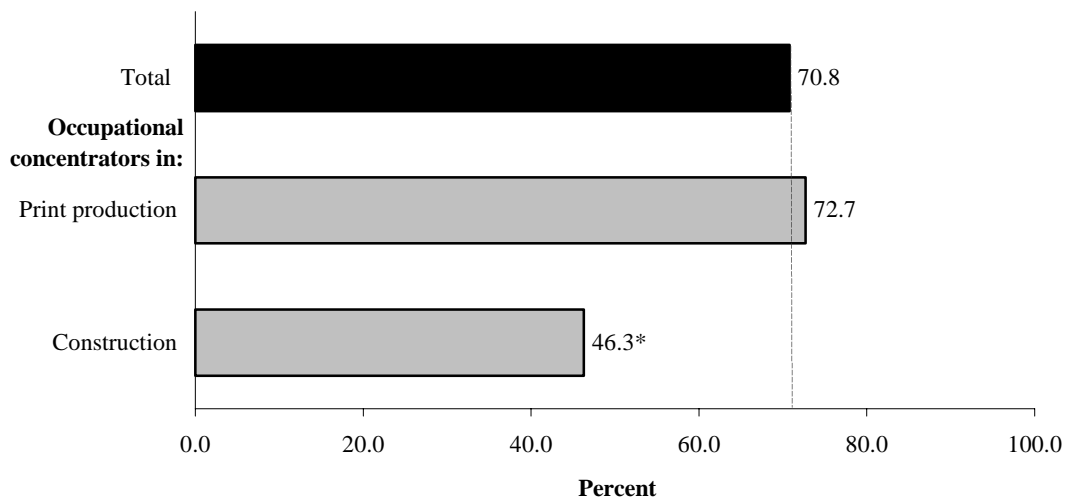
Coursework in geometry was identified as important for the construction and print production program areas (the latter including drafting programs). While 1998 graduates concentrating in print production took geometry at a rate that was not significantly different from the average rate for all 1998 graduates (72.7 percent versus 70.8 percent), 1998 graduates concentrating in construction exhibited a below-average geometry coursetaking rate (46.3 percent versus 70.8 percent) (figure 61 and table A31).

**Related Science**

Concentrators in two occupational program areas were identified as benefiting from related coursework in regular or advanced biology: agriculture and health care. However, neither health care concentrators nor agriculture concentrators exhibited biology coursetaking rates that were statistically different from the average for all 1998 public high school graduates (figure 62 and table A32).

Concentrators in three occupational program areas were identified as potentially benefiting from related coursework in regular or advanced chemistry: health care, food service and hospitality, and personal and other services (especially cosmetology). Among 1998 graduates, food

**Figure 61. Percentage of public high school graduates taking geometry courses, by related occupational concentration area: 1998**

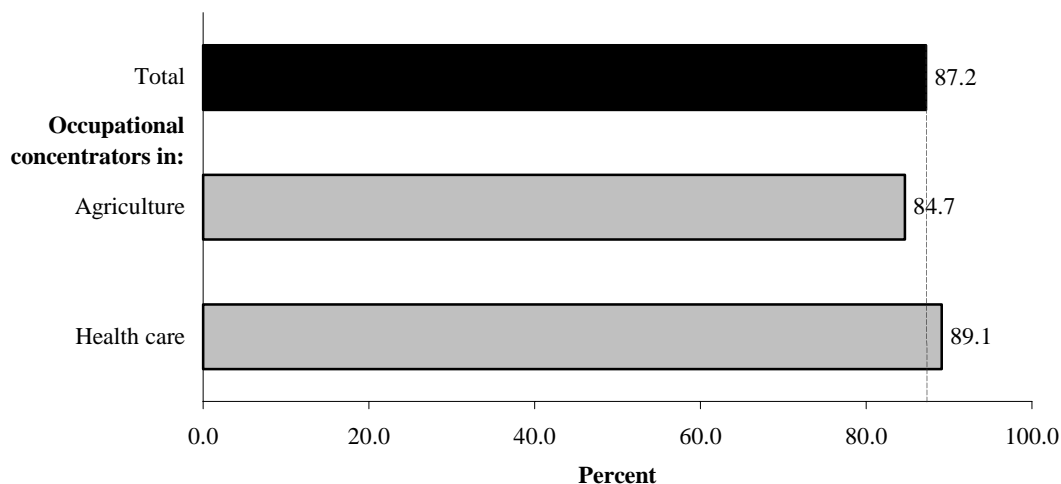


\*This program area was statistically different from the total, while the other was not.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Figure 62. Percentage of public high school graduates taking regular or advanced biology courses, by related occupational concentration area: 1998**



NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed. Neither program area was statistically different from the total.

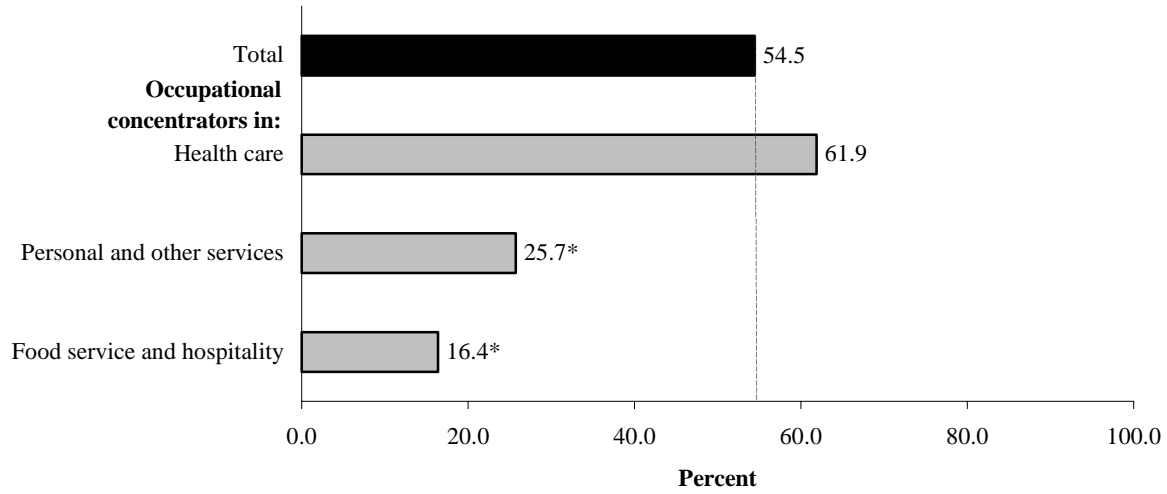
SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

service and hospitality concentrators and personal and other services concentrators exhibited below-average chemistry coursetaking rates (figure 63 and table A33). For example, 16.4 percent of 1998 graduates concentrating in food service and hospitality took regular or advanced chemistry, a rate that was 38.1 percentage points lower than the average rate of 54.5 percent for all 1998 public high school graduates. In contrast, health care concentrators exhibited a chemistry coursetaking rate that was not statistically different from the average rate for all 1998 graduates.

Several trade and industry program areas and technology program areas were identified as benefiting from related coursework in physics (table 18).<sup>83</sup> Of the five related programs with sufficient data, two programs exhibited below-average rates of physics coursetaking (mechanics and repair and materials production) (figure 64 and table A34). For example, 9.3 percent of 1998 graduates concentrating in mechanics and repair took physics, a rate that was 17.4 percentage points lower than the average rate of 26.7 percent for all 1998 graduates. In contrast, occupational concentrators in three program areas (computer technology, communications technology, and other precision production) exhibited rates of physics coursetaking that were not statistically different from the average rate for all 1998 graduates.

<sup>83</sup>The physics category in the SST contains Principles of Technology, among other courses.

**Figure 63. Percentage of public high school graduates taking regular or advanced chemistry courses, by related occupational concentration area: 1998**

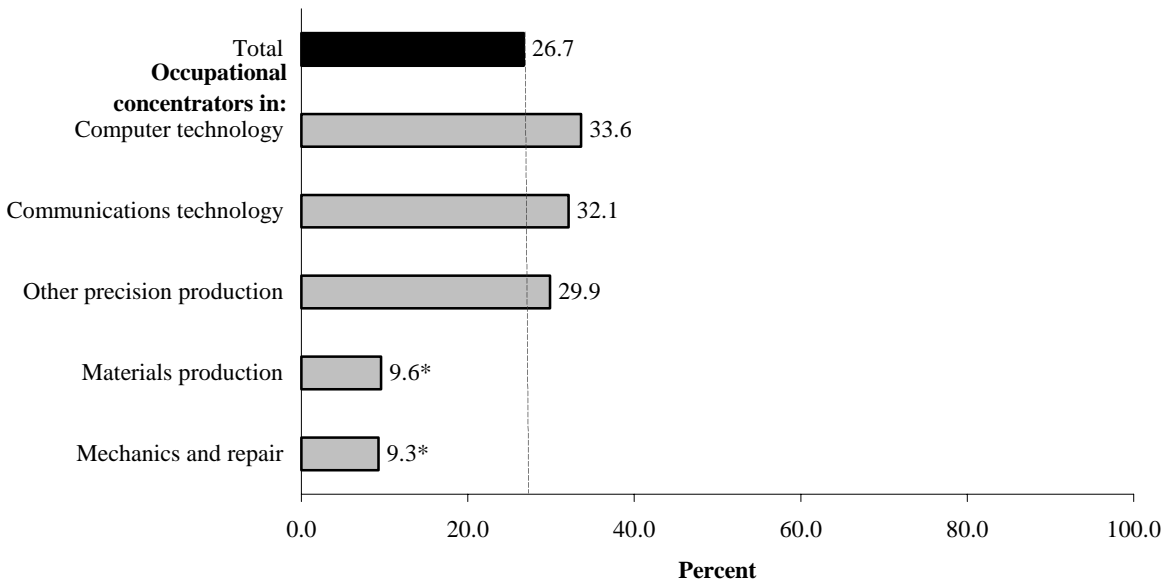


\*These program areas were statistically different from the total.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Figure 64. Percentage of public high school graduates taking physics courses, by related occupational concentration area: 1998**



\*These program areas were statistically different from the total.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

### ***Summary of Related Academic Coursetaking***

Looking across the academic coursetaking areas, graduates concentrating in construction, mechanics and repair, materials production, food service and hospitality, and personal and other services took all of their identified related academic courses at *below*-average rates. These findings indicate that the programs in which occupational concentrators took related academic courses at below-average rates were generally clustered in the trade and industry and in the occupational home economics-related program areas.<sup>84</sup> At the same time, concentrators in communications technology took some of their identified related academic courses at *above*-average rates.

However, concentrators in most program areas took related academic courses at rates that were not statistically different from the average for all graduates, including concentrators in agriculture, business services, business management, marketing, health care, computer technology, print production, and other precision production.

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<sup>84</sup>As mentioned above, trade and industry programs include construction, mechanics and repair, print production, materials production, other precision production, and transportation. As described in chapter I, occupational home economics-related program areas include food service and hospitality, personal and other services, and child care and education.

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## Appendix A—Means Tables

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**Table A1. Percentage of public high school graduates taking vocational/technical education courses, by vocational/technical curriculum: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	98.2	98.0	97.7	97.2	96.5
Occupational education	88.7	90.6	92.2	90.8	90.7
Family and consumer sciences education	50.2	48.1	45.0	45.1	44.4
General labor market preparation	77.6	68.8	60.0	61.1	58.8

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A2. Percentage of public high school graduates meeting different definitions of participation in vocational/technical education: Various years, 1982–98**

	1982	1990	1992	1994	1998
Vocational/technical coursetakers <sup>1</sup>	98.2	98.0	97.7	97.2	96.5
Occupational coursetakers <sup>2</sup>	88.7	90.6	92.2	90.8	90.7
Vocational/technical investors <sup>3</sup>	71.3	63.7	61.9	61.1	61.5
Occupational investors <sup>4</sup>	46.2	43.0	42.2	42.0	43.8
Occupational concentrators <sup>5</sup>	33.7	27.8	24.9	25.4	25.0
Advanced occupational concentrators <sup>6</sup>	24.0	16.1	16.2	14.5	14.4
Advanced occupational concentrators with cooperative education <sup>7</sup>	4.2	4.1	3.9	5.2	4.5

<sup>1</sup>Graduates earning greater than 0.0 credits in vocational/technical education.

<sup>2</sup>Graduates earning greater than 0.0 credits in occupational education.

<sup>3</sup>Graduates earning 3.0 or more credits in vocational/technical education.

<sup>4</sup>Graduates earning 3.0 or more credits in one or more of the following 10 broad occupational program areas, regardless of whether they concentrate their occupational coursetaking in a single program area: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>5</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>6</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

<sup>7</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A3. Average number of credits earned in general labor market preparation by public high school graduates, by area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	0.95	0.73	0.62	0.64	0.61
Basic typewriting/keyboarding	0.55	0.45	0.34	0.37	0.29
Industrial arts/technology education, total	0.17	0.11	0.12	0.12	0.12
Industrial arts	0.17	0.10	0.10	0.08	0.04
Technology education	‡	0.01	0.02	0.04	0.08
Career preparation/general work experience	0.23	0.17	0.16	0.15	0.20

‡Reporting standards not met. (Too few cases.).

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A4. Percentage distribution of vocational/technical credits earned by public high school graduates, by grade level of course: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Grade level					
9	17.0	18.1	19.3	19.7	20.7
10	19.9	18.7	19.7	19.1	19.5
11	28.8	24.9	24.4	23.9	23.6
12	34.4	38.3	36.6	37.3	36.2

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A5. Percentage of public high school graduates earning credits in occupational education, by program area: Various years, 1982–98**

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	88.7	90.6	92.2	90.8	90.7	2.0
Materials production	20.3	14.9	12.4	9.7	11.6	-8.8
Business management	23.8	18.6	18.9	18.8	16.1	-7.6
Mechanics and repair	13.1	10.1	9.4	8.9	10.0	-3.1
Personal and other services	6.3	5.4	6.6	5.8	4.6	-1.7
Construction	7.3	5.5	5.3	6.5	5.6	-1.6
Other precision production	3.9	4.1	3.1	2.2	3.0	-0.9
Protective services	1.3	0.6	1.4	1.3	1.3	0.0
Child care and education	7.6	5.8	5.8	6.1	7.8	0.1
Agriculture	10.1	9.1	9.7	11.3	10.6	0.5
Transportation	0.5	1.1	1.1	1.3	1.0	0.6
Food service and hospitality	2.3	2.3	2.3	3.1	3.2	1.0
Marketing	9.2	9.3	8.3	10.3	10.5	1.3
Print production	19.2	18.7	19.0	17.5	20.5	1.3
Other technology	1.2	0.9	2.4	1.2	2.7	1.5
Health care	4.5	2.8	4.0	4.6	6.7	2.1
Business services	42.1	46.9	47.3	51.4	44.4	2.3
Communications technology	10.8	9.7	9.7	10.6	15.1	4.4
Computer technology	13.2	38.6	44.6	28.7	34.3	21.1

NOTE: Rows sum to greater than the total because graduates may have taken courses in more than one program area. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.



**Table A6. Average number of occupational credits earned by public high school graduates, by program area: Various years, 1982–98**

	1982	1990	1992	1994	1998	Change in average number from 1982 to 1998
Total	3.03	2.89	2.84	2.79	2.87	-0.16
Business services	0.79	0.72	0.65	0.71	0.56	-0.23
Materials production	0.34	0.23	0.19	0.14	0.17	-0.17
Mechanics and repair	0.26	0.20	0.18	0.15	0.17	-0.09
Business management	0.22	0.16	0.18	0.17	0.14	-0.08
Construction	0.13	0.10	0.12	0.10	0.10	-0.03
Personal and other services	0.10	0.10	0.11	0.09	0.07	-0.03
Other precision production	0.05	0.06	0.04	0.02	0.04	-0.01
Agriculture	0.21	0.20	0.19	0.24	0.20	-0.01
Marketing	0.16	0.16	0.13	0.18	0.16	0.00
Protective services	0.01	0.00	0.01	0.01	0.01	0.00
Transportation	0.01	0.01	0.01	0.01	0.01	0.00
Print production	0.26	0.25	0.26	0.23	0.27	0.01
Other technology	0.01	0.01	0.03	0.01	0.03	0.02
Food service and hospitality	0.03	0.04	0.03	0.04	0.05	0.02
Child care and education	0.07	0.06	0.06	0.08	0.10	0.03
Communications technology	0.08	0.09	0.10	0.10	0.16	0.08
Health care	0.05	0.04	0.06	0.08	0.14	0.09
Computer technology	0.11	0.30	0.37	0.23	0.31	0.20

NOTE: Detail may not sum to totals because of rounding and because a small number of occupational courses recorded on the transcripts did not specify an occupational program area with which they were associated. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A7. Percentage of public high school graduates concentrating in occupational education, by program area: Various years, 1982–98**

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	33.7	27.8	24.9	25.4	25.0	-8.7
Business services	9.3	6.5	4.8	5.4	3.3	-6.0
Materials production	3.0	1.8	1.5	1.1	1.3	-1.7
Mechanics and repair	3.0	2.3	1.9	1.6	1.8	-1.2
Personal and other services	1.3	1.3	1.3	1.1	0.8	-0.5
Construction	1.5	1.1	1.2	1.0	1.3	-0.2
Agriculture	2.8	2.5	2.3	3.2	2.6	-0.2
Other precision production	0.4	0.4	0.2	0.2	0.2	-0.2
Print production	2.0	1.8	2.2	1.8	2.0	0.0
Marketing	1.8	2.1	1.3	2.2	1.8	0.0
Transportation	‡	0.1	#	0.1	0.1	†
Protective services	‡	‡	0.1	0.1	0.1	†
Other technology	0.1	‡	0.2	0.0	0.2	0.1
Food service and hospitality	0.2	0.5	0.4	0.4	0.5	0.2
Business management	0.2	0.2	0.3	0.3	0.4	0.3
Computer technology	0.3	0.3	0.4	0.3	0.6	0.4
Child care and education	0.2	0.3	0.4	0.6	0.6	0.4
Communications technology	0.1	0.3	0.3	0.3	0.8	0.7
Health care	0.6	0.6	0.6	1.0	1.9	1.3
Mixed programs						
Business	2.1	1.8	2.4	2.0	1.2	1.0
Precision production	2.5	1.9	1.3	1.1	1.4	1.2
Trade and industry	2.3	1.8	1.8	1.6	1.8	-0.5
Technology	‡	0.2	0.4	0.2	0.6	†

†Not applicable.

