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Career and Technical Education: A Primer

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Career and Technical Education: A Primer

Career and technical education (CTE), sometimes referred to as vocational education, provides secondary and postsecondary education students with the skills and knowledge required for specific jobs or fields of work. CTE is a key element of the nation's workforce development system, providing students with both academic and technical skills to succeed in further education and future careers. Federal investments in CTE aim to increase the number of individuals with recognized postsecondary credentials, including industry-recognized credentials, in order to reduce unemployment, improve individual earnings, and benefit the nation's economy. This report provides a primer on CTE to support congressional discussion of initiatives designed to improve workforce development and to address skills deficits that may exist in the workforce. (For information on the primary federal program that funds CTE programs, see CRS Report R47071, *Strengthening Career and Technical Education for the 21st Century Act (Perkins V): A Primer*.)

SUMMARY

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CTE is commonly organized into 14 career clusters that help design career pathways and programs of study and coordinate them with employment opportunities. These clusters include several occupational areas, such as healthcare and advanced manufacturing. Career clusters are groupings of industry sectors with commonalities, and there are multiple career pathways within each cluster. Career pathways and programs of study combine high quality education, training, and other services that help individuals to secure the postsecondary credentials needed to obtain employment within an occupational area, or to advance to a higher level of education. As it can be difficult to anticipate the precise technical skills needed by future occupations, general education and academic skills remain a critical component of secondary and postsecondary CTE programs.

At the secondary level, CTE is commonly offered in high schools, area CTE centers, and detention centers. According to the most recent available federal data, the vast majority (85%) of 2019 public and private high school graduates attained at least one CTE unit. CTE courses can broaden students' education and provide early exposure to several career options. They can also facilitate students' entry into the workforce immediately after high school by equipping them with a recognized postsecondary credential upon completion of a CTE program. Similarly, secondary CTE courses can prepare students for an additional one to two years of postsecondary education or training that leads to a postsecondary credential.

At the postsecondary level, CTE is commonly offered by community colleges, by trade schools, and by employers through apprenticeships and on-the-job training. Postsecondary CTE programs commonly lead to credentials at or below the associate's degree level. Some CTE programs are terminal (i.e., few courses are transferable for credit toward a more advanced credential), while others may be stackable (i.e., part of a sequence of programs leading to more advanced credentials). Earning stackable credentials is intended to increase the odds of securing employment and of garnering higher wages once employed.

There is a limited body of rigorous research that isolates the benefits of CTE. Wage premiums for earning CTE credentials vary depending on the program of study. For example, certificates and associate's degrees in more technical CTE fields such as computer and information services are associated with higher earnings than certificates and associate's degrees in less technical CTE fields such as business. Programs in fields such as information technology are becoming more popular at both the secondary and postsecondary levels, as they yield higher wage returns.

Shorter-term benefits associated with CTE include a greater likelihood of graduating high school. Though both the short- and long-term returns of certain types of postsecondary CTE credentials (e.g., health sciences, cosmetology, and protective services) are positive on average, earnings for those who only hold a certificate are more sensitive to economic conditions than earnings for individuals with associate's degrees. Wage returns to certificates vary depending upon the program of study, institution type, and local labor market conditions.

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Introduction

To better align both secondary and postsecondary education with the nation's economic and workforce needs, the federal government provides funding to states, institutions of higher education (IHEs), and local educational agencies (LEAs) to support career and technical education (CTE). CTE, sometimes referred to as vocational education,[1] provides occupational preparation at the secondary and postsecondary levels. A CTE program of study[2] is often designed to have an immediate practical application in the workforce while also developing broadly applicable skills such as writing and effective communication.

This report provides an overview of CTE, beginning with a discussion of the history of federal support, CTE as defined at the secondary and postsecondary levels, and the most recent enrollment and completion data. The second half of the report discusses challenges with CTE program implementation and access, strategies and resources that have been used to address these challenges, and outcomes associated with participating in and completing CTE programs of study. The **Appendix** provides additional information on the specifics of career clusters and programs of study referenced throughout the report.