#Rounds to zero.

‡Reporting standards not met. (Too few cases.).

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on the 18 narrow program areas in which graduates earned 3.0 or more credits. "Mixed" categories include students who earned 3.0 or more credits in one of the 10 broad occupational program areas, but fewer than 3.0 credits in any one of the associated sub-areas. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A8. Percentage of occupational coursetakers concentrating in occupational education, by program area in which they took courses: Various years, 1982–98**

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	38.0	30.6	27.1	28.0	27.6	-10.4
Business services	22.1	13.9	10.2	10.5	7.4	-14.7
Mechanics and repair	23.3	22.7	19.8	18.4	18.1	-5.2
Materials production	15.0	12.1	11.8	11.7	11.4	-3.5
Agriculture	27.2	27.9	23.5	28.1	24.0	-3.2
Personal and other services	20.4	23.8	19.9	18.8	17.3	-3.0
Other precision production	10.5	9.6	6.0	6.6	7.7	-2.8
Marketing	19.2	22.6	15.4	21.0	17.2	-2.1
Other technology	6.3	4.2	7.0	3.3	5.5	-0.8
Print production	10.3	9.6	11.4	10.1	9.7	-0.7
Transportation	7.0	8.8	1.9	6.0	6.5	-0.5
Computer technology	1.9	0.8	0.9	0.9	1.9	-0.1
Construction	20.6	20.2	22.8	15.7	22.4	1.9
Business management	0.6	0.9	1.5	1.6	2.6	1.9
Protective services	2.3	‡	4.9	3.8	5.2	2.9
Food service and hospitality	10.8	20.2	16.5	11.5	14.2	3.4
Communications technology	1.1	2.8	2.7	3.2	5.6	4.5
Child care and education	2.5	4.9	6.0	9.3	7.6	5.0
Health care	13.0	20.4	15.6	21.1	28.0	15.0

‡Reporting standards not met. (Too few cases.).

NOTE: Occupational coursetakers earned greater than 0.0 occupational credits. Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on occupational coursetakers who earned 3.0 or more credits in the narrow program areas in which they took courses. Rows sum to greater than the total because occupational coursetakers took courses in more than one program area. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A9. Percentage distribution of occupational concentrators, by program area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Transportation	0.1	0.3	0.1	0.3	0.3
Protective services	0.1	‡	0.3	0.2	0.3
Other technology	0.2	0.1	0.7	0.2	0.6
Other precision production	1.2	1.4	0.7	0.6	0.9
Business management	0.4	0.6	1.1	1.2	1.7
Food service and hospitality	0.7	1.7	1.5	1.4	1.8
Child care and education	0.6	1.0	1.4	2.2	2.4
Computer technology	0.8	1.0	1.6	1.0	2.5
Personal and other services	3.8	4.6	5.3	4.3	3.2
Communications technology	0.4	1.0	1.1	1.3	3.4
Construction	4.4	4.0	4.8	4.0	5.1
Materials production	9.0	6.5	5.8	4.5	5.3
Marketing	5.3	7.6	5.1	8.5	7.2
Mechanics and repair	9.0	8.3	7.5	6.4	7.2
Health care	1.8	2.0	2.5	3.8	7.4
Print production	5.9	6.4	8.7	7.0	7.9
Agriculture	8.2	9.2	9.2	12.5	10.2
Business services	27.6	23.5	19.4	21.2	13.1
Mixed programs					
Technology	‡	0.8	1.7	0.9	2.4
Business	6.3	6.3	9.5	7.8	4.6
Precision production	7.5	7.0	5.2	4.4	5.5
Trade and industry	6.7	6.6	7.1	6.4	7.0

‡Reporting standards not met. (Too few cases.).

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on the narrow program areas in which graduates earned 3.0 or more credits. “Mixed” categories include students who earned 3.0 or more credits in one of the 10 broad occupational program areas, but fewer than 3.0 credits in any one of the associated sub-areas. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A10. Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by various concentration definitions: Various years, 1982–98**

	1982	1990	1992	1994	1998
Occupational concentrators <sup>1</sup>	72.8	64.6	59.1	60.6	57.0
Advanced occupational concentrators <sup>2</sup>	52.0	37.5	38.4	34.6	32.9
Advanced occupational concentrators with cooperative education <sup>3</sup>	9.1	9.5	9.3	12.3	10.3

<sup>1</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>2</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

<sup>3</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A11. Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by program area of concentration: Various years, 1982–98**

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	72.8	64.6	59.1	60.6	57.0	-15.8
Business services	20.1	15.2	11.4	12.8	7.5	-12.6
Materials production	6.6	4.2	3.5	2.7	3.0	-3.6
Mechanics and repair	6.6	5.3	4.4	3.9	4.1	-2.5
Personal and other services	2.8	3.0	3.1	2.6	1.8	-0.9
Other precision production	0.9	0.9	0.4	0.4	0.5	-0.4
Construction	3.2	2.6	2.9	2.5	2.9	-0.4
Agriculture	6.0	5.9	5.4	7.6	5.8	-0.1
Transportation	0.1	0.2	0.1	0.2	0.2	0.1
Protective services	0.1	‡	0.2	0.1	0.2	0.1
Other technology	0.2	0.1	0.4	0.1	0.3	0.2
Print production	4.3	4.2	5.1	4.2	4.5	0.2
Marketing	3.8	4.9	3.0	5.1	4.1	0.3
Food service and hospitality	0.5	1.1	0.9	0.9	1.0	0.5
Business management	0.3	0.4	0.7	0.7	0.9	0.6
Computer technology	0.6	0.7	1.0	0.6	1.5	0.9
Child care and education	0.4	0.7	0.8	1.4	1.3	0.9
Communications technology	0.3	0.6	0.6	0.8	1.9	1.7
Health care	1.3	1.3	1.5	2.3	4.2	3.0
Mixed programs						
Precision production	5.5	4.5	3.1	2.6	3.1	-2.3
Business	4.6	4.1	5.6	4.7	2.6	-1.9
Trade and industry	4.9	4.3	4.2	3.9	4.0	-0.9
Technology	‡	0.6	1.0	0.5	1.4	†

†Not applicable.

‡Reporting standards not met. (Too few cases.).

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on the narrow program areas in which graduates earned 3.0 or more credits. "Mixed" categories include students who earned 3.0 or more credits in one of the 10 broad occupational program areas, but fewer than 3.0 credits in any one of the associated sub-areas. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A12. Percentage distribution of occupational credits earned by public high school graduates who earned 3.0 or more occupational credits, by program area: Various years, 1982–98**

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	100.0	100.0	100.0	100.0	100.0	0.0
Business services	26.7	25.0	22.8	24.4	18.8	-7.9
Materials production	11.3	8.2	7.2	5.2	6.0	-5.2
Mechanics and repair	8.7	6.8	6.2	5.6	6.3	-2.5
Business management	6.9	5.2	6.2	6.0	4.8	-2.0
Personal and other services	3.4	3.5	3.9	3.3	2.6	-0.9
Construction	4.3	3.4	3.7	3.8	3.6	-0.7
Other precision production	1.8	2.0	1.4	0.9	1.2	-0.6
Marketing	6.1	6.5	5.3	7.3	6.3	0.2
Protective services	0.3	0.1	0.4	0.3	0.5	0.2
Transportation	0.2	0.4	0.4	0.5	0.4	0.2
Agriculture	7.2	7.2	7.6	9.2	7.6	0.4
Print production	9.1	9.2	9.9	8.6	9.6	0.6
Other technology	0.4	0.3	1.0	0.4	1.1	0.7
Food service and hospitality	1.0	1.4	1.3	1.6	1.8	0.8
Child care and education	2.2	2.0	1.9	2.9	3.3	1.1
Communications technology	2.2	2.9	3.1	3.4	5.7	3.4
Health care	1.6	1.6	2.2	3.2	5.1	3.5
Computer technology	2.9	8.2	10.5	6.5	9.0	6.2

NOTE: Detail may not sum to totals because of rounding and because a small number of occupational courses recorded on the transcripts did not specify an occupational program area with which they were associated. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A13. Average number of credits earned by occupational concentrators in their area of concentration, by level of course: Various years, 1982–98**

	1982	1990	1992	1994	1998	Change in average number from 1982 to 1998
Total	4.76	4.60	4.57	4.40	4.39	-0.37
Course level						
First	2.76	2.91	2.54	2.61	2.63	-0.13
Second or higher	1.42	1.01	1.15	0.85	0.88	-0.54
Specialty	0.29	0.29	0.45	0.37	0.38	0.09
Cooperative education	0.29	0.39	0.43	0.57	0.51	0.22

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.



**Table A14. Percentage distribution of credits earned by occupational concentrators in their area of concentration, by level of course: Various years, 1982–98**

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	100.0	100.0	100.0	100.0	100.0	0.0
Course level						
First	58.6	63.4	57.2	59.4	59.6	1.0
Second or higher	28.3	20.9	23.6	18.2	19.5	-8.7
Specialty	6.5	6.8	10.1	8.8	9.4	2.9
Cooperative education	6.7	8.8	9.2	13.6	11.5	4.8

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A15. Percentage of total occupational credits earned by occupational coursetakers that were cooperative education credits: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	6.3	6.8	6.2	8.6	8.5

NOTE: Occupational coursetakers earned greater than 0.0 credits in occupational education.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A16. Average number of computer-related credits earned by public high school graduates, by vocational/technical curriculum and subarea: Various years, 1982–98**

	1982 <sup>1</sup>	1990	1992	1994	1998
Total	†	1.04	1.03	1.04	1.05
General labor market preparation, total	†	0.45	0.34	0.40	0.35
Basic typewriting/keyboarding	†	0.45	0.34	0.37	0.29
Technology education <sup>2</sup>	‡	‡	‡	0.03	0.06
Occupational education, total	0.12	0.59	0.68	0.64	0.70
Business services <sup>2</sup>	0.01	0.28	0.29	0.38	0.33
Drafting <sup>2</sup>	‡	0.01	0.02	0.03	0.06
Computer technology, total	0.11	0.30	0.37	0.23	0.31
Computer applications	‡	0.05	0.03	0.07	0.16
Computer programming	0.04	0.13	0.09	0.05	0.04
Data processing	0.04	0.01	0.03	0.01	0.01
Computer science and systems	0.01	0.10	0.20	0.08	0.09
Computer mathematics	0.02	0.02	0.02	0.02	0.01

†Not applicable.

‡Reporting standards not met. (Too few cases.).

<sup>1</sup>In 1982, all basic typewriting/keyboarding courses were assumed not to be computer-related, while in subsequent years all of these courses were classified as computer-related. Therefore, 1982 estimates for basic typewriting/keyboarding, total general labor market preparation and total computer-related courses are not comparable with other years.

<sup>2</sup>Only a subset of courses in the technology education, business services, and drafting areas were considered to be computer-related. See figure 33.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A17. Percentage distribution of computer-related credits earned by public high school graduates, by vocational/technical curriculum and computer-related area: Various years, 1982–98**

	1982 <sup>1</sup>	1990	1992	1994	1998
Total	†	100.00	100.00	100.00	100.00
General labor market preparation, total	†	47.97	35.95	42.04	38.29
Basic typewriting/keyboarding	†	47.97	35.96	39.91	33.48
Technology education	†	‡	‡	2.13	4.81
Occupational education, total	†	52.03	64.05	57.97	61.71
Business services	†	22.24	27.03	34.26	30.49
Drafting	†	0.99	1.49	1.83	4.06
Computer technology, total	†	28.79	35.49	21.87	27.16
Computer applications	†	3.87	2.78	6.46	12.51
Computer programming	†	10.92	7.19	4.43	3.08
Data processing	†	0.72	2.32	0.40	0.65
Computer science and systems	†	11.24	21.12	9.22	9.88
Computer mathematics	†	2.04	2.08	1.38	1.04

†Not applicable.

‡Reporting standards not met. (Too few cases.).

<sup>1</sup>In 1982, all basic typewriting/keyboarding courses were assumed not to be computer-related, while in subsequent years all of these courses were classified as computer-related. Therefore, 1982 estimates are not comparable with other years.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A18. Percentage distribution of general labor market preparation and of occupational education credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98**

	1982 <sup>1</sup>	1990	1992	1994	1998
General labor market preparation, total	†	100.0	100.0	100.0	100.0
Noncomputer-related	†	27.9	34.6	26.8	31.5
Computer-related, total	†	72.1	65.4	73.2	68.5
Basic typewriting/keyboarding	†	72.1	65.4	70.1	60.4
Technology education	†	‡	‡	3.0	8.1
Occupational education, total	100.0	100.0	100.0	100.0	100.0
Noncomputer-related	93.7	69.2	65.3	66.1	66.7
Computer-related, total	6.3	30.8	34.7	33.9	33.3
Business services	0.4	12.7	14.1	19.9	15.9
Drafting	‡	0.5	0.7	0.9	2.0
Computer technology, total	6.0	17.7	19.8	13.1	15.4
Computer applications	0.2	2.4	1.6	4.0	7.1
Computer programming	2.3	7.0	4.3	2.8	2.0
Data processing	1.3	0.5	1.3	0.2	0.3
Computer science and systems	0.8	6.3	11.2	5.2	5.3
Computer mathematics	1.4	1.5	1.4	0.9	0.7

†Not applicable.

‡Reporting standards not met. (Too few cases.).

<sup>1</sup>In 1982, all basic typewriting/keyboarding courses were assumed not to be computer-related, while in subsequent years all of these courses were classified as computer-related. Therefore, 1982 estimates for basic typewriting/keyboarding, total computer-related general labor market preparation and total noncomputer-related general labor market preparation courses are not comparable with other years.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A19. Percentage distribution of public high school graduates according to level of mathematics coursetaking achieved, by occupational concentration status: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Advanced mathematics <sup>1</sup>	22.6	28.7	34.0	36.3	38.3
Upper-middle mathematics <sup>2</sup>	17.2	25.7	26.3	26.8	28.9
Lower-middle mathematics <sup>3</sup>	30.9	26.5	24.6	23.4	21.7
Low mathematics <sup>4</sup>	29.4	19.2	15.1	13.5	11.2
Occupational concentrators <sup>5</sup>	100.0	100.0	100.0	100.0	100.0
Advanced mathematics	9.3	11.4	17.7	18.5	26.0
Upper-middle mathematics	13.3	20.1	21.6	25.0	28.3
Lower-middle mathematics	36.1	34.9	32.2	32.6	28.6
Low mathematics	41.3	33.6	28.4	24.0	17.2
Nonconcentrators <sup>6</sup>	100.0	100.0	100.0	100.0	100.0
Advanced mathematics	29.3	35.3	39.4	42.3	42.4
Upper-middle mathematics	19.2	27.8	27.9	27.4	29.0
Lower-middle mathematics	28.2	23.3	22.0	20.3	19.3
Low mathematics	23.3	13.6	10.7	9.9	9.2

<sup>1</sup>Includes algebra 3, trigonometry, analytical geometry, linear algebra, probability, statistics, pre-calculus, introduction to analysis, and calculus.

<sup>2</sup>Includes algebra 2 and unified mathematics 3, but no higher mathematics.

<sup>3</sup>Includes algebra 1, plane and solid geometry, and unified mathematics 1 and 2, but no higher mathematics.

<sup>4</sup>Includes no mathematics; remedial-level mathematics; general, basic or consumer mathematics; technical or vocational mathematics; and low-level “academic” mathematics, such as pre-algebra, algebra 1 taught over the course of two academic years, and informal geometry; but no mathematics in higher categories.

<sup>5</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>6</sup>All graduates except occupational concentrators.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A20. Percentage distribution of public high school graduates according to level of science coursetaking achieved, by occupational concentration status: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Advanced science <sup>1</sup>	27.7	45.5	47.8	51.8	57.2
Biology <sup>2</sup>	40.5	40.1	40.5	37.0	31.9
Low science <sup>3</sup>	31.9	14.4	11.7	11.3	10.9
Occupational concentrators <sup>4</sup>	100.0	100.0	100.0	100.0	100.0
Advanced science	12.8	21.2	27.0	30.0	42.0
Biology	43.0	55.3	53.6	52.1	41.0
Low science	44.2	23.5	19.5	18.0	17.1
Nonconcentrators <sup>5</sup>	100.0	100.0	100.0	100.0	100.0
Advanced science	35.2	54.8	54.8	59.2	62.2
Biology	39.2	34.3	36.1	31.8	28.9
Low science	25.6	10.9	9.1	9.0	8.9

<sup>1</sup>Includes chemistry 1 and 2 and physics 1 and 2.

<sup>2</sup>Includes general biology 1, secondary life sciences (including ecology, zoology, marine biology, and human physiology), general or honors biology 2, and advanced biology, but no higher science.

<sup>3</sup>Includes no science courses, remedial-level science, physical science, earth science, unified science, astronomy, geology, environmental science, oceanography, general physics, basic biology 1, and consumer or introductory chemistry, but no higher science.

<sup>4</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>5</sup>All graduates except occupational concentrators.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A21. Percentage distribution of public high school graduates according to level of English coursetaking achieved, by occupational concentration status: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Advanced English <sup>1</sup>	12.1	19.0	22.8	23.8	24.3
Middle English <sup>2</sup>	76.5	60.6	57.8	58.2	60.8
Low English <sup>3</sup>	11.5	20.4	19.4	18.1	14.8
Occupational concentrators <sup>4</sup>	100.0	100.0	100.0	100.0	100.0
Advanced English	6.7	8.3	12.5	12.8	17.0
Middle English	79.6	64.9	60.6	65.1	63.8
Low English	13.8	26.8	26.9	22.1	19.3
Nonconcentrators <sup>5</sup>	100.0	100.0	100.0	100.0	100.0
Advanced English	14.8	23.0	26.1	27.5	26.8
Middle English	74.9	59.0	56.9	55.8	59.9
Low English	10.3	18.0	17.0	16.7	13.4

<sup>1</sup>Includes at least some English coursework in honors courses.

<sup>2</sup>Includes no honors and no low-level English coursework.

<sup>3</sup>Includes at least some English coursework in low-level courses.

<sup>4</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>5</sup>All graduates except occupational concentrators.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.



**Table A22. Percentage of public high school graduates completing specific science courses, by occupational concentration status: Various years, 1982–98**

	1982	1990	1992	1994	1998
Biology, chemistry, or physics, total	83.0	94.5	95.7	97.2	95.6
Biology	79.3	92.9	94.0	95.7	94.1
Chemistry	31.4	49.7	53.8	57.4	61.3
Physics	16.7	23.1	25.1	27.4	30.2
Occupational concentrators <sup>1</sup>					
Biology, chemistry, or physics, total	73.0	90.2	91.5	95.1	92.5
Biology	68.9	88.2	90.3	93.5	90.3
Chemistry	15.0	24.6	31.5	34.6	46.5
Physics	7.8	9.7	13.4	13.0	21.4
Nonconcentrators <sup>2</sup>					
Biology, chemistry, or physics, total	88.0	96.1	97.0	97.8	96.6
Biology	84.6	94.7	95.3	96.5	95.4
Chemistry	39.8	59.4	61.3	65.1	66.2
Physics	21.3	28.3	29.0	32.3	33.1

<sup>1</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>2</sup>All graduates except occupational concentrators.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A23. Percentage of public high school graduates completing U.S. or world history courses, by type of course and occupational concentration status: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	91.8	96.9	96.1	97.9	95.5
U.S. history	86.9	95.4	92.7	96.3	94.0
World history	42.5	57.6	64.5	65.3	65.0
Occupational concentrators <sup>1</sup>	90.4	96.9	94.7	98.2	95.7
U.S. history	86.7	96.0	91.1	96.6	94.1
World history	36.3	49.9	56.8	59.2	60.5
Nonconcentrators <sup>2</sup>	92.5	96.9	96.6	97.8	95.5
U.S. history	87.0	95.1	93.3	96.2	94.0
World history	45.6	60.6	67.1	67.4	66.5

<sup>1</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>2</sup>All graduates except occupational concentrators.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A24. Percentage of public high school graduates completing a college-preparatory course of study, by selected vocational/technical participation and nonparticipation measures: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	8.7	28.7	32.0	36.7	38.9
Vocational/technical participation measures					
Vocational/technical coursetakers <sup>1</sup>	8.3	28.1	31.4	35.9	38.2
Occupational coursetakers <sup>2</sup>	6.8	27.0	30.4	35.1	37.3
Vocational/technical investors <sup>3</sup>	3.0	17.3	20.0	24.4	30.1
Occupational investors <sup>4</sup>	2.2	13.5	17.8	21.6	28.6
Occupational concentrators <sup>5</sup>	1.7	10.1	13.5	17.9	25.9
Advanced occupational concentrators <sup>6</sup>	1.4	10.9	14.0	18.4	26.7
Advanced occupational concentrators with cooperative education <sup>7</sup>	1.1	9.7	18.8	16.2	33.7
Vocational/technical nonparticipation measures					
All graduates except vocational/technical coursetakers	32.5	59.9	60.1	63.6	57.7
All graduates except occupational coursetakers	23.4	45.4	51.7	53.1	54.3
All graduates except vocational/technical investors	22.9	48.8	51.6	56.0	52.9
All graduates except occupational investors	14.3	40.1	42.4	47.7	46.9
All graduates except occupational concentrators	12.2	35.9	38.2	43.1	43.2
All graduates except advanced occupational concentrators	11.0	32.1	35.5	39.8	40.9
All graduates except advanced occupational concentrators with cooperative education	9.0	29.5	32.6	37.8	39.1

<sup>1</sup>Graduates earning greater than 0.0 credits in vocational/technical education.

<sup>2</sup>Graduates earning greater than 0.0 credits in occupational education.

<sup>3</sup>Graduates earning 3.0 or more credits in vocational/technical education.

<sup>4</sup>Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

<sup>5</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>6</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

<sup>7</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A25. Percentage distribution of public high school graduates according to college-preparatory and occupational concentration status: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
College-preparatory only	8.1	25.9	28.7	32.2	32.4
Occupational concentration only	33.1	25.0	21.6	20.9	18.5
Both college-preparatory and occupational concentration	0.6	2.8	3.4	4.5	6.5
Neither college-preparatory nor occupational concentration	58.2	46.3	46.4	42.4	42.6

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. An occupational concentration is defined as earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A26. Percentage of occupational concentrators and nonconcentrators completing college-preparatory coursework, by subject: Various years, 1982–98**

	1982	1990	1992	1994	1998
<b>Occupational concentrators<sup>1</sup></b>					
College-preparatory, total	1.7	10.1	13.5	17.9	25.9
English	57.7	78.7	82.1	88.7	82.0
Mathematics	13.7	24.7	30.5	37.3	48.1
Science	16.5	30.8	38.6	43.2	54.8
Social studies	81.6	92.2	91.8	96.5	93.1
Foreign languages	10.1	23.9	27.5	32.5	42.0
<b>Nonconcentrators<sup>2</sup></b>					
College-preparatory, total	12.2	35.9	38.2	43.1	43.2
English	65.5	85.5	86.6	88.6	85.8
Mathematics	37.4	56.3	58.3	62.9	66.0
Science	43.2	64.4	66.3	71.1	73.4
Social studies	85.7	93.9	94.2	96.7	92.9
Foreign languages	37.1	59.5	62.2	64.9	67.1

<sup>1</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>2</sup>All graduates except occupational concentrators.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A27. Average number of credits earned in vocational/technical education by public high school graduates, by vocational/technical curriculum and whether graduates completed college-preparatory coursework: Various years, 1982–98**

	1982	1990	1992	1994	1998
Vocational/technical, total	4.68	4.19	3.99	3.96	3.99
College-preparatory	1.99	2.51	2.57	2.59	3.03
Not college-preparatory	4.93	4.87	4.66	4.75	4.60
Occupational education	3.03	2.89	2.84	2.79	2.87
College-preparatory	1.13	1.70	1.85	1.83	2.19
Not college-preparatory	3.21	3.37	3.30	3.35	3.30
General labor market preparation	0.95	0.73	0.62	0.64	0.61
College-preparatory	0.64	0.54	0.43	0.45	0.46
Not college-preparatory	0.98	0.81	0.70	0.75	0.70
Family and consumer sciences education	0.69	0.57	0.54	0.52	0.51
College-preparatory	0.22	0.28	0.29	0.31	0.37
Not college-preparatory	0.74	0.69	0.65	0.65	0.60

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A28. Percentage of public high school graduates meeting selected definitions of participation in vocational/technical education, by college-preparatory coursework status: 1998**

	College-preparatory	Not college-preparatory
Total	100.0	100.0
Vocational/technical coursetakers <sup>1</sup>	94.8	97.6
Occupational coursetakers <sup>2</sup>	86.9	93.0
Vocational/technical investors <sup>3</sup>	47.6	70.4
Occupational investors <sup>4</sup>	32.3	51.2
Occupational concentrators <sup>5</sup>	16.7	30.3
Advanced occupational concentrators <sup>6</sup>	7.7	15.2
Advanced occupational concentrators with cooperative education <sup>7</sup>	4.0	4.9

<sup>1</sup>Graduates earning greater than 0.0 credits in vocational/technical education.

<sup>2</sup>Graduates earning greater than 0.0 credits in occupational education.

<sup>3</sup>Graduates earning 3.0 or more credits in vocational/technical education.

<sup>4</sup>Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

<sup>5</sup>Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

<sup>6</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

<sup>7</sup>Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Table A29. Percentage of public high school graduates concentrating in occupational education, by program area and college-preparatory status: 1998**

	College-preparatory	Not college-preparatory	Difference
Total	16.7	30.3	-13.6
Health care	2.3	1.6	0.8
Communications technology	1.3	0.6	0.7
Business services	3.5	3.1	0.4
Computer technology	0.6	0.7	0.0
Transportation	0.0	0.1	-0.1
Other precision production	0.2	0.3	-0.1
Business management	0.4	0.4	-0.1
Other technology	0.1	0.2	-0.1
Child care and education	0.3	0.7	-0.4
Food service and hospitality	0.1	0.7	-0.6
Personal and other services	0.3	1.1	-0.8
Marketing	1.2	2.2	-0.9
Print production	1.3	2.4	-1.1
Construction	0.3	1.9	-1.7
Agriculture	1.5	3.2	-1.7
Mechanics and repair	0.4	2.7	-2.3
Protective services	‡	0.1	†
Materials production	‡	‡	†
Mixed programs			
Business	1.0	1.2	-0.2
Precision production	0.5	1.9	-1.4
Trade and industry	0.3	2.7	-2.3
Technology	0.7	0.6	0.1

†Not applicable.

‡Reporting standards not met. (Too few cases.).

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. Occupational concentrators (the "total" row) earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on the narrow program areas in which graduates earned 3.0 or more credits. "Mixed" categories include students who earned 3.0 or more credits in one of the 10 broad occupational program areas, but fewer than 3.0 credits in any one of the associated sub-areas. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.



**Table A30. Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status and program area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	72.8	83.1	86.8	88.4	91.6
Nonconcentrators <sup>1</sup>	78.6	88.3	90.9	91.7	93.2
Concentrators, total <sup>2</sup>	61.2	69.5	74.2	78.8	87.1
Agriculture	52.2	60.7	62.5	78.5	87.3
Business management	‡	‡	87.1	72.6	92.1
Business services	69.4	80.1	87.2	84.7	91.4
Child care and education	‡	65.1	55.2	72.1	92.8
Communications technology	‡	95.8	91.9	89.6	99.1
Computer technology	‡	86.3	88.9	92.7	93.4
Construction	38.9	51.0	58.2	60.5	71.6
Food service and hospitality	‡	36.9	37.1	42.4	75.4
Health care	50.7	66.6	68.6	86.7	92.3
Marketing	71.4	77.5	70.8	85.9	92.8
Materials production	53.0	49.4	51.7	57.3	79.9
Mechanics and repair	48.3	50.1	53.5	62.6	76.4
Other precision production	59.3	62.4	‡	73.0	88.8
Other technology	‡	‡	‡	‡	‡
Personal and other services	61.9	56.6	70.7	74.2	83.2
Print production	71.2	85.6	89.8	90.3	91.3
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

<sup>1</sup>All graduates except occupational concentrators.

<sup>2</sup>Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A31. Percentage of public high school graduates taking geometry courses, by occupational concentration status and program area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	45.5	61.5	65.4	68.6	70.8
Nonconcentrators <sup>1</sup>	54.0	68.9	71.5	73.9	72.9
Concentrators, total <sup>2</sup>	28.7	42.2	47.1	53.2	64.3
Agriculture	21.8	32.0	40.5	53.9	61.3
Business management	‡	‡	62.4	59.3	68.0
Business services	33.1	50.4	58.7	59.0	73.5
Child care and education	‡	25.3	40.9	46.1	64.6
Communications technology	‡	82.2	85.1	75.7	86.8
Computer technology	‡	68.5	56.9	73.3	70.6
Construction	12.2	19.6	23.8	30.1	46.3
Food service and hospitality	‡	25.2	21.4	16.3	45.1
Health care	21.4	30.0	27.5	56.2	79.3
Marketing	29.9	52.9	51.2	61.7	69.9
Materials production	20.0	22.2	25.4	34.5	46.5
Mechanics and repair	14.0	22.4	24.4	32.3	44.4
Other precision production	30.8	40.6	‡	47.1	62.4
Other technology	‡	‡	‡	‡	‡
Personal and other services	18.3	29.8	26.4	47.4	59.1
Print production	46.6	61.9	63.4	63.2	72.7
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

<sup>1</sup>All graduates except occupational concentrators.

<sup>2</sup>Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A32. Percentage of public high school graduates taking regular or advanced biology courses, by occupational concentration status and program area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	61.3	83.0	86.1	86.5	87.2
Nonconcentrators <sup>1</sup>	66.1	86.2	88.4	88.5	89.4
Concentrators, total <sup>2</sup>	51.8	74.6	78.9	80.5	80.6
Agriculture	52.4	75.6	81.8	86.6	84.7
Business management	‡	‡	83.7	82.9	85.1
Business services	56.2	78.4	87.3	84.9	84.8
Child care and education	‡	74.7	72.3	77.5	91.6
Communications technology	‡	95.8	94.4	88.3	94.6
Computer technology	‡	88.4	92.8	78.1	82.9
Construction	44.1	63.7	66.0	73.3	64.8
Food service and hospitality	‡	54.8	53.3	55.2	59.2
Health care	54.4	75.0	76.0	85.1	89.1
Marketing	60.1	82.4	87.2	83.7	89.0
Materials production	49.3	56.1	62.2	67.2	67.6
Mechanics and repair	42.9	68.3	63.6	64.2	68.0
Other precision production	48.3	54.7	‡	83.9	76.0
Other technology	‡	‡	‡	‡	‡
Personal and other services	49.2	70.0	78.6	75.9	74.7
Print production	61.9	79.3	77.4	85.1	80.6
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

<sup>1</sup>All graduates except occupational concentrators.

<sup>2</sup>Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A33. Percentage of public high school graduates taking regular or advanced chemistry courses, by occupational concentration status and program area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	25.5	43.1	45.6	48.5	54.5
Nonconcentrators <sup>1</sup>	32.6	52.0	52.6	55.6	59.4
Concentrators, total <sup>2</sup>	11.7	20.0	24.4	27.7	39.6
Agriculture	13.2	16.9	28.0	27.9	39.8
Business management	‡	‡	31.9	26.9	45.2
Business services	11.5	25.1	30.4	35.3	47.3
Child care and education	‡	9.7	16.6	24.9	28.4
Communications technology	‡	40.0	54.9	47.2	70.8
Computer technology	‡	49.9	45.6	39.5	62.4
Construction	3.7	8.8	11.8	15.9	20.0
Food service and hospitality	‡	‡	6.7	3.3	16.4
Health care	13.1	27.2	25.7	33.4	61.9
Marketing	9.2	21.8	22.0	26.7	46.8
Materials production	9.1	8.8	10.7	12.2	16.7
Mechanics and repair	3.0	6.3	5.3	11.7	21.2
Other precision production	13.5	12.4	‡	12.5	63.2
Other technology	‡	‡	‡	‡	‡
Personal and other services	5.6	7.3	15.4	12.3	25.7
Print production	24.7	29.8	30.4	38.5	40.3
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

<sup>1</sup>All graduates except occupational concentrators.

<sup>2</sup>Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table A34. Percentage of public high school graduates taking physics courses, by occupational concentration status and program area: Various years, 1982–98**

	1982	1990	1992	1994	1998
Total	13.9	20.5	21.3	23.8	26.7
Nonconcentrators <sup>1</sup>	17.9	25.6	24.7	28.4	29.7
Concentrators, total <sup>2</sup>	6.1	7.4	11.0	10.3	17.7
Agriculture	8.5	7.0	5.9	8.2	13.9
Business management	‡	‡	‡	2.9	11.0
Business services	3.1	6.2	12.5	9.8	18.7
Child care and education	‡	‡	‡	5.2	13.3
Communications technology	‡	19.4	18.4	21.9	32.1
Computer technology	‡	34.3	37.7	31.0	33.6
Construction	4.0	1.5	3.9	1.3	6.7
Food service and hospitality	‡	‡	‡	3.4	4.5
Health care	4.6	‡	‡	10.7	33.2
Marketing	2.4	2.6	6.5	6.9	10.7
Materials production	7.9	4.5	12.0	8.4	9.6
Mechanics and repair	5.7	2.6	7.5	2.2	9.3
Other precision production	‡	17.8	‡	‡	29.9
Other technology	‡	‡	‡	‡	‡
Personal and other services	2.2	2.5	‡	1.8	8.5
Print production	12.9	16.6	18.1	22.6	30.2
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

<sup>1</sup>All graduates except occupational concentrators.

<sup>2</sup>Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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## **Appendix B—Standard Error Tables**

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**Table B1. Standard errors for figure 2: Average number of credits completed by public high school graduates, by type of coursework: 1998**

		English	Vocational/ technical	Social studies	Mathematics	Science	Fine arts	Foreign languages
Total	s.e.	0.037	0.098	0.038	0.024	0.026	0.079	0.039
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617	2,617	2,617	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.



**Table B2. Standard errors for figures 6 and 8: Average number of credits earned by public high school graduates, by curriculum: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.080	0.127	0.094	0.144	0.162
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Academic	s.e.	0.074	0.116	0.094	0.092	0.127
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical	s.e.	0.059	0.079	0.063	0.068	0.098
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Enrichment/other	s.e.	0.037	0.073	0.035	0.077	0.077
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B3. Standard errors for figure 7: Percentage distribution of total credits earned by public high school graduates, by curriculum: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Academic	s.e.	0.26	0.40	0.27	0.28	0.44
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical	s.e.	0.24	0.32	0.24	0.27	0.34
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Enrichment/other	s.e.	0.15	0.28	0.14	0.27	0.28
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B4. Standard errors for figure 9: Average number of credits earned in vocational/technical education by public high school graduates, by vocational/technical curriculum: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.059	0.079	0.063	0.068	0.098
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational education	s.e.	0.053	0.065	0.050	0.057	0.074
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General labor market preparation	s.e.	0.018	0.023	0.019	0.021	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Family and consumer sciences education	s.e.	0.017	0.026	0.018	0.028	0.034
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B5. Standard errors for figure 12: Percentage distribution of vocational/technical credits earned by public high school graduates, by vocational/technical curriculum: Various years, 1982–98**

		Total	Occupational education	General labor market preparation	Family and consumer sciences education
1982	s.e.	†	0.50	0.43	0.35
	weighted n (in 1,000s)	2,559	2,559	2,559	2,559
1990	s.e.	†	0.88	0.63	0.57
	weighted n (in 1,000s)	2,454	2,454	2,454	2,454
1992	s.e.	†	0.62	0.51	0.46
	weighted n (in 1,000s)	2,125	2,125	2,125	2,125
1994	s.e.	†	0.85	0.63	0.70
	weighted n (in 1,000s)	2,150	2,150	2,150	2,150
1998	s.e.	†	1.02	0.77	0.80
	weighted n (in 1,000s)	2,526	2,526	2,526	2,526

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B6. Standard errors for figure 13: Percentage distribution of vocational/technical credits earned by public high school graduates, by grade level of course: 1998**

		Vocational/ technical total	General labor market preparation	Family and consumer sciences education	Occupational education
Total	s.e.	†	†	†	†
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372
Grade level					
9	s.e.	0.72	2.53	1.52	0.74
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372
10	s.e.	0.54	1.57	1.14	0.60
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372
11	s.e.	0.50	1.03	0.90	0.60
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372
12	s.e.	0.61	1.28	1.63	0.64
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Table B7. Standard errors for figure 14: Average number of occupational credits earned by public high school graduates, by grade level of course: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.053	0.065	0.050	0.057	0.074
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	0.011	0.015	0.012	0.013	0.020
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	0.015	0.016	0.015	0.015	0.017
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	0.021	0.025	0.019	0.019	0.025
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	0.021	0.034	0.025	0.027	0.038
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B8. Standard errors for figure 24: Percentage of occupational concentrators completing advanced coursework in their area of concentration: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	1.23	1.90	1.59	1.76	2.52
	weighted n (in 1,000s)	878.00	696.00	542.00	562.00	654.00

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B9. Standard errors for figure 29: Percentage of public high school graduates taking work-based learning, by type of course: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.93	1.48	1.14	1.53	2.10
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Cooperative education	s.e.	0.61	1.22	0.68	0.83	1.21
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General work experience	s.e.	0.85	1.38	1.07	1.56	2.03
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.