Federal Support for Career and Technical Education

The federal government has a long history of supporting CTE. The Morrill Land Grant College Act of 1862 (7 U.S.C. §301 et. seq.) supported the development of the current system of land-grant colleges to teach the agricultural and mechanical arts to the "industrial classes."[3] At the secondary level, federal involvement began with the passing of the Smith-Hughes Act in 1917, which provided federal aid to the states for the purpose of promoting vocational education in agriculture, industrial trades, and home economics.[4] The Smith-Hughes Act was among the first federal efforts focused on supporting the education of students aged 14 and older and was passed with unanimous support on the eve of World War I.[5]

Federal involvement in CTE has often been preceded by Congress's desire for the nation to remain economically competitive internationally and to address perceived skill deficits[6] in the nation's workforce. Rationales for funding CTE over the past century have relied on shared benefits to both the nation's and individual citizens' economic well-being. In 1917, vocational

[1] *Career and technical education* is also referred to as *career education*, *technical and vocational education*, and *technical education*. "Career and technical education" is defined in the Strengthening Career and Technical Education for the 21st Century Act of 2018 (Perkins V; P.L. 115-224), the largest source of federal support for CTE programs. For more information, see CRS Report R47071, *Strengthening Career and Technical Education for the 21st Century Act (Perkins V): A Primer*.

[2] According to Section 7(41) of Perkins V, programs of study (POS) are coordinated, nonduplicative sequences of academic and technical content at the secondary and postsecondary level that incorporate challenging academic standards; address both academic and technical knowledge and skills, including employability skills; are aligned with the needs of industries; progress in specificity; have multiple entry and exit points that incorporate credentialing; and culminate in the attainment of a recognized postsecondary credential.

[3] For more information, see CRS Report R45897, *The U.S. Land-Grant University System: Overview and Role in Agricultural Research*.

[4] The Smith-Hughes Act was repealed by the Balanced Budget Act of 1997 (P.L. 105-33).

[5] David Carleton, *Landmark Congressional Laws on Education* (Westport, CT: Greenwood Publishing Group, 2001). The author claims that the war was an impetus for the legislation.

[6] For more recent information on skills deficits and gaps, see CRS Report R47059, *Skills Gaps: A Review of Underlying Concepts and Evidence*.

education was termed "vital to national defense and prosperity."[7] Other efforts have focused on retraining individuals whose occupational skills had become obsolete, or who did not have educational opportunities. For example, the Manpower Development and Training Act of 1962 (MDTA; P.L. 87-415) was intended to prepare individuals for employment who could not reasonably be expected to secure full-time employment without training.[8] The MDTA was a policy response to the perceived negative effects of automation on the existing workforce.

Nearly 50 years after the passage of the Smith-Hughes Act, the federal government's role in CTE policy further expanded with the Vocational Education Act of 1963 (VEA, P.L. 88-210), which supported vocational education schools; vocational work-study programs; and research, training, and demonstration programs related to vocational education. Whereas the Smith-Hughes Act focused on secondary schools, the VEA substantially increased funding for postsecondary and adult education. Additional legislative actions since the VEA have focused on serving students with disabilities and other special populations who have historically been underserved.[9]

Today, the federal government remains active in CTE, although appropriations have declined over the last several decades. Perkins V is the largest source of federal funding for CTE at the secondary and postsecondary levels.[10] After adjusting appropriations for inflation, **Figure 1** demonstrates the extent to which funding for CTE via Perkins V has declined since FY1980[11], though this decline has plateaued in recent years. In FY2024, the federal government invested $1.8 billion less in CTE than in FY1980 (after adjusting for inflation).

[7] U.S. Congress, House of Representatives, *Annual Report of the Federal Board for Vocational Education*, 65th Cong., 2nd sess., Doc. No. 16 (Washington, DC: GPO, 1917).