**Table B10. Standard errors for figure 30: Average number of credits earned in work-based learning by public high school graduates, by type of course: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.020	0.026	0.023	0.025	0.044
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Cooperative education	s.e.	0.015	0.028	0.019	0.022	0.035
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General work experience	s.e.	0.014	0.015	0.011	0.011	0.022
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B11. Standard errors for figure 31: Percentage of public high school graduates taking introductory technology courses, by area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.73	0.74	0.67	0.83	0.98
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Industrial arts	s.e.	0.73	0.78	0.61	0.67	0.57
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Technology education	s.e.	0.09	0.22	0.31	0.72	0.89
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B12. Standard errors for figure 32: Average number of credits earned in introductory technology courses by public high school graduates, by area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.010	0.008	0.012	0.010	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Industrial arts	s.e.	0.010	0.008	0.011	0.008	0.006
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Technology education	s.e.	‡	0.002	‡	0.007	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B13. Standard errors for figure 48: Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.75	0.94	0.63	0.67	0.56
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	1.33	1.71	1.26	1.45	0.93
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators	s.e.	0.82	0.82	0.67	0.54	0.55
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B14. Standard errors for table 2: Average number of vocational/technical credits earned by public high school graduates, by grade level of course: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.059	0.079	0.063	0.068	0.098
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	0.015	0.022	0.019	0.019	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	0.018	0.022	0.018	0.016	0.026
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	0.022	0.028	0.021	0.022	0.032
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	0.025	0.036	0.027	0.031	0.047
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B15. Standard errors for table 3: Average number of vocational/technical credits earned by public high school graduates, by grade level of course: 1998**

		Vocational/ technical total	General labor market preparation	Family and consumer sciences education	Occupational education
Total	s.e.	0.098	0.028	0.034	0.074
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617
Grade level					
9	s.e.	0.028	0.019	0.010	0.020
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617
10	s.e.	0.026	0.010	0.010	0.017
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617
11	s.e.	0.032	0.010	0.009	0.025
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617
12	s.e.	0.047	0.011	0.013	0.038
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Table B16. Standard errors for table 4: Average number of credits earned in family and consumer sciences education by public high school graduates, by grade level of course: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.017	0.026	0.018	0.028	0.034
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	0.006	0.009	0.007	0.009	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	0.006	0.007	0.005	0.008	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	0.007	0.009	0.005	0.008	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	0.008	0.011	0.010	0.010	0.013
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B17. Standard errors for table 5: Average number of credits earned in general labor market preparation by public high school graduates, by grade level of course: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.018	0.023	0.019	0.021	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	0.010	0.009	0.013	0.013	0.019
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	0.009	0.015	0.009	0.009	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	0.008	0.007	0.005	0.006	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	0.009	0.013	0.006	0.007	0.011
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.



**Table B18. Standard errors for table 6: Average number of credits earned in core academic subjects by public high school graduates, by grade level of course: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.055	#	0.056	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
	9					
9	s.e.	#	#	#	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	#	#	#	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	#	#	#	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	#	#	#	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

#Rounds to zero.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B19. Standard errors for table 7: Average credits earned in business services by public high school graduates, by computer-related area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.019	0.031	0.019	0.025	0.030
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Noncomputer-related	s.e.	0.019	0.024	0.014	0.015	0.014
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer-related	s.e.	0.002	0.016	0.012	0.019	0.024
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B20. Standard errors for table 9: Average credits earned in computer-related occupational courses and in business services courses by graduates earning 3.0 or more occupational credits, by program area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Computer-related, total	s.e.	0.014	0.033	0.025	0.030	0.048
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Business services	s.e.	0.004	0.023	0.019	0.025	0.035
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Drafting/graphics	s.e.	‡	0.004	0.004	0.011	0.012
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Computer technology	s.e.	0.013	0.020	0.016	0.015	0.040
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Business services, total	s.e.	0.036	0.049	0.034	0.035	0.047
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Computer-related	s.e.	0.004	0.023	0.019	0.025	0.035
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Noncomputer-related	s.e.	0.036	0.040	0.026	0.029	0.024
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B21. Standard errors for table 11: Average number of vocational/technical credits earned by public high school graduates by vocational/technical curriculum, by change in state high school graduation requirements: 1990 and 1998**

		Vocational/technical, total			General labor market preparation			Family and consumer sciences education			Occupational education		
		1990	1998	Change	1990	1998	Change	1990	1998	Change	1990	1998	Change
Total	s.e.	0.079	0.098	0.126	0.023	0.028	0.036	0.026	0.034	0.043	0.065	0.074	0.098
	weighted n (in 1,000s)	2,505	2,617		2,505	2,617		2,505	2,617		2,505	2,617	
Change in vocational/technical requirements													
Increase	s.e.	0.201	0.236	0.310	0.036	0.081	0.089	0.066	0.069	0.095	0.142	0.159	0.213
	weighted n (in 1,000s)	593	662		593	662		593	662		593	662	
No change	s.e.	0.446	0.439	0.626	0.107	0.110	0.153	0.105	0.090	0.138	0.397	0.337	0.521
	weighted n (in 1,000s)	133	235		133	235		133	235		133	235	
Decrease	s.e.	0.126	0.167	0.209	0.034	0.035	0.049	0.032	0.042	0.053	0.106	0.130	0.168
	weighted n (in 1,000s)	1,385	1,424		1,385	1,424		1,385	1,424		1,385	1,424	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	
Change in specific nonvocational/technical, nonelective requirements													
Increase	s.e.	0.166	0.191	0.253	0.036	0.046	0.058	0.061	0.059	0.085	0.126	0.165	0.208
	weighted n (in 1,000s)	821	880		821	880		821	880		821	880	
No increase	s.e.	0.113	0.187	0.218	0.034	0.045	0.056	0.029	0.048	0.056	0.098	0.132	0.164
	weighted n (in 1,000s)	1,289	1,441		1,289	1,441		1,289	1,441		1,289	1,441	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	

See notes at end of table.

**Table B21. Standard errors for table 11: Average number of vocational/technical credits earned by public high school graduates by vocational/technical curriculum, by change in state high school graduation requirements: 1990 and 1998—Continued**

		Vocational/technical, total			General labor market preparation			Family and consumer sciences education			Occupational education		
		1990	1998	Change	1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in total, nonvocational/technical requirements													
Increase	s.e.	0.155	0.171	0.231	0.033	0.045	0.056	0.049	0.070	0.085	0.125	0.131	0.181
	weighted n (in 1,000s)	890	819		890	819		890	819		890	819	
No increase	s.e.	0.119	0.151	0.192	0.031	0.046	0.055	0.033	0.039	0.051	0.099	0.106	0.145
	weighted n (in 1,000s)	1,220	1,502		1,220	1,502		1,220	1,502		1,220	1,502	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	
Change in total graduation requirements													
Increase of 2 or more credits	s.e.	0.258	0.191	0.321	0.087	0.073	0.114	0.078	0.058	0.097	0.186	0.147	0.237
	weighted n (in 1,000s)	281	296		281	296		281	296		281	296	
Increase of less than 2 credits	s.e.	0.169	0.322	0.364	0.035	0.066	0.075	0.070	0.097	0.120	0.139	0.241	0.278
	weighted n (in 1,000s)	535	415		535	415		535	415		535	415	
No increase	s.e.	0.116	0.145	0.186	0.030	0.045	0.054	0.026	0.039	0.047	0.103	0.105	0.147
	weighted n (in 1,000s)	1,295	1,610		1,295	1,610		1,295	1,610		1,295	1,610	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	

See notes at end of table.

**Table B21. Standard errors for table 11: Average number of vocational/technical credits earned by public high school graduates by vocational/technical curriculum, by change in state high school graduation requirements: 1990 and 1998—Continued**

		Vocational/technical, total			General labor market preparation			Family and consumer sciences education			Occupational education		
		1990	1998	Change	1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in New Basics core academic requirements													
Met in 1998 only	s.e.	0.157	0.213	0.265	0.049	0.054	0.073	0.091	0.074	0.117	0.148	0.168	0.224
	weighted n (in 1,000s)	413	526		413	526		413	526		413	526	
Met in both years	s.e.	0.268	0.365	0.453	0.064	0.095	0.115	0.096	0.123	0.156	0.161	0.415	0.445
	weighted n (in 1,000s)	138	175		138	175		138	175		138	175	
Not met in 1998	s.e.	0.112	0.154	0.190	0.029	0.044	0.053	0.030	0.047	0.056	0.094	0.103	0.139
	weighted n (in 1,000s)	1,560	1,621		1,560	1,621		1,560	1,621		1,560	1,621	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Studies (HSTS), 1990 and 1998.

**Table B22. Standard errors for table 12: Percentage of public high school graduates by different measures of participation in vocational/technical education, by change in state high school graduation requirements: 1990 and 1998**

		Occupational concentrators			Occupational investors			Vocational/technical investors		
		Total	1998	Change	1990	1998	Change	1990	1998	Change
Total	s.e.	1.01	0.87	1.33	1.25	1.24	1.76	1.29	1.48	1.97
	weighted n (in 1,000s)	2,505	2,617		2,505	2,617		2,505	2,617	
Change in vocational/technical requirements										
Increase	s.e.	2.10	2.23	3.06	2.66	3.06	4.05	3.12	3.82	4.93
	weighted n (in 1,000s)	593	662		593	662		593	662	
No change	s.e.	3.79	3.57	5.20	6.83	5.91	9.03	6.68	7.22	9.84
	weighted n (in 1,000s)	133	235		133	235		133	235	
Decrease	s.e.	1.58	1.61	2.25	1.95	2.28	3.01	1.96	2.33	3.05
	weighted n (in 1,000s)	1,385	1,424		1,385	1,424		1,385	1,424	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	5.50
	weighted n (in 1,000s)	395	296		395	296		395	296	
Change in specific nonvocational/technical, nonelective requirements										
Increase	s.e.	1.65	2.05	2.63	2.30	3.05	3.82	2.47	3.03	0.27
	weighted n (in 1,000s)	821	880		821	880		821	880	
No increase	s.e.	1.43	1.61	2.16	1.75	2.34	2.92	1.82	2.66	-0.88
	weighted n (in 1,000s)	1,289	1,441		1,289	1,441		1,289	1,441	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	-0.92
	weighted n (in 1,000s)	395	296		395	296		395	296	

See notes at end of table.

**Table B22. Standard errors for table 12: Percentage of public high school graduates by different measures of participation in vocational/technical education, by change in state high school graduation requirements: 1990 and 1998—Continued**

		Occupational concentrators			Occupational investors			Vocational/technical investors		
		1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in total, nonvocational/technical requirements										
Increase	s.e.	1.79	1.82	2.56	2.27	2.27	3.22	2.30	2.79	3.62
	weighted n (in 1,000s)	890	819		890	819		890	819	
No increase	s.e.	1.47	1.45	2.07	1.78	1.93	2.63	1.83	2.29	2.93
	weighted n (in 1,000s)	1,220	1,502		1,220	1,502		1,220	1,502	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	5.50
	weighted n (in 1,000s)	395	296		395	296		395	296	
Change in total graduation requirements										
Increase of 2 or more credits	s.e.	2.91	1.71	3.37	3.75	2.93	4.76	4.07	4.06	5.74
	weighted n (in 1,000s)	281	296		281	296		281	296	
Increase of less than 2 credits	s.e.	1.82	3.47	3.91	2.27	4.51	5.05	2.51	5.47	6.02
	weighted n (in 1,000s)	535	415		535	415		535	415	
No increase	s.e.	1.43	1.31	1.94	1.81	1.88	2.61	1.72	2.13	2.74
	weighted n (in 1,000s)	1,295	1,610		1,295	1,610		1,295	1,610	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	5.50
	weighted n (in 1,000s)	395	296		395	296		395	296	

See notes at end of table.



**Table B22. Standard errors for table 12: Percentage of public high school graduates by different measures of participation in vocational/technical education, by change in state high school graduation requirements: 1990 and 1998—Continued**

		Occupational concentrators			Occupational investors			Vocational/technical investors		
		1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in New Basics core academic requirements										
Met in 1998 only	s.e.	1.72	2.06	2.68	2.29	3.32	4.03	2.08	3.69	4.24
	weighted n (in 1,000s)	413	526		413	526		413	526	
Met in both years	s.e.	3.32	4.86	5.88	5.22	4.90	7.16	5.54	6.60	8.62
	weighted n (in 1,000s)	138	175		138	175		138	175	
Not met in 1998	s.e.	1.34	1.30	1.87	1.65	1.97	2.57	1.72	2.17	2.77
	weighted n (in 1,000s)	1,560	1,621		1,560	1,621		1,560	1,621	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	5.50
	weighted n (in 1,000s)	395	296		395	296		395	296	

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Studies (HSTS), 1990 and 1998.

**Table B23. Standard errors for table 13: Percentage distribution of total credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Noncomputer-related	s.e.	†	0.11	0.08	0.10	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer-related, total	s.e.	†	0.11	0.08	0.10	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B24. Standard errors for table 14: Average number of credits earned in academic subjects by public high school graduates, by subject: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.074	0.116	0.094	0.092	0.127
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Core academics, total	s.e.	0.055	0.077	0.056	0.063	0.081
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
English	s.e.	0.019	0.034	0.019	0.028	0.037
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Mathematics	s.e.	0.019	0.028	0.019	0.021	0.024
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Science	s.e.	0.021	0.028	0.027	0.028	0.026
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Social studies	s.e.	0.024	0.040	0.023	0.041	0.038
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Foreign languages	s.e.	0.023	0.041	0.035	0.033	0.039
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Fine arts	s.e.	0.030	0.045	0.046	0.041	0.079
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B25. Standard errors for table 15: Average number of credits earned in core academic subjects by public high school graduates, by selected participation measures: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.055	0.077	0.056	0.063	0.081
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical participation measures						
Vocational/technical coursetakers	s.e.	0.055	0.077	0.057	0.064	0.085
	weighted n (in 1,000s)	2,559	2,454	2,125	2,150	2,526
Occupational coursetakers	s.e.	0.055	0.078	0.059	0.066	0.086
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Vocational/technical investors	s.e.	0.060	0.074	0.066	0.077	0.108
	weighted n (in 1,000s)	1,859	1,595	1,346	1,351	1,609
Occupational investors	s.e.	0.077	0.082	0.073	0.082	0.115
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Occupational concentrators	s.e.	0.096	0.081	0.093	0.083	0.132
	weighted n (in 1,000s)	878	696	542	562	654
Advanced occupational concentrators	s.e.	0.123	0.089	0.094	0.093	0.166
	weighted n (in 1,000s)	626	404	353	321	378
Advanced occupational concentrators with cooperative education	s.e.	0.312	0.135	0.135	0.125	0.353
	weighted n (in 1,000s)	109	103	85	114	118
Vocational/technical nonparticipation measures						
All graduates except vocational/technical coursetakers	s.e.	0.224	0.164	0.265	0.168	0.184
	weighted n (in 1,000s)	48	51	50	62	90
All graduates except occupational coursetakers	s.e.	0.134	0.101	0.110	0.108	0.126
	weighted n (in 1,000s)	295	235	169	204	245
All graduates except vocational investors	s.e.	0.077	0.094	0.067	0.070	0.088
	weighted n (in 1,000s)	748	910	828	861	1,007
All graduates except occupational investors	s.e.	0.060	0.089	0.062	0.063	0.077
	weighted n (in 1,000s)	1,402	1,429	1,256	1,284	1,470
All graduates except occupational concentrators	s.e.	0.057	0.094	0.058	0.064	0.078
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
All graduates except advanced occupational concentrators	s.e.	0.054	0.083	0.057	0.063	0.079
	weighted n (in 1,000s)	1,981	2,101	1,821	1,892	2,239

See notes at end of table.

**Table B25. Standard errors for table 15: Average number of credits earned in core academic subjects by public high school graduates, by selected participation measures: Various years, 1982–98**  
**—Continued**

		1982	1990	1992	1994	1998
All graduates except advanced						
occupational concentrators with	s.e.	0.054	0.077	0.057	0.062	0.082
cooperative education	weighted n (in 1,000s)	2,498	2,403	2,089	2,098	2,499

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B26. Standard errors for table 16: Average number of credits earned in core academic subjects by public high school graduates, by occupational concentration status and subject area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.055	0.077	0.056	0.063	0.081
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators						
All core academic subjects	s.e.	0.096	0.081	0.093	0.083	0.132
	weighted n (in 1,000s)	878	696	542	562	654
English	s.e.	0.032	0.030	0.030	0.026	0.055
	weighted n (in 1,000s)	878	696	542	562	654
Mathematics	s.e.	0.034	0.031	0.033	0.029	0.037
	weighted n (in 1,000s)	878	696	542	562	654
Science	s.e.	0.029	0.041	0.040	0.033	0.051
	weighted n (in 1,000s)	878	696	542	562	654
Social studies	s.e.	0.035	0.042	0.028	0.050	0.047
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators						
All core academic subjects	s.e.	0.057	0.094	0.058	0.064	0.078
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
English	s.e.	0.021	0.042	0.020	0.032	0.035
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Mathematics	s.e.	0.020	0.032	0.019	0.022	0.024
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Science	s.e.	0.024	0.032	0.030	0.030	0.027
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Social studies	s.e.	0.025	0.044	0.026	0.041	0.039
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B27. Standard errors for table 17: Percentage of public high school graduates meeting New Basics standards in core academic subjects, by occupational concentration status and academic subject area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.59	1.70	1.18	1.50	2.34
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators						
All core academic subjects	s.e.	0.65	1.73	1.52	1.89	3.45
	weighted n (in 1,000s)	878	696	542	562	654
4 years of English	s.e.	1.57	2.18	1.35	1.42	2.75
	weighted n (in 1,000s)	878	696	542	562	654
3 years of mathematics	s.e.	1.19	2.11	1.66	2.04	1.77
	weighted n (in 1,000s)	878	696	542	562	654
3 years of science	s.e.	0.89	2.01	1.69	1.93	2.32
	weighted n (in 1,000s)	878	696	542	562	654
3 years of social studies	s.e.	1.59	2.34	1.39	2.70	1.98
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators						
All core academic subjects	s.e.	0.78	2.03	1.36	1.64	2.30
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
4 years of English	s.e.	1.17	2.10	0.82	1.47	1.73
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
3 years of mathematics	s.e.	0.98	1.56	1.00	0.94	0.94
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
3 years of science	s.e.	0.93	1.45	1.32	1.15	1.37
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
3 years of social studies	s.e.	1.18	1.22	0.84	1.32	0.79
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B28. Standard errors for table A1: Percentage of public high school graduates taking vocational/technical education courses, by vocational/technical curriculum: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.19	0.24	0.27	0.32	0.48
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational education	s.e.	0.47	0.68	0.48	0.66	0.80
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Family and consumer sciences education	s.e.	0.91	1.64	1.19	1.74	2.29
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General labor market preparation	s.e.	0.71	1.58	1.28	1.62	2.08
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.



**Table B29. Standard errors for table A2: Percentage of public high school graduates meeting different definitions of participation in vocational/technical education: Various years, 1982–98**

		1982	1990	1992	1994	1998
Vocational/technical coursetakers	s.e.	0.19	0.24	0.27	0.32	0.48
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational coursetakers	s.e.	0.47	0.68	0.48	0.66	0.80
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical investors	s.e.	0.79	1.29	1.12	1.19	1.48
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational investors	s.e.	0.85	1.25	1.02	1.06	1.24
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	0.83	1.01	0.78	0.95	0.87
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Advanced occupational concentrators	s.e.	0.71	0.64	0.63	0.72	0.81
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Advanced occupational concentrators with cooperative education	s.e.	0.33	0.49	0.33	0.45	0.61
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B30. Standard errors for table A3: Average number of credits earned in general labor market preparation by public high school graduates, by area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.018	0.023	0.019	0.021	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Basic typewriting/keyboarding	s.e.	0.009	0.016	0.011	0.016	0.018
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Industrial arts/technology education, total	s.e.	0.010	0.008	0.012	0.010	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Industrial arts	s.e.	0.010	0.008	0.011	0.008	0.006
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Technology education	s.e.	‡	0.002	‡	0.007	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Career preparation/general work experience	s.e.	0.014	0.015	0.011	0.011	0.022
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B31. Standard errors for table A4: Percentage distribution of vocational/technical credits earned by public high school graduates, by grade level of course: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526
Grade level						
9	s.e.	0.38	0.67	0.56	0.56	0.72
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526
10	s.e.	0.34	0.58	0.57	0.49	0.54
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526
11	s.e.	0.35	0.41	0.42	0.40	0.50
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526
12	s.e.	0.41	0.57	0.52	0.48	0.61
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B32. Standard errors for table A5: Percentage of public high school graduates earning credits in occupational education, by program area: Various years, 1982–98**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	0.47	0.68	0.48	0.66	0.80	0.93
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Materials production	s.e.	0.68	0.88	0.65	0.61	0.80	1.05
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business management	s.e.	0.82	1.10	0.75	1.31	1.33	1.56
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Mechanics and repair	s.e.	0.57	0.77	0.51	0.63	0.81	0.99
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Personal and other services	s.e.	0.40	0.49	0.51	0.51	0.56	0.69
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Construction	s.e.	0.41	0.58	0.38	0.43	0.55	0.68
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other precision production	s.e.	0.33	0.53	0.28	0.31	0.62	0.70
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Protective services	s.e.	0.29	0.31	0.25	0.50	0.34	0.45
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Child care and education	s.e.	0.52	0.68	0.48	0.73	0.80	0.96
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Agriculture	s.e.	0.59	0.93	0.65	0.94	1.33	1.45
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Transportation	s.e.	0.09	0.21	0.22	0.29	0.24	0.25
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Food service and hospitality	s.e.	0.25	0.34	0.30	0.54	0.55	0.61
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Marketing	s.e.	0.48	0.58	0.52	0.79	0.91	1.03
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Print production	s.e.	0.71	0.89	0.77	0.68	1.06	1.27
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other technology	s.e.	0.23	0.19	0.27	0.22	0.52	0.57
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

See notes at end of table.

**Table B32. Standard errors for table A5: Percentage of public high school graduates earning credits in occupational education, by program area: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Health care	s.e.	0.47	0.61	0.44	0.46	0.82	0.95
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business services	s.e.	0.77	1.71	1.08	1.32	2.00	2.14
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Communications technology	s.e.	0.64	0.70	0.62	0.93	1.08	1.26
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Computer technology	s.e.	0.59	1.40	1.20	1.73	2.56	2.63
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B33. Standard errors for table A6: Average number of occupational credits earned by public high school graduates, by program area: Various years, 1982–98**

		1982	1990	1992	1994	1998	Change in average number from 1982 to 1998
Total	s.e.	0.053	0.065	0.050	0.057	0.074	0.091
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business services	s.e.	0.019	0.031	0.019	0.025	0.030	0.036
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Materials production	s.e.	0.016	0.017	0.013	0.011	0.014	0.021
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Mechanics and repair	s.e.	0.018	0.016	0.016	0.011	0.013	0.022
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business management	s.e.	0.010	0.010	0.009	0.012	0.014	0.017
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Construction	s.e.	0.010	0.008	0.017	0.009	0.010	0.014
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Personal and other services	s.e.	0.011	0.010	0.014	0.009	0.009	0.014
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other precision production	s.e.	0.006	0.013	0.004	0.003	0.008	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Agriculture	s.e.	0.016	0.022	0.015	0.023	0.031	0.035
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Marketing	s.e.	0.011	0.012	0.009	0.015	0.014	0.018
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Protective services	s.e.	‡	0.002	‡	0.003	0.004	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Transportation	s.e.	‡	0.003	‡	0.004	0.003	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Print production	s.e.	0.012	0.014	0.014	0.012	0.021	0.041
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other technology	s.e.	0.000	0.002	0.004	0.002	0.006	0.006
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Food service and hospitality	s.e.	0.004	0.005	0.005	0.006	0.008	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

See notes at end of table.

**Table B33. Standard errors for table A6: Average number of occupational credits earned by public high school graduates, by program area: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998	Change in average number from 1982 to 1998
Child care and education	s.e.	0.005	0.006	0.005	0.009	0.010	0.011
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Communications technology	s.e.	0.005	0.006	0.007	0.007	0.013	0.014
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Health care	s.e.	0.005	0.005	0.007	0.007	0.030	0.030
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Computer technology	s.e.	0.007	0.013	0.011	0.013	0.027	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B34. Standard errors for table A7: Percentage of public high school graduates concentrating in occupational education, by program area: Various years, 1982–98**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	0.83	1.01	0.78	0.95	0.87	1.20
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business services	s.e.	0.41	0.52	0.32	0.35	0.35	0.53
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Materials production	s.e.	0.26	0.24	0.16	0.14	0.22	0.34
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Mechanics and repair	s.e.	0.26	0.25	0.20	0.16	0.18	0.32
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Personal and other services	s.e.	0.20	0.17	0.25	0.15	0.11	0.23
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Construction	s.e.	0.16	0.14	0.18	0.13	0.16	0.23
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Agriculture	s.e.	0.29	0.35	0.26	0.37	0.54	0.61
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other precision production	s.e.	0.08	0.15	0.05	0.04	0.07	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Print production	s.e.	0.21	0.19	0.26	0.17	0.27	0.34
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Marketing	s.e.	0.19	0.29	0.18	0.23	0.22	0.29
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Transportation	s.e.	0.02	0.05	0.01	0.04	0.04	0.04
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Protective services	s.e.	0.02	‡	0.04	0.02	0.03	0.04
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other technology	s.e.	0.03	0.02	0.06	0.02	0.06	0.07
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Food service and hospitality	s.e.	0.06	0.12	0.10	0.07	0.10	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business management	s.e.	0.06	0.06	0.07	0.10	0.13	0.14
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

See notes at end of table.



**Table B34. Standard errors for table A7: Percentage of public high school graduates concentrating in occupational education, by program area: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Computer technology	s.e.	0.07	0.06	0.08	0.06	0.18	0.19
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Child care and education	s.e.	0.05	0.05	0.07	0.11	0.10	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Communications technology	s.e.	0.04	0.05	0.05	0.06	0.12	0.13
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Health care	s.e.	0.10	0.09	0.10	0.11	0.46	0.48
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Mixed programs							
Precision production	s.e.	0.26	0.23	0.15	0.14	0.19	0.33
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business	s.e.	0.21	0.21	0.24	0.21	0.14	0.25
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Trade and industry	s.e.	0.20	0.22	0.18	0.15	0.17	0.26
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Technology	s.e.	‡	0.05	0.10	0.04	0.11	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B35. Standard errors for table A8: Percentage of occupational coursetakers concentrating in occupational education, by program area in which they took courses: Various years, 1982–98**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	0.88	0.98	0.83	1.00	0.88	1.25
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372	
Business services	s.e.	0.92	1.04	0.68	0.62	0.69	1.15
	weighted n (in 1,000s)	1,097	1,174	1,028	1,137	1,162	
Mechanics and repair	s.e.	1.80	2.17	1.93	1.86	1.71	2.48
	weighted n (in 1,000s)	340	253	204	197	261	
Materials production	s.e.	1.24	1.53	1.27	1.19	1.74	2.14
	weighted n (in 1,000s)	530	372	269	215	303	
Agriculture	s.e.	2.25	2.31	2.24	2.03	3.35	4.04
	weighted n (in 1,000s)	264	228	212	249	278	
Personal and other services	s.e.	2.87	3.10	3.11	2.39	2.39	3.74
	weighted n (in 1,000s)	163	135	144	127	120	
Other precision production	s.e.	1.87	3.24	1.58	1.63	1.99	2.74
	weighted n (in 1,000s)	102	102	67	49	79	
Marketing	s.e.	1.89	3.15	1.99	2.40	1.86	2.65
	weighted n (in 1,000s)	240	234	181	228	273	
Other technology	s.e.	2.67	2.42	2.35	1.78	2.29	3.52
	weighted n (in 1,000s)	31	23	53	26	70	
Print production	s.e.	0.99	0.99	1.31	0.88	1.06	1.45
	weighted n (in 1,000s)	501	468	412	387	537	
Transportation	s.e.	3.88	4.77	1.16	2.82	3.61	5.31
	weighted n (in 1,000s)	12	27	23	28	26	
Computer technology	s.e.	0.51	0.16	0.17	0.22	0.45	0.68
	weighted n (in 1,000s)	344	968	970	635	896	
Construction	s.e.	2.04	3.02	2.82	1.87	2.41	3.15
	weighted n (in 1,000s)	190	139	115	145	147	
Business management	s.e.	0.26	0.34	0.34	0.52	0.71	0.76
	weighted n (in 1,000s)	619	466	411	416	422	
Protective services	s.e.	1.51	‡	2.50	2.51	2.59	3.00
	weighted n (in 1,000s)	35	14	31	29	35	

See notes at end of table.

**Table B35. Standard errors for table A8: Percentage of occupational coursetakers concentrating in occupational education, by program area in which they took courses: Various years, 1982–98  
—Continued**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Food service and hospitality	s.e.	2.58	4.79	4.06	2.54	2.69	3.73
	weighted n (in 1,000s)	59	58	49	69	84	
Communications technology	s.e.	0.34	0.51	0.49	0.64	0.74	0.82
	weighted n (in 1,000s)	281	242	212	235	396	
Child care and education	s.e.	0.67	0.97	1.19	1.92	1.30	1.46
	weighted n (in 1,000s)	199	144	125	135	203	
Health care	s.e.	2.43	5.70	2.58	2.43	5.10	5.65
	weighted n (in 1,000s)	118	69	87	102	174	

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's sum to greater than totals, because some graduates took courses in more than one occupational program area.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B36. Standard errors for table A9: Percentage distribution of occupational concentrators, by program area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	878	696	542	562	654
Transportation	s.e.	0.06	0.17	0.05	0.17	0.15
	weighted n (in 1,000s)	878	696	542	562	654
Protective services	s.e.	0.06	‡	0.14	0.09	0.12
	weighted n (in 1,000s)	878	696	542	562	654
Other technology	s.e.	0.09	0.08	0.24	0.08	0.24
	weighted n (in 1,000s)	878	696	542	562	654
Other precision production	s.e.	0.23	0.52	0.19	0.15	0.29
	weighted n (in 1,000s)	878	696	542	562	654
Business management	s.e.	0.19	0.23	0.26	0.37	0.51
	weighted n (in 1,000s)	878	696	542	562	654
Food service and hospitality	s.e.	0.17	0.40	0.39	0.27	0.41
	weighted n (in 1,000s)	878	696	542	562	654
Child care and education	s.e.	0.15	0.19	0.27	0.41	0.39
	weighted n (in 1,000s)	878	696	542	562	654
Computer technology	s.e.	0.20	0.23	0.30	0.24	0.71
	weighted n (in 1,000s)	878	696	542	562	654
Personal and other services	s.e.	0.59	0.59	0.96	0.54	0.42
	weighted n (in 1,000s)	878	696	542	562	654
Communications technology	s.e.	0.11	0.17	0.19	0.23	0.47
	weighted n (in 1,000s)	878	696	542	562	654
Construction	s.e.	0.47	0.46	0.68	0.48	0.62
	weighted n (in 1,000s)	878	696	542	562	654
Materials production	s.e.	0.71	0.85	0.62	0.54	0.86
	weighted n (in 1,000s)	878	696	542	562	654
Marketing	s.e.	0.56	1.03	0.69	0.88	0.91
	weighted n (in 1,000s)	878	696	542	562	654
Mechanics and repair	s.e.	0.73	0.85	0.76	0.61	0.75
	weighted n (in 1,000s)	878	696	542	562	654

See notes at end of table.

**Table B36. Standard errors for table A9: Percentage distribution of occupational concentrators, by program area: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998
Health care	s.e.	0.31	0.32	0.38	0.41	1.74
	weighted n (in 1,000s)	878	696	542	562	654
Print production	s.e.	0.60	0.62	1.01	0.66	1.01
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	0.84	1.22	1.02	1.33	2.14
	weighted n (in 1,000s)	878	696	542	562	654
Business services	s.e.	1.08	1.64	1.16	1.16	1.31
	weighted n (in 1,000s)	878	696	542	562	654
Mixed programs						
Technology	s.e.	‡	0.18	0.38	0.15	0.41
	weighted n (in 1,000s)	878	696	542	562	654
Business	s.e.	0.60	0.72	0.93	0.72	0.59
	weighted n (in 1,000s)	878	696	542	562	654
Precision production	s.e.	0.77	0.80	0.58	0.54	0.78
	weighted n (in 1,000s)	878	696	542	562	654
Trade and industry	s.e.	0.58	0.79	0.71	0.69	0.68
	weighted n (in 1,000s)	878	696	542	562	654

‡Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B37. Standard errors for table A10: Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by various concentration definitions: Various years, 1982–98**

		1982	1990	1992	1994	1998
Occupational concentrators	s.e.	1.03	1.35	1.21	1.48	1.10
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Advanced occupational concentrators	s.e.	1.13	1.19	1.17	1.49	1.70
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Advanced occupational concentrators with cooperative education	s.e.	0.69	1.09	0.76	0.97	1.38
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B38. Standard errors for table A11: Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by program area of concentration: Various years, 1982–98**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	1.03	1.35	1.21	1.48	1.10	1.50
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business services	s.e.	0.81	1.11	0.71	0.71	0.75	1.10
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Materials production	s.e.	0.54	0.57	0.38	0.34	0.49	0.73
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Mechanics and repair	s.e.	0.55	0.55	0.46	0.40	0.43	0.69
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Personal and other services	s.e.	0.43	0.39	0.58	0.36	0.25	0.50
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Other precision production	s.e.	0.17	0.34	0.12	0.09	0.17	0.24
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Construction	s.e.	0.35	0.32	0.41	0.31	0.36	0.50
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Agriculture	s.e.	0.61	0.79	0.61	0.81	1.20	1.35
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Transportation	s.e.	0.04	0.11	0.03	0.10	0.08	0.09
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Protective services	s.e.	0.04	‡	0.08	0.06	0.07	0.08
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Other technology	s.e.	0.07	0.05	0.14	0.05	0.14	0.15
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Print production	s.e.	0.44	0.42	0.61	0.42	0.60	0.74
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Marketing	s.e.	0.41	0.68	0.42	0.55	0.53	0.67
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Food service and hospitality	s.e.	0.13	0.27	0.23	0.17	0.23	0.26
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business management	s.e.	0.14	0.15	0.15	0.23	0.30	0.32
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	

See notes at end of table.

**Table B38. Standard errors for table A11: Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by program area of concentration: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Computer technology	s.e.	0.14	0.15	0.18	0.14	0.41	0.43
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Child care and education	s.e.	0.11	0.13	0.16	0.25	0.23	0.25
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Communications technology	s.e.	0.08	0.11	0.11	0.14	0.26	0.27
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Health care	s.e.	0.22	0.21	0.23	0.26	1.03	1.05
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Mixed programs							
Precision production	s.e.	0.56	0.51	0.34	0.33	0.45	0.72
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business	s.e.	0.44	0.47	0.56	0.47	0.33	0.55
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Trade and industry	s.e.	0.42	0.48	0.42	0.38	0.37	0.56
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Technology	s.e.	‡	0.12	0.23	0.09	0.23	†
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.



**Table B39. Standard errors for table A12: Percentage distribution of occupational credits earned by public high school graduates who earned 3.0 or more occupational credits, by program area: Various years, 1982–98**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	†	†	†	†	†	†
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business services	s.e.	0.70	1.00	0.66	0.69	0.97	1.20
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Materials production	s.e.	0.48	0.56	0.41	0.41	0.49	0.68
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Mechanics and repair	s.e.	0.50	0.47	0.41	0.42	0.49	0.70
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business management	s.e.	0.33	0.36	0.34	0.44	0.48	0.58
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Personal and other services	s.e.	0.39	0.36	0.47	0.34	0.31	0.50
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Construction	s.e.	0.29	0.31	0.36	0.32	0.38	0.47
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Other precision production	s.e.	0.19	0.35	0.15	0.14	0.29	0.35
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Marketing	s.e.	0.42	0.51	0.45	0.61	0.59	0.73
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Protective services	s.e.	0.08	0.04	0.08	0.09	0.12	0.15
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Transportation	s.e.	0.06	0.09	0.10	0.16	0.11	0.12
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Agriculture	s.e.	0.56	0.86	0.64	0.82	1.15	1.28
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Print production	s.e.	0.49	0.52	0.58	0.49	0.77	0.91
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Other technology	s.e.	0.08	0.08	0.14	0.08	0.23	0.25
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Food service and hospitality	s.e.	0.14	0.23	0.22	0.26	0.33	0.36
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	

See notes at end of table.

**Table B39. Standard errors for table A12: Percentage distribution of occupational credits earned by public high school graduates who earned 3.0 or more occupational credits, by program area: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Child care and education	s.e.	0.20	0.22	0.19	0.32	0.36	0.41
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Communications technology	s.e.	0.17	0.22	0.29	0.24	0.44	0.47
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Health care	s.e.	0.19	0.20	0.26	0.30	0.88	0.90
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Computer technology	s.e.	0.21	0.44	0.36	0.34	0.80	0.82
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B40. Standard errors for table A13: Average number of credits earned by occupational concentrators in their area of concentration, by level of course: Various years, 1982–98**

		1982	1990	1992	1994	1998	Change from 1982 to 1998
Total	s.e.	0.074	0.069	0.092	0.050	0.101	0.125
	weighted n (in 1,000s)	878	696	542	562	654	
Course level							
First	s.e.	0.065	0.082	0.056	0.064	0.102	0.121
	weighted n (in 1,000s)	878	696	542	562	654	
Second or higher	s.e.	0.044	0.068	0.051	0.047	0.054	0.070
	weighted n (in 1,000s)	878	696	542	562	654	
Specialty	s.e.	0.023	0.025	0.051	0.025	0.026	0.035
	weighted n (in 1,000s)	878	696	542	562	654	
Cooperative education	s.e.	0.025	0.051	0.047	0.049	0.091	0.094
	weighted n (in 1,000s)	878	696	542	562	654	

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B41. Standard errors for table A14: Percentage distribution of credits earned by occupational concentrators in their area of concentration, by level of course: Various years, 1982–98**

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	†	†	†	†	†	†
	weighted n (in 1,000s)	878	696	542	562	654	
Course level							
First	s.e.	0.83	1.47	0.99	1.08	1.45	1.67
	weighted n (in 1,000s)	878	696	542	562	654	
Second or higher	s.e.	0.72	1.21	0.80	0.93	1.23	1.43
	weighted n (in 1,000s)	878	696	542	562	654	
Specialty	s.e.	0.50	0.61	0.65	0.58	0.66	0.83
	weighted n (in 1,000s)	878	696	542	562	654	
Cooperative education	s.e.	0.57	1.15	0.83	1.10	1.69	1.79
	weighted n (in 1,000s)	878	696	542	562	654	

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B42. Standard errors for table A15: Percentage of total occupational credits earned by occupational coursetakers that were cooperative education credits: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.34	0.61	0.46	0.51	0.71
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B43. Standard errors for table A16: Average number of computer-related credits earned by public high school graduates, by vocational/technical curriculum and subarea: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.007	0.027	0.019	0.025	0.029
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General labor market preparation, total	s.e.	†	0.016	0.011	0.019	0.019
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Basic typewriting/keyboarding	s.e.	†	0.016	0.011	0.016	0.018
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Technology education	s.e.	†	‡	‡	0.007	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational education, total	s.e.	0.007	0.022	0.016	0.023	0.033
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Business services	s.e.	0.002	0.016	0.012	0.019	0.024
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Drafting	s.e.	‡	0.002	0.002	0.006	0.007
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer technology, total	s.e.	0.007	0.013	0.011	0.013	0.027
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer applications	s.e.	0.001	0.007	0.004	0.009	0.021
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer programming	s.e.	0.003	0.011	0.005	0.005	0.005
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Data processing	s.e.	0.005	‡	0.004	‡	‡
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer science and systems	s.e.	0.002	0.011	0.009	0.009	0.012
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer mathematics	s.e.	0.002	0.005	0.004	0.003	0.005
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B44. Standard errors for table A17: Percentage distribution of computer-related credits earned by public high school graduates, by vocational/technical curriculum and computer-related area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
General labor market preparation, total	s.e.	†	1.77	1.13	1.58	2.08
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Basic typewriting/keyboarding	s.e.	†	1.77	1.13	1.59	2.03
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Technology education	s.e.	†	‡	‡	0.41	0.71
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Occupational education, total	s.e.	†	1.77	1.13	1.58	2.08
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Business services	s.e.	†	1.50	1.14	1.57	2.45
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Drafting	s.e.	†	0.22	0.19	0.35	0.50
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer technology, total	s.e.	†	1.15	0.94	1.28	2.25
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer applications	s.e.	†	0.63	0.33	0.97	1.45
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer programming	s.e.	†	0.77	0.44	0.44	0.35
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Data processing	s.e.	†	0.36	0.32	0.10	0.26
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer science and systems	s.e.	†	1.32	0.89	1.04	1.44
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer mathematics	s.e.	†	0.47	0.45	0.22	0.43
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B45. Standard errors for table A18: Percentage distribution of general labor market preparation and of occupational education credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98**

		1982	1990	1992	1994	1998
General labor market preparation, total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Noncomputer-related	s.e.	†	1.52	1.47	1.86	2.45
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Computer-related, total	s.e.	†	1.52	1.47	1.86	2.45
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Basic typewriting/keyboarding	s.e.	†	1.52	1.47	1.89	2.57
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Technology education	s.e.	†	‡	‡	0.62	1.24
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Occupational education, total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Noncomputer-related	s.e.	0.33	1.00	0.84	0.93	1.30
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer-related, total	s.e.	0.33	1.00	0.84	0.93	1.30
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Business services	s.e.	0.07	0.83	0.70	1.00	1.17
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Drafting	s.e.	‡	0.12	0.12	0.19	0.28
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer technology, total	s.e.	0.33	0.76	0.69	0.81	1.25
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer applications	s.e.	0.07	0.40	0.21	0.58	0.79
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer programming	s.e.	0.22	0.53	0.29	0.27	0.26
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Data processing	s.e.	0.18	0.24	0.18	0.06	0.11
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372

See notes at end of table.



**Table B45. Standard errors for table A18: Percentage distribution of general labor market preparation and of occupational education credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998
Computer science and systems	s.e.	0.13	0.72	0.55	0.63	0.74
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer mathematics	s.e.	0.17	0.36	0.38	0.15	0.35
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B46. Standard errors for table A19: Percentage distribution of public high school graduates according to level of mathematics coursetaking achieved, by occupational concentration status: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Advanced mathematics	s.e.	0.70	1.13	0.94	1.06	1.25
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Upper-middle mathematics	s.e.	0.62	0.86	0.98	0.83	1.17
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Lower-middle mathematics	s.e.	0.75	0.79	0.80	0.78	0.97
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Low mathematics	s.e.	0.78	0.98	0.66	0.68	0.63
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	878	696	542	562	654
Advanced mathematics	s.e.	0.77	1.25	1.10	1.14	1.73
	weighted n (in 1,000s)	878	696	542	562	654
Upper-middle mathematics	s.e.	0.85	1.25	1.21	1.09	1.44
	weighted n (in 1,000s)	878	696	542	562	654
Lower-middle mathematics	s.e.	1.31	1.26	1.31	0.97	1.52
	weighted n (in 1,000s)	878	696	542	562	654
Low mathematics	s.e.	1.35	1.70	1.28	1.36	0.87
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Advanced mathematics	s.e.	0.90	1.13	1.14	1.23	1.40
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Upper-middle mathematics	s.e.	0.77	0.94	1.22	0.91	1.28
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Lower-middle mathematics	s.e.	0.86	0.82	0.93	0.87	0.93
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

See notes at end of table.

**Table B46. Standard errors for table A19: Percentage distribution of public high school graduates according to level of mathematics coursetaking achieved, by occupational concentration status: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998
Low mathematics	s.e.	0.85	0.91	0.70	0.61	0.67
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

†Not applicable.

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B47. Standard errors for table A20: Percentage distribution of public high school graduates according to level of science coursetaking achieved, by occupational concentration status: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Advanced science	s.e.	0.78	1.18	1.07	1.30	1.46
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Biology	s.e.	1.05	1.46	1.06	1.35	1.16
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Low science	s.e.	1.03	1.23	0.71	0.94	0.93
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	878	696	542	562	654
Advanced science	s.e.	0.93	1.29	1.42	1.64	2.10
	weighted n (in 1,000s)	878	696	542	562	654
Biology	s.e.	1.62	2.07	1.63	1.91	1.87
	weighted n (in 1,000s)	878	696	542	562	654
Low science	s.e.	1.66	2.39	1.22	1.46	1.50
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Advanced science	s.e.	0.95	1.33	1.27	1.31	1.50
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Biology	s.e.	1.14	1.42	1.18	1.27	1.09
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Low science	s.e.	1.03	0.94	0.79	0.95	0.94
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

†Not applicable.

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B48. Standard errors for table A21: Percentage distribution of public high school graduates according to level of English coursetaking achieved, by occupational concentration status: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,602	2,489	2,164	2,195	2,585
Advanced English	s.e.	0.76	1.43	0.92	1.28	1.56
	weighted n (in 1,000s)	2,602	2,489	2,164	2,195	2,585
Middle English	s.e.	1.00	1.68	1.13	1.53	1.88
	weighted n (in 1,000s)	2,602	2,489	2,164	2,195	2,585
Low English	s.e.	0.75	1.53	0.92	1.41	1.57
	weighted n (in 1,000s)	2,602	2,489	2,164	2,195	2,585
Occupational concentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	875	688	535	554	13
Advanced English	s.e.	0.76	1.12	1.08	1.23	1.97
	weighted n (in 1,000s)	875	688	535	554	644
Middle English	s.e.	1.34	2.18	1.60	2.01	2.04
	weighted n (in 1,000s)	875	688	535	554	644
Low English	s.e.	1.11	1.85	1.46	1.61	2.33
	weighted n (in 1,000s)	875	688	535	554	644
Nonconcentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	1,728	1,801	1,629	1,640	1,941
Advanced English	s.e.	0.92	1.62	1.10	1.46	1.62
	weighted n (in 1,000s)	1,728	1,801	1,629	1,640	1,941
Middle English	s.e.	1.11	1.81	1.30	1.57	2.05
	weighted n (in 1,000s)	1,728	1,801	1,629	1,640	1,941
Low English	s.e.	0.80	1.66	1.02	1.53	1.46
	weighted n (in 1,000s)	1,728	1,801	1,629	1,640	1,941

†Not applicable.

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B49. Standard errors for table A22: Percentage of public high school graduates completing specific science courses, by occupational concentration status: Various years, 1982–98**

		1982	1990	1992	1994	1998
Biology, chemistry, or physics, total	s.e.	0.74	0.90	0.36	0.33	0.63
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Biology	s.e.	0.80	0.96	0.41	0.59	0.68
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Chemistry	s.e.	0.74	1.32	1.05	0.98	1.25
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Physics	s.e.	0.69	0.96	0.89	1.12	1.43
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators						
Biology, chemistry, or physics, total	s.e.	1.38	1.72	0.85	0.65	1.37
	weighted n (in 1,000s)	878	696	542	562	654
Biology	s.e.	1.42	1.86	0.88	0.84	1.39
	weighted n (in 1,000s)	878	696	542	562	654
Chemistry	s.e.	0.97	1.40	1.37	1.49	2.01
	weighted n (in 1,000s)	878	696	542	562	654
Physics	s.e.	0.94	0.99	1.15	1.09	1.92
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators						
Biology, chemistry, or physics, total	s.e.	0.67	0.70	0.32	0.28	0.48
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Biology	s.e.	0.76	0.73	0.40	0.56	0.57
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Chemistry	s.e.	0.93	1.44	1.22	1.03	1.30
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Physics	s.e.	0.81	1.02	1.02	1.19	1.63
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B50. Standard errors for table A23: Percentage of public high school graduates completing U.S. or world history courses, by type of course and occupational concentration status: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.78	1.16	0.62	0.58	1.46
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
U.S. history	s.e.	0.92	1.49	0.77	0.81	1.49
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
World history	s.e.	1.37	2.73	1.46	2.62	3.32
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	1.19	1.40	1.16	0.40	1.59
	weighted n (in 1,000s)	878	696	542	562	654
U.S. history	s.e.	1.29	1.64	1.32	0.70	1.68
	weighted n (in 1,000s)	878	696	542	562	654
World history	s.e.	1.70	3.28	2.00	3.11	3.31
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators	s.e.	0.76	1.28	0.60	0.71	1.45
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
U.S. history	s.e.	0.97	1.60	0.79	0.92	1.48
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
World history	s.e.	1.52	2.78	1.59	2.67	3.49
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B51. Standard errors for table A24: Percentage of public high school graduates completing a college-preparatory course of study, by selected vocational/technical participation and nonparticipation measures: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.49	1.18	1.06	1.11	1.69
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical participation measures						
Vocational/technical coursetakers	s.e.	0.48	1.16	1.07	1.08	1.69
	weighted n (in 1,000s)	2,559	2,454	2,125	2,150	2,526
Occupational coursetakers	s.e.	0.44	1.14	1.09	1.08	1.76
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Vocational/technical investors	s.e.	0.29	0.99	0.90	0.92	1.87
	weighted n (in 1,000s)	1,859	1,595	1,346	1,351	1,609
Occupational investors	s.e.	0.29	0.98	0.99	0.95	1.93
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Occupational concentrators	s.e.	0.31	0.89	1.01	0.96	2.07
	weighted n (in 1,000s)	878	696	542	562	654
Advanced occupational concentrators	s.e.	0.31	1.01	1.31	1.19	2.42
	weighted n (in 1,000s)	626	404	353	321	378
Advanced occupational concentrators with cooperative education	s.e.	0.53	1.53	3.62	1.49	4.53
	weighted n (in 1,000s)	109	103	85	114	118
Vocational/technical nonparticipation measures						
All graduates except vocational/technical coursetakers	s.e.	4.56	4.08	5.83	3.24	5.68
	weighted n (in 1,000s)	48	51	50	62	90
All graduates except occupational coursetakers	s.e.	1.84	2.70	3.05	2.73	3.04
	weighted n (in 1,000s)	295	235	169	204	245
All graduates except vocational/technical investors	s.e.	1.27	2.25	1.87	1.86	2.52
	weighted n (in 1,000s)	748	910	828	861	1,007
All graduates except occupational investors	s.e.	0.79	1.69	1.45	1.57	2.02
	weighted n (in 1,000s)	1,402	1,429	1,256	1,284	1,470
All graduates except occupational concentrators	s.e.	0.68	1.54	1.28	1.42	1.88
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
All graduates except advanced occupational concentrators	s.e.	0.61	1.36	1.19	1.30	1.76
	weighted n (in 1,000s)	1,981	2,101	1,821	1,892	2,239

See notes at end of table.



**Table B51. Standard errors for table A24: Percentage of public high school graduates completing a college-preparatory course of study, by selected vocational/technical participation and nonparticipation measures: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998
All graduates except advanced occupational concentrators with cooperative education	s.e.	0.51	1.24	1.09	1.18	1.74
	weighted n (in 1,000s)	2,498	2,403	2,089	2,098	2,499

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B52. Standard errors for table A25: Percentage distribution of public high school graduates according to college-preparatory and occupational concentration status: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory only	s.e.	0.47	1.09	1.03	0.99	1.43
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentration only	s.e.	0.83	0.89	0.74	0.83	0.68
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Both college-preparatory and occupational concentration	s.e.	0.11	0.28	0.27	0.29	0.63
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Neither college-preparatory nor occupational concentration	s.e.	0.83	1.40	1.05	1.35	1.53
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B53. Standard errors for table A26: Percentage of occupational concentrators and nonconcentrators completing college-preparatory coursework, by subject: Various years, 1982–98**

		1982	1990	1992	1994	1998
<b>Occupational concentrators</b>						
College-preparatory, total	s.e.	0.31	0.89	1.01	0.96	2.07
	weighted n (in 1,000s)	878	696	542	562	654
English	s.e.	1.57	2.18	1.35	1.42	2.75
	weighted n (in 1,000s)	878	696	542	562	654
Mathematics	s.e.	0.82	1.26	1.41	1.41	1.87
	weighted n (in 1,000s)	878	696	542	562	654
Science	s.e.	0.97	1.81	1.55	1.57	2.15
	weighted n (in 1,000s)	878	696	542	562	654
Social studies	s.e.	1.45	1.70	1.23	0.54	1.73
	weighted n (in 1,000s)	878	696	542	562	654
Foreign languages	s.e.	0.75	1.63	1.37	1.51	2.18
	weighted n (in 1,000s)	878	696	542	562	654
<b>Nonconcentrators</b>						
College-preparatory, total	s.e.	0.68	1.54	1.28	1.42	1.88
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
English	s.e.	1.17	2.10	0.82	1.47	1.73
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Mathematics	s.e.	0.97	1.45	1.26	1.21	1.21
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Science	s.e.	0.95	1.35	1.22	1.04	1.24
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Social studies	s.e.	1.01	1.45	0.75	0.78	1.65
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Foreign languages	s.e.	1.02	1.52	1.29	1.21	1.32
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B54. Standard errors for table A27: Average number of credits earned in vocational/technical education by public high school graduates, by vocational/technical curriculum and whether graduates completed college-preparatory coursework: Various years, 1982–98**

		1982	1990	1992	1994	1998
Vocational/technical, total	s.e.	0.059	0.079	0.063	0.068	0.098
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory	s.e.	0.071	0.077	0.062	0.066	0.114
	weighted n (in 1,000s)	227	719	697	812	1,017
Not college-preparatory	s.e.	0.060	0.097	0.077	0.088	0.132
	weighted n (in 1,000s)	2,380	1,786	1,478	1,400	1,600
Occupational education	s.e.	0.053	0.065	0.050	0.057	0.074
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory	s.e.	0.055	0.062	0.053	0.054	0.094
	weighted n (in 1,000s)	227	719	697	812	1,017
Not college-preparatory	s.e.	0.054	0.081	0.065	0.079	0.096
	weighted n (in 1,000s)	2,380	1,786	1,478	1,400	1,600
General labor market preparation	s.e.	0.018	0.023	0.019	0.021	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory	s.e.	0.028	0.024	0.018	0.021	0.026
	weighted n (in 1,000s)	227	719	697	812	1,017
Not college-preparatory	s.e.	0.019	0.028	0.024	0.024	0.037
	weighted n (in 1,000s)	2,380	1,786	1,478	1,400	1,600
Family and consumer sciences education	s.e.	0.017	0.026	0.018	0.028	0.034
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory	s.e.	0.025	0.017	0.020	0.021	0.034
	weighted n (in 1,000s)	227	719	697	812	1,017
Not college-preparatory	s.e.	0.019	0.032	0.023	0.035	0.042
	weighted n (in 1,000s)	2,380	1,786	1,478	1,400	1,600

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B55. Standard errors for table A28: Percentage of public high school graduates meeting selected definitions of participation in vocational/technical education, by college-preparatory coursework status: 1998**

		College- preparatory	Not college- preparatory
Total		†	†
Vocational/technical coursetakers	s.e.	0.77	0.50
	weighted n (in 1,000s)	1,017	1,600
Occupational coursetakers	s.e.	1.39	0.69
	weighted n (in 1,000s)	1,017	1,600
Vocational/technical investors	s.e.	2.29	1.78
	weighted n (in 1,000s)	1,017	1,600
Occupational investors	s.e.	1.89	1.43
	weighted n (in 1,000s)	1,017	1,600
Occupational concentrators	s.e.	1.35	1.07
	weighted n (in 1,000s)	1,017	1,600
Advanced occupational concentrators	s.e.	1.08	0.92
	weighted n (in 1,000s)	1,017	1,600
Advanced occupational concentrators with cooperative education	s.e.	0.98	0.54
	weighted n (in 1,000s)	1,017	1,600

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Table B56. Standard errors for table A29: Percentage of public high school graduates concentrating in occupational education, by program area and college-preparatory status: 1998**

		College- preparatory	Not college- preparatory
Total	s.e.	1.35	1.07
	weighted n (in 1,000s)	1,017	1,600
Health care	s.e.	0.94	0.23
	weighted n (in 1,000s)	1,017	1,600
Communications technology	s.e.	0.20	0.11
	weighted n (in 1,000s)	1,017	1,600
Business services	s.e.	0.55	0.38
	weighted n (in 1,000s)	1,017	1,600
Computer technology	s.e.	0.24	0.18
	weighted n (in 1,000s)	1,017	1,600
Transportation	s.e.	0.02	0.05
	weighted n (in 1,000s)	1,017	1,600
Other precision production	s.e.	0.10	0.08
	weighted n (in 1,000s)	1,017	1,600
Business management	s.e.	0.17	0.12
	weighted n (in 1,000s)	1,017	1,600
Other technology	s.e.	0.07	0.07
	weighted n (in 1,000s)	1,017	1,600
Child care and education	s.e.	0.11	0.13
	weighted n (in 1,000s)	1,017	1,600
Food service and hospitality	s.e.	0.05	0.14
	weighted n (in 1,000s)	1,017	1,600
Personal and other services	s.e.	0.13	0.13
	weighted n (in 1,000s)	1,017	1,600
Marketing	s.e.	0.28	0.23
	weighted n (in 1,000s)	1,017	1,600
Print production	s.e.	0.20	0.40
	weighted n (in 1,000s)	1,017	1,600
Construction	s.e.	0.10	0.23
	weighted n (in 1,000s)	1,017	1,600

See notes at end of table.

**Table B56. Standard errors for table A29: Percentage of public high school graduates concentrating in occupational education, by program area and college-preparatory status: 1998—Continued**

		College- preparatory	Not college- preparatory
Agriculture	s.e.	0.41	0.67
	weighted n (in 1,000s)	1,017	1,600
Mechanics and repair	s.e.	0.10	0.26
	weighted n (in 1,000s)	1,017	1,600
Protective services	s.e.	‡	0.05
	weighted n (in 1,000s)	1,017	1,600
Materials production	s.e.	‡	‡
	weighted n (in 1,000s)	1,017	1,600
Mixed programs			
Business	s.e.	0.18	0.16
	weighted n (in 1,000s)	1,017	1,600
Precision production	s.e.	0.11	0.27
	weighted n (in 1,000s)	1,017	1,600
Trade and industry	s.e.	0.06	0.27
	weighted n (in 1,000s)	1,017	1,600
Technology	s.e.	0.17	0.09
	weighted n (in 1,000s)	1,017	1,600

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

**Table B57. Standard errors for table A30: Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status and program area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.75	0.94	0.63	0.67	0.56
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	0.82	0.82	0.67	0.54	0.55
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	1.33	1.71	1.26	1.45	0.93
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	4.91	3.65	3.26	3.17	1.72
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	5.56	8.16	3.12
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	1.94	2.20	1.89	1.96	1.51
	weighted n (in 1,000s)	242	163	105	119	85
Child care and education	s.e.	‡	6.88	9.21	4.58	2.37
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	2.65	4.57	3.44	0.72
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	7.01	4.30	3.80	3.11
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	4.74	5.59	5.89	4.51	3.44
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	6.26	11.23	5.41	8.05
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	8.94	6.30	8.03	3.35	1.98
	weighted n (in 1,000s)	15	14	13	21	47
Marketing	s.e.	4.20	3.17	7.24	2.38	1.78
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	3.96	4.93	4.81	4.20	3.11
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	4.24	3.88	4.94	2.78	2.96
	weighted n (in 1,000s)	79	57	40	36	47

See notes at end of table.



**Table B57. Standard errors for table A30: Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status and program area: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998
Other precision production	s.e.	9.11	13.70	‡	7.74	5.12
	weighted n (in 1,000s)	11	10	4	3	6
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	7.10	5.05	6.60	4.13	3.22
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	5.19	2.91	2.98	1.89	1.46
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B58. Standard errors for table A31: Percentage of public high school graduates taking geometry courses, by occupational concentration status and program area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.87	1.61	1.14	1.56	2.07
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	1.02	1.65	1.26	1.61	2.22
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	1.19	2.12	1.58	2.07	2.16
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	3.57	2.87	3.14	3.13	4.64
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	10.09	7.00	5.87
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	2.20	3.19	3.20	2.92	4.45
	weighted n (in 1,000s)	242	163	1,049	1,189	85
Child care and education	s.e.	‡	6.78	10.12	4.99	6.76
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	6.93	6.77	6.81	2.82
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	8.83	8.13	5.61	5.48
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	3.00	4.73	5.13	4.44	4.02
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	7.01	9.67	3.08	8.53
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	6.37	6.66	5.76	5.67	4.75
	weighted n (in 1,000s)	15	14	13	21	49
Marketing	s.e.	4.84	4.08	6.07	4.42	4.80
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	3.45	3.74	3.81	4.29	5.58
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	2.57	3.31	3.81	3.41	4.36
	weighted n (in 1,000s)	80	57	40	36	47
Other precision production	s.e.	8.30	9.14	‡	8.53	11.25
	weighted n (in 1,000s)	11	10	4	3	6

See notes at end of table.

**Table B58. Standard errors for table A31: Percentage of public high school graduates taking geometry courses, by occupational concentration status and program area: Various years, 1982–98**  
—Continued

		1982	1990	1992	1994	1998
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	5.48	4.51	7.57	5.59	7.71
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	4.77	4.64	5.55	5.04	3.59
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B59. Standard errors for table A32: Percentage of public high school graduates taking regular or advanced biology courses, by occupational concentration status and program area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	1.20	1.49	0.79	1.20	0.95
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	1.28	1.19	0.89	1.27	1.04
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	1.69	2.65	1.29	1.56	1.41
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	5.05	3.61	3.09	2.80	3.48
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	6.16	7.43	4.62
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	2.55	3.50	1.96	2.45	3.27
	weighted n (in 1,000s)	242	163	105	119	85
Child care and education	s.e.	‡	5.81	7.88	5.12	4.61
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	2.83	3.08	2.79	2.66
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	6.86	4.21	7.96	3.44
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	5.53	6.95	5.42	3.67	5.95
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	6.18	12.87	7.32	8.66
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	9.30	8.27	5.26	3.00	2.53
	weighted n (in 1,000s)	15	14	13	21	49
Marketing	s.e.	4.87	4.53	3.30	2.98	2.68
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	4.06	6.55	5.36	5.31	4.56
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	4.38	3.59	5.14	3.83	3.99
	weighted n (in 1,000s)	79	57	40	36	47

See notes at end of table.

**Table B59. Standard errors for table A32: Percentage of public high school graduates taking regular or advanced biology courses, by occupational concentration status and program area: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998
Other precision production	s.e.	9.38	14.36	‡	5.95	8.67
	weighted n (in 1,000s)	11	10	4	3	6
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	8.39	5.48	5.85	4.75	7.78
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	4.57	5.04	5.01	2.16	4.36
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B60. Standard errors for table A33: Percentage of public high school graduates taking regular or advanced chemistry courses, by occupational concentration status and program area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.78	1.22	1.10	1.49	1.52
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	0.98	1.37	1.28	1.58	1.59
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	0.83	1.26	1.33	1.59	2.12
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	3.06	2.79	4.43	2.66	3.41
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	8.25	6.89	6.75
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	1.35	2.39	3.24	2.74	3.78
	weighted n (in 1,000s)	242	163	105	119	85
Child care and education	s.e.	‡	4.05	5.51	6.07	6.64
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	7.83	8.84	6.66	4.73
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	9.75	9.49	9.47	5.59
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	1.83	1.63	6.87	3.47	4.24
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	0.85	3.59	1.57	4.22
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	5.45	8.03	6.07	5.51	8.33
	weighted n (in 1,000s)	15	14	13	21	49
Marketing	s.e.	3.50	3.48	3.75	4.03	5.37
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	1.92	2.84	2.78	2.40	3.36
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	1.30	1.64	1.77	1.91	4.10
	weighted n (in 1,000s)	79	57	40	36	47

See notes at end of table.

**Table B60. Standard errors for table A33: Percentage of public high school graduates taking regular or advanced chemistry courses, by occupational concentration status and program area: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998
Other precision production	s.e.	5.66	5.52	‡	5.98	10.90
	weighted n (in 1,000s)	11	10	4	3	6
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	2.60	2.63	6.94	3.32	4.83
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	4.58	2.81	4.94	3.73	3.70
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

**Table B61. Standard errors for table A34: Percentage of public high school graduates taking physics courses, by occupational concentration status and program area: Various years, 1982–98**

		1982	1990	1992	1994	1998
Total	s.e.	0.64	0.98	0.82	1.14	1.24
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	0.79	1.14	0.95	1.28	1.44
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	0.77	0.61	1.08	0.89	1.73
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	2.94	1.57	1.75	1.11	3.70
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	‡	1.81	4.42
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	1.09	1.10	3.02	1.39	2.41
	weighted n (in 1,000s)	242	163	105	119	85
Child care and education	s.e.	‡	1.15	0.00	2.74	3.25
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	7.54	6.20	5.81	6.00
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	8.24	9.16	7.90	5.85
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	1.73	0.99	1.52	0.73	1.49
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	2.61	0.00	1.92	2.43
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	3.06	2.40	‡	2.65	12.53
	weighted n (in 1,000s)	15	14	13	21	49
Marketing	s.e.	1.27	0.97	2.21	2.04	1.34
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	2.17	1.74	4.64	3.55	2.65
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	1.95	1.11	3.57	0.95	2.38
	weighted n (in 1,000s)	79	57	40	36	47
Other precision production	s.e.	‡	5.99	‡	4.66	16.27
	weighted n (in 1,000s)	11	10	4	3	6

See notes at end of table.



**Table B61. Standard errors for table A34: Percentage of public high school graduates taking physics courses, by occupational concentration status and program area: Various years, 1982–98**  
—Continued

		1982	1990	1992	1994	1998
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	1.48	1.11	0.00	1.15	5.71
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	2.91	2.85	3.33	2.84	3.84
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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## Appendix C—Glossary

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**Academic subjects:** The high school academic curriculum is divided into the main subject areas listed below, corresponding to the 1998 revised Secondary School Taxonomy categories (Bradby and Hoachlander 1999). The examples given are not exhaustive of the courses included in each subject area.

**Mathematics:** Includes courses in general mathematics, consumer mathematics, pre-algebra, algebra 1, geometry, algebra 2 and 3, trigonometry, analytic geometry, mathematical analysis, pre-calculus, calculus, Advanced Placement (AP) calculus, International Baccalaureate (IB) mathematics, probability and statistics, unified mathematics (an integrated course sequence usually taught over 2 or 3 years), and occupationally related mathematics.

**Science:** Includes courses in survey science, biological science (including biology and some specialized courses such as botany, zoology, and anatomy and physiology), chemistry, physics, earth science, physical science, and engineering.

**English:** Includes survey courses (including language skills courses and English 9–12), as well as courses in literature, composition and writing, speech, and English as a Second Language.

**Social studies:** Includes courses in U.S. history, world history, government and politics, economics, behavioral sciences (including psychology and sociology), geography, social studies, American studies, area studies, women’s studies, law, anthropology, and philosophy.

**Fine arts:** Includes courses in visual arts, music, dance, and theater arts.

**Foreign (non-English) languages:** Includes courses in Spanish, French, German, Latin, Italian, and other non-English languages and literatures.

**Advanced English:** Includes honors-level English courses.

**Advanced mathematics:** Includes coursework in algebra 3, trigonometry, analytical geometry, linear algebra, probability, statistics, pre-calculus, introduction to analysis, and calculus.

**Advanced occupational concentrator:** Graduate earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed in figure 3, with at least 1.0 credit in a second- or higher-level or cooperative education course in that program area.

**Advanced occupational concentrator with cooperative education:** Graduate earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed in figure 3, with at least 1.0 cooperative education credit in that program area.

**Advanced science:** Includes coursework in chemistry 1 and 2 and physics 1 and 2.

**Carnegie unit:** A standard of measurement used for secondary or high school education that represents the completion of a course that meets 1 period per day for 1 year. See **credit**.

**College-preparatory coursework:** Public high school graduates were classified as completing college-preparatory coursework if they completed 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 (non-English) language during high school.

**Cooperative education:** Programs that allow students to earn course 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.

**Core academic standards:** See **New Basics core academic standards**.

**Core academic subjects:** Includes mathematics, science, English, and social studies, as defined under **academic subjects**.

**Credit:** Term used in place of a “Carnegie unit” to represent the completion of a course that meets 1 period per day for 1 year. See **Carnegie unit**.

**Curriculum types:** At its most aggregated level, the 1998 revised Secondary School Taxonomy divides the high school curriculum into the following curricula (excluding special education):

**Academic:** See **academic subjects**.

**Vocational/technical:** See **vocational/technical education**.

**Enrichment/other:** See **enrichment/other**.

**Enrichment/other:** Includes courses designed for students’ personal enrichment, including courses in general skills; health, physical, and recreation education; religion and theology; and military science.

**Family and consumer sciences education:** Consists of courses intended to prepare students for roles outside the paid labor market, including home economics, child development, foods and nutrition, and clothing. Home economics-related courses that prepare students for the paid labor market are included under **occupational education**, in the child care and education, food service and hospitality, and personal and other services program areas.

**General labor market preparation:** Consists of courses that teach general employment skills but do not have as their primary objective preparing students for paid employment in a specific field. These courses include typewriting, word processing, industrial arts, career exploration, general work experience, and technology education.

**General work experience:** Programs that allow students to earn course credit for paid or unpaid employment. Unlike **cooperative education**, general work experience is not connected to a specific occupational program of study.

**New Basics core academic standards:** In the 1983 publication *A Nation at Risk*, the National Commission on Excellence in Education recommended that all high school students take 4 years of English; 3 years each of mathematics, science, 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.

**Occupational concentrator:** Graduate earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed under **occupational programs**. In some cases, the report also examines trends in concentrating (earning 3.0 or more credits) in the 18 narrow occupational program areas listed under **occupational programs**.

**Occupational coursetaker:** Graduate earning greater than 0.0 credits in occupational education in high school.

**Occupational education:** Also called **specific labor market preparation**, consists of courses that teach skills and provide information required in a particular occupation or cluster of occupations. Courses are organized into 10 broad and 18 narrow occupational program areas. See **occupational programs**.

**Occupational home economics-related programs:** Includes coursework in food service and hospitality, child care and education, and personal and other services.

**Occupational investor:** Graduate earning 3.0 or more credits in occupational education in high school, regardless of whether the graduate concentrates his or her occupational coursetaking in a single occupational program area.

**Occupational programs:** The 1998 Secondary School Taxonomy organizes high school occupational programs into the following 10 broad and 18 narrow program areas. The examples given are not exhaustive of the courses offered in each area. See also figure 3.

**Agriculture (and renewable resources):** Includes courses in agricultural mechanics, horticulture, animal sciences, and environmental management.

**Business:** Includes the following two narrow program areas of business management and business services:

**Business management:** Includes courses in business and management and banking and finance.

**Business services:** Includes courses in bookkeeping, accounting, data entry, secretarial administration, and office procedures.

**Marketing:** Includes courses related to the selling and distribution of goods and services, including distributive education, distribution and marketing, fashion merchandising, and entrepreneurship.

**Health care:** Includes courses intended to prepare students for careers in the health professions, such as health occupations, dental assistant, medical laboratory technologies, and practical nursing.

**Protective services (and public services):** Includes courses in criminal justice, fire protection, public administration, and social work.

**Trade and industry:** Includes the following four narrow program areas of construction, mechanics and repair, precision production, and transportation:

**Construction:** Includes coursework in electricity, masonry, carpentry, plumbing, and building construction.

**Mechanics and repair:** Includes coursework in industrial mechanics, radio and TV repair, air conditioning and heating, power mechanics, auto mechanics, and aviation powerplant.

**Precision production:** Includes the following three narrow program areas of print production, materials production, and other precision production:

**Print production:** Includes coursework in drafting, graphics, and printing.

**Materials production:** Includes coursework in metals, plastics, and woodworking.

**Other precision production:** Includes coursework in electronics, leatherwork, meatcutting, and commercial photography.

**Transportation:** Includes coursework in aeronautics, aviation technology, marine mechanics, transportation technology, and vehicle and equipment operation. Also referred to as transportation and materials moving.

**Technology:** Includes the following three narrow program areas of computer technology, communications technology, and other technology:

**Computer technology:** Includes coursework in computer applications, computer programming, data processing, computer science and systems, and computer mathematics.

**Communications technology:** Includes coursework in broadcast management, film making, and radio and television production.

**Other technology:** Includes coursework in electronic technology, industrial production technology, chemical technology, and engineering technologies.

**Food service and hospitality:** Includes coursework in food marketing/distribution, hospitality sales, culinary arts, and hotel management.

**Child care and education:** Includes coursework in child care services, child development, education, and library science.

**Personal and other services:** Includes coursework in cosmetology, building and grounds maintenance, clothing and textiles, housing and interior design, and home economics occupations.

**Specific labor market preparation:** Also called **occupational education**, consists of courses that teach skills and provide information required in a particular occupation or cluster of occupa-

tions. Courses are organized into 10 broad and 18 narrow occupational program areas. See **occupational programs**.

**Vocational/technical coursetaker:** Graduate earning greater than 0.0 credits in vocational/technical education in high school.

**Vocational/technical education:** Organized educational programs, services, and activities that are directly related to the preparation of individuals for paid or unpaid employment or for additional preparation for a career that requires other than a bachelor's or an advanced degree. This publication refers to the following three types of vocational education at the high school level: **family and consumer sciences education, general labor market preparation, and specific labor market preparation** or “**occupational education.**”

**Vocational/technical investor:** Graduate earning 3.0 or more credits in vocational/technical education in high school.



## Appendix D—Technical Notes and Methodology

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### Sources of Data

The data for this report came from five surveys conducted by NCES between 1982 and 1998. These surveys are the High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; the National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and the National Assessment of Educational Progress (NAEP) High School Transcript Studies (HSTS) of 1990, 1994, and 1998.

For all transcripts and samples used in this report, a course identification code number, based on the Classification of Secondary School Courses (CSSC), was assigned to each course taken by a student. *The 1998 Revision of the Secondary School Taxonomy* (Bradby and Hoachlander 1999) further classified these CSSC codes. This taxonomy served to standardize all transcript data included in the analysis.

The analysis sample from each survey was restricted to a subset of students who were public high school graduates and who had a complete set of transcripts. A complete transcript was defined as one that recorded 16 or more total credits (Carnegie units), with a positive, non-zero number of credits completed in English.

One additional step was taken to ensure that the analysis samples were comparable across the 5 trend years. This was necessary because the HS&B and NELS studies excluded students with the most severe disabilities, where it was determined by school staff that these students were unable to complete the lengthy student questionnaires that were a part of these longitudinal studies. In order to ensure comparability, graduates with special education diplomas were excluded from the HSTS samples. This procedure was first determined by Gifford et al. (1989) and then again by Tuma (1996) to produce comparable samples across HS&B, NELS, and HSTS. Thus, the samples used for this trend analysis were consistent with the population of public high graduates, including students with disabilities, who earned regular or honors diplomas in each of the study years. This restriction is consistent with NCES reports on high school vocational/technical coursetaking published over the last decade and is consistent with NCES procedures for transcript studies (Alt and Bradby 1999).

In addition, there are some minor coding differences between NELS and the other transcript data that may affect the data for 1992. NCES plans to study this issue. The following section provides a brief description of each study.

### ***High School and Beyond***

The High School and Beyond (HS&B) longitudinal survey was first administered in 1980 to a stratified, nationally representative sample of approximately 30,000 high school sophomores and 28,000 high school seniors from more than 1,000 high schools. Follow-up surveys were administered in 1982, 1984, 1986, and 1992. This report focused on the sophomore cohort from the First Follow-up Survey conducted in 1982. For purposes of this report, the analysis sample was limited to public high school students using the variable HSTYPE. This group was reduced further by including only high school graduates, defined by using a composite of graduation status variables RESNLEFT, FUSTTYPE, and SY12 from the Transcript, First Follow-up and Second Follow-up surveys, respectively.

The First Follow-up and High School Transcript Study were used to examine coursetaking patterns. The analysis sample included 9,598 public high school students who graduated in 1982 and had complete transcripts available. Standard errors were computed using the Taylor series approximation method. More information on the First Follow-up and Transcript data files can be found in *High School and Beyond, 1980 Sophomore Cohort, First Follow-Up (1982), Data File User's Manual* (Jones et al. 1983) and *High School and Beyond Transcripts Survey (1982), Data File User's Manual* (Jones et al. 1984).

### ***National Education Longitudinal Study of 1988***

The National Education Longitudinal Study of 1988 (NELS:88) is another major longitudinal study sponsored by NCES. The Base Year Survey was administered to about 24,000 8th-graders in more than 1,000 schools with an 8th-grade class. The First, Second, Third, and Fourth Follow-ups revisited the same sample of students in 1990, 1992, 1994, and 2000, when most of the 1988 8th-graders were in the 10th grade, 12th grade, and then, 2 and 6 years after they graduated from high school. Unlike HS&B, for each in-school follow-up (i.e., 1990 and 1992), the student sample was “freshened” to obtain a representative, cross-sectional grade-cohort sample (i.e., 10th-graders in 1990 and 12th-graders in 1992). In addition, as a part of the Second Follow-up Survey, high school transcripts were collected for the members of the 12th-grade cohort in the fall of 1992. Transcript data were available for about 17,200 students. For purposes of this report, the analysis sample was limited to public high school students using G12CTRL2. This group was reduced further by including only high school graduates using the variable F2REASL.

The report used the Second Follow-up and High School Transcript Study to examine coursetaking patterns. The analysis sample included 11,788 public high school students who graduated in 1992 and had complete transcripts available. Standard errors were computed using the Taylor series approximation method. For more information on the Second Follow-up Survey of NELS:88, see *Second Follow-up: Transcript Component Data File User's Manual* (Ingels et al. 1995).

### ***NAEP High School Transcript Studies of 1990, 1994, and 1998***

This report used three NAEP transcript studies conducted in 1990, 1994, and 1998. The NAEP is a congressionally mandated assessment program conducted by the National Center for Education Statistics in the Institute of Education Sciences, U.S. Department of Education. The overall goal of NAEP is to determine the nation's progress in education. Conducted in association with NAEP, the High School Transcript Studies (HSTS) provided coursetaking and demographic information for a stratified, nationally representative sample of high school seniors. The 1990 transcript file included the high school transcripts of 21,531 seniors from about 330 schools, while the 1994 transcript file included the high school transcripts of 24,844 seniors from 340 schools. The 1998 HSTS collected transcript data from 25,422 seniors in 264 high schools. Like HS&B and NELS:88, the availability of complete high school transcripts and students' graduation status defined the NAEP student samples included in this report. To assure comparability with the samples from HS&B and NELS:88, only public high school seniors who graduated with a "regular" or "honors" diploma were included, using the variable EXSTAT.

The final analysis samples were 16,507 for 1990; 23,706 for 1994; and 23,176 for 1998. Standard errors were computed using the jackknife replication method. For further information about NAEP High School Transcript Studies, see *The 1994 High School Transcript Study Tabulations: Comparative Data on Credits Earned and Demographics for 1994, 1990, 1987, and 1982 High School Graduates (Revised)* (Legum et al. 1998), and *The 1998 High School Transcript Study User's Guide and Technical Report* (Roey et al. 2001).

### **Description of Academic Pipeline Measures**

In each data set described above, composite coursetaking measures in mathematics, science, and English were constructed based on the transcripts of public high school graduates collected as part of HS&B, NELS:88, and NAEP. These measures place students in different levels

of an academic “pipeline.”<sup>85</sup> The pipeline generally organizes courses in each subject based on the normal progression and difficulty of courses within that subject area. For example, in mathematics, algebra 1 is less difficult than and is traditionally taken before algebra 2; thus, algebra 1 is placed lower in the pipeline hierarchy than is algebra 2. In addition, the pipeline classifies graduates by the highest level of courses completed in a subject area, not the highest level attempted. Thus, the pipeline for a subject can be used to assess the rigor and difficulty of courses that high school graduates have completed during high school. Graduates at the high end of a pipeline have completed more advanced coursework than graduates at a lower level of the pipeline.

For purposes of this report, the original pipeline measures were condensed into fewer categories that were more relevant for an analysis of participation in vocational/technical education. The following section describes how the pipeline measures used in this report were constructed for mathematics, science, and English. For more information on the construction of the original pipeline measures, see *Mathematics, Foreign Language, and Science Coursetaking and the NELS:88 Transcript Data* (Burkam, Lee, and Smerdon 1997) and *English Coursetaking and the NELS:88 Transcript Data* (Burkam 1998).

### ***Mathematics Pipeline***

The original mathematics pipeline had eight levels: No mathematics, Nonacademic, Low academic, Middle academic I, Middle academic II, Advanced I, Advanced II, and Advanced III. The condensed mathematics pipeline used in this report contained four categories: the first three levels were collapsed into “low mathematics” and the last three levels into “advanced mathematics.” The middle two levels were kept as originally defined. The types of coursework used to define the four condensed categories are described below.

**Low mathematics.** Includes students who completed no mathematics; remedial-level mathematics; general, basic or consumer mathematics; technical or vocational mathematics; and low-level “academic” mathematics, such as pre-algebra, algebra 1 taught over the course of 2 academic years, or informal geometry; and who completed no mathematics in higher pipeline categories.

**Lower-middle mathematics.** Includes students who completed algebra 1; plane and/or solid geometry; or unified mathematics 1 and/or 2; but no higher mathematics.

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<sup>85</sup>Researchers at the University of Michigan using the NELS:88 transcript file first developed these pipeline measures (Burkam, Lee, and Smerdon 1997 and Burkam 1998). Following the concept and logic of these original measures, Pinkerton Computer Consultants created similar pipeline variables using the HS&B and NAEP data files.

**Upper-middle mathematics.** Includes students who completed algebra 2 or unified mathematics 3, but no higher mathematics.

**Advanced mathematics.** Includes students who completed algebra 3; trigonometry; analytical geometry; linear algebra; probability; statistics; pre-calculus; introduction to analysis; or calculus.

### ***Science Pipeline***

Unlike mathematics and other subjects such as foreign languages, coursework in science does not follow a common or easily defined sequence. Depending on a school's curriculum, students may be able to choose from several courses with minimal sequencing. Consequently, the method used to construct the original science pipeline differed from that of the mathematics pipeline. First, all science courses were placed in one of four groups based on subject matter: 1) life science (biology); 2) chemistry; 3) physics; and 4) all other physical sciences (for example, geology, earth science, and physical science). Second, a pipeline was constructed for each of these four groups. Third, the pipelines for chemistry, physics, and all other physical sciences were combined into a single pipeline. The result was a pipeline with seven levels: no science; primary physical science; secondary physical science; biology; chemistry I or physics I; chemistry I and physics I; and chemistry II or physics II.

For purposes of this report, this science pipeline was condensed into three categories. The first three categories were collapsed into “low science” and the last three into “advanced science.” The middle biology category was kept as originally defined. The types of coursework used to define the three condensed categories are described below.

**Low science.** Includes students who completed no science courses; remedial-level science; physical science; earth science; unified science; astronomy; geology; environmental science; oceanography; general physics; basic biology 1; or consumer or introductory chemistry; but no higher science.

**Biology.** Includes students who completed at least one of the following courses: general biology 1; secondary life sciences (including ecology, zoology, marine biology, and human physiology); general or honors biology 2; or advanced biology, but no higher science.

**Advanced science.** Includes students who completed one of the following combinations of chemistry and physics: chemistry 1 or physics 1; chemistry 1 and physics 1; or chemistry 2 or physics 2.

## ***English Pipeline***

English language and literature courses also do not fit neatly into an ordered hierarchical framework. While the mathematics curriculum adds more challenging content to the content studied earlier, the hierarchy in the English curriculum is different. In general, the English curriculum is stratified by the level of difficulty and intensity of work required within a specific content area rather than among different courses. Within each area (such as literature or composition), the courses can be classified according to three tracks: below-grade courses, at-grade courses, and above-grade or honors courses. The original English pipeline was constructed to reflect the proportion of coursework students completed in each track. For example, the lowest category in the original English pipeline included students who completed 75 percent or more of their English coursework in low-level courses (below grade), and the highest category included students who completed 75 percent or more of their English courses at the honors level. Hence, the English pipeline departed somewhat from the “pipeline” concept that was developed for mathematics and science. It reflected the quality (or rigor) of a student’s English coursetaking rather than the progression from low-level to more challenging coursework. Using the proportion of coursework students completed in different tracks, a student’s overall English coursetaking was classified into seven categories.

For purposes of this report, the original English pipeline was condensed into three categories. The first three levels were collapsed into “low English” and the last three into “advanced English.” The middle category was defined as in the original pipeline, and was labeled “other English.”

**Low English.** Includes students who completed at least some English coursework in low-level courses.

**Other English.** Includes students who completed no honors and no low-level English coursework.

**Advanced English.** Includes students who completed at least some English coursework in honors courses.

## **Accuracy of Estimates**

The estimates in this report are derived from samples and are subject to two broad classes of error—nonsampling errors and sampling errors. Nonsampling errors occur not only in sample surveys but also in complete censuses of entire populations. Nonsampling errors can be attributed to a number of factors: inability to obtain complete information about all students in all institu-

tions in the sample (some students or institutions refused to participate, or students participated but answered only certain items); ambiguous definitions; differences in interpreting questions; inability or unwillingness to give correct information; mistakes in recording or coding data; and other errors of collecting, processing, sampling, and imputing missing data. Although nonsampling errors due to questionnaire and item nonresponse can be reduced somewhat by adjusting sample weights and imputation procedures, correcting all the forms of nonsampling errors that may be operating, or gauging the effects of these errors, is usually difficult.

Sampling errors occur because observations are made only on samples, not on entire populations. Surveys of population universes are not subject to sampling errors. Estimates based on a sample will differ somewhat from those that would have been obtained by a complete census of the relevant population using the same survey instruments, instructions, and procedures. The standard error is a measure of the variability due to sampling when estimating statistics. Standard errors can be used as a measure of the precision expected from a particular sample. If all possible samples were surveyed under similar conditions, intervals of 1.96 standard errors below to 1.96 standard errors above a particular statistic would include the true population parameter being estimated in about 95 percent of the samples. In addition, the standard errors for two sample statistics can be used to determine the precision of the difference between the two statistics and thus to determine whether the sample difference is large enough so that it can be assumed to represent a difference in the population.

Because HS&B, NELS:88, and NAEP data were collected using complex sampling designs, the sampling errors of the estimates from these surveys are typically larger than would be expected if the samples were simple random samples and the observations were independent and identically distributed random variables. Not taking the complex sample designs into account can lead to an underestimate of the sampling variance associated with an estimate. In order to generate accurate standard errors for the statistics reported in this study, the Taylor series approximation method and jackknife replication method were used. In particular, standard errors of estimates from the HS&B and NELS:88 data were computed using the Taylor series approximation and standard errors of estimates from the NAEP data were computed using the jackknife replication method. For more information about these methods, see Wolter (1985).

## Statistical Procedures

The comparisons in the text have all been tested for statistical significance to ensure that differences are larger than those that might be expected due to sampling variance. Two types of statistical tests have been used and reported in the text.

**Testing the difference between two means or percentages.** The Student's  $t$  statistic was used to test the likelihood that the differences between two independent means or percentages were larger than would be expected due to sampling error. The Student's  $t$  values can be computed for comparisons using the estimates in the report's tables with the following formula:

$$t = \frac{E_1 - E_2}{\sqrt{(se_1)^2 + (se_2)^2}} \quad (1)$$

where  $E_1$  and  $E_2$  are the estimates to be compared and  $se_1$  and  $se_2$  are their corresponding standard errors. This formula is valid only for independent estimates. When the estimates are not independent (for example, when comparing any estimates that are parts of a percentage distribution), a covariance term must be added to the denominator of the  $t$ -test formula. Because the actual covariances were not known, it was assumed that the estimates were perfectly negatively correlated. Consequently,  $2*(se_1*se_2)$  was added within the square root of the denominator of the  $t$ -test formula for dependent estimates.

**Testing the difference between differences.** Another statistical test used in this report assessed the difference between two difference estimates. For example, to test whether the difference between occupational concentrators and nonconcentrators in a specific year (e.g., 1982) differed significantly from the difference between these two groups in another year (e.g., 1998), a test of differences between differences was performed using the following formula:

$$t = \{(E_{11}-E_{21})-(E_{12}-E_{22})\} / \text{sqrt}\{(se_{11}^2+se_{21}^2)+(se_{12}^2+se_{22}^2)\} \quad (2)$$

where  $E_{11}$  and  $E_{21}$  are the estimates for the two comparison groups at time 1 (e.g.,  $E_{11}-E_{21}$  is the difference between concentrators and nonconcentrators in 1982),  $E_{12}$  and  $E_{22}$  are the estimates for the two comparison groups at time 2 (e.g.,  $E_{12}-E_{22}$  is the difference between concentrators and nonconcentrators in 1998), and  $se_{11}$ ,  $se_{21}$ ,  $se_{12}$ , and  $se_{22}$  are their corresponding standard errors.

Generally, whether a difference is considered statistically significant is determined by calculating a  $t$  value for the difference, and comparing this value to published tables of values at certain critical levels, called *alpha* levels. The *alpha* level is an a priori statement of the probability of inferring that a difference exists when, in fact, it does not. The *alpha* level used in this report is .05; differences discussed in the text have been tested and found significant at this level. Two-tailed tests were performed.

In order to make proper inferences and interpretations from the statistics, several points must be kept in mind. First, comparisons resulting in large  $t$  statistics may appear to merit special consideration. However, this is not always the case because the size of the  $t$  statistic depends not



only on the observed differences between the two estimates being compared but also on the standard error of the difference. Thus, a small difference between two groups with a much smaller standard error could result in a large  $t$  statistic, but this small difference is not necessarily noteworthy.

Second, when multiple statistical comparisons are made, it becomes increasingly likely that a finding of a statistically significant difference is erroneous. Even when there is no difference for a particular comparison in the population, at an *alpha* level of .05, there is still a 5 percent chance of concluding that an observed  $t$  value representing one comparison in the sample is large enough to be statistically significant. As the number of comparisons increases, so does the risk of making such an error in inference.

To guard against errors of inference based upon multiple comparisons, the Bonferroni procedure to correct significance tests for multiple contrasts was used, where appropriate, in this report. This method corrects the significance (or *alpha*) level for the total number of contrasts made with a particular classification variable. For each classification variable, there are  $K$  possible contrasts (or nonredundant pairwise comparisons), where  $K=(N*(N-1)/2)$  and  $N$  is the number of categories in the variable (e.g., because the English pipeline has 3 categories ( $N=3$ ), there are  $(3*2)/2=3$  possible comparisons among the categories). The Bonferroni procedure divides the *alpha* level for a single  $t$  test (for example, .05) by the number of possible pairwise comparisons in order to provide a new *alpha* level that adjusts for all possible multiple comparisons.