[8] U.S. Congress, Senate Committee on Agriculture and Forestry, Subcommittee on Rural Development, *Manpower Training and Employment Programs Serving Rural America*, committee print, prepared by the Congressional Research Service, 65th Cong., 2nd sess., October 31, 1973 (Washington, DC: GPO, 1973), p. 2.

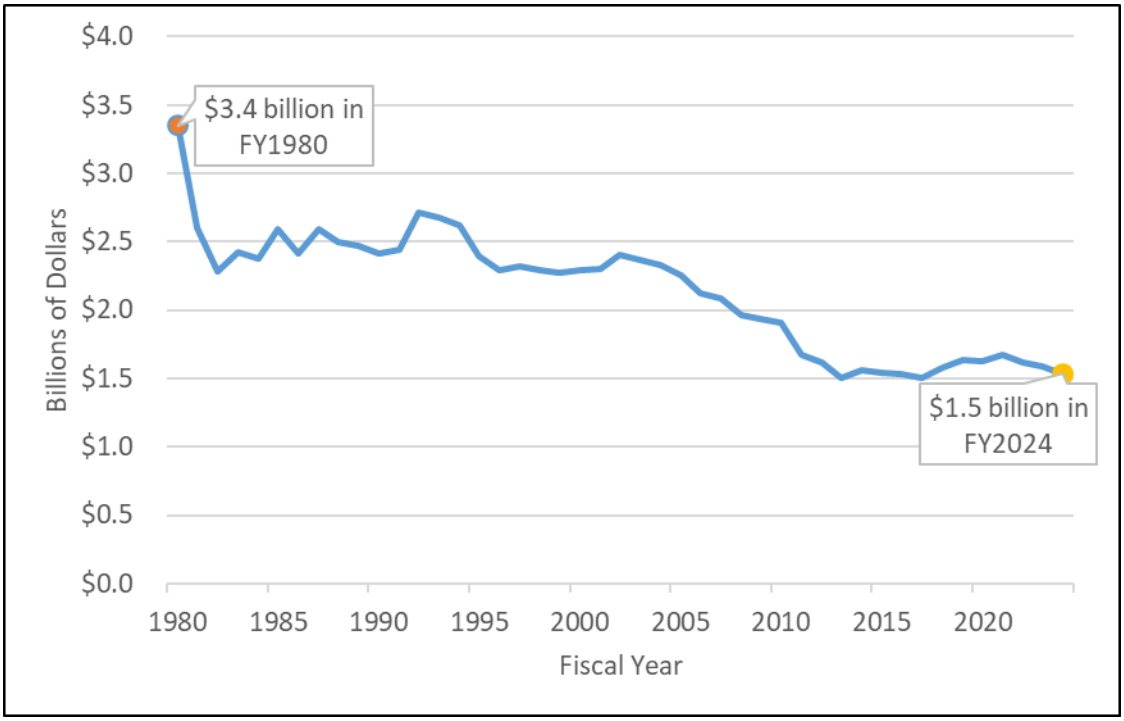
[9] For a more detailed history of federal involvement in CTE, see CRS Report R47071, *Strengthening Career and Technical Education for the 21st Century Act (Perkins V): A Primer*.

[10] While Perkins V provides the only federal funding focused specifically on CTE, funds under other federal programs may be used to support CTE. For example, funds provided under the Title I-A, Student Support and Academic Enrichment Grants, and the 21st Century Community Learning Centers programs authorized by the Elementary and Secondary Education Act may be used to support CTE activities. CTE is also supported by non-federal sources such as funds provided by states and local entities (e.g., school districts, industry support).

[11] FY1980 is the earliest year with a historical budget for the U.S. Department of Education, which was founded as a cabinet level agency on October 17, 1979 (although many of its functions and many of the programs it administers existed prior to this point). This starting point also coincides with the end of historically high levels of funding for CTE during the last year of the Carter Administration.

Figure 1. Inflation-Adjusted U.S. Department of Education Appropriations for CTE

FY1980–FY2024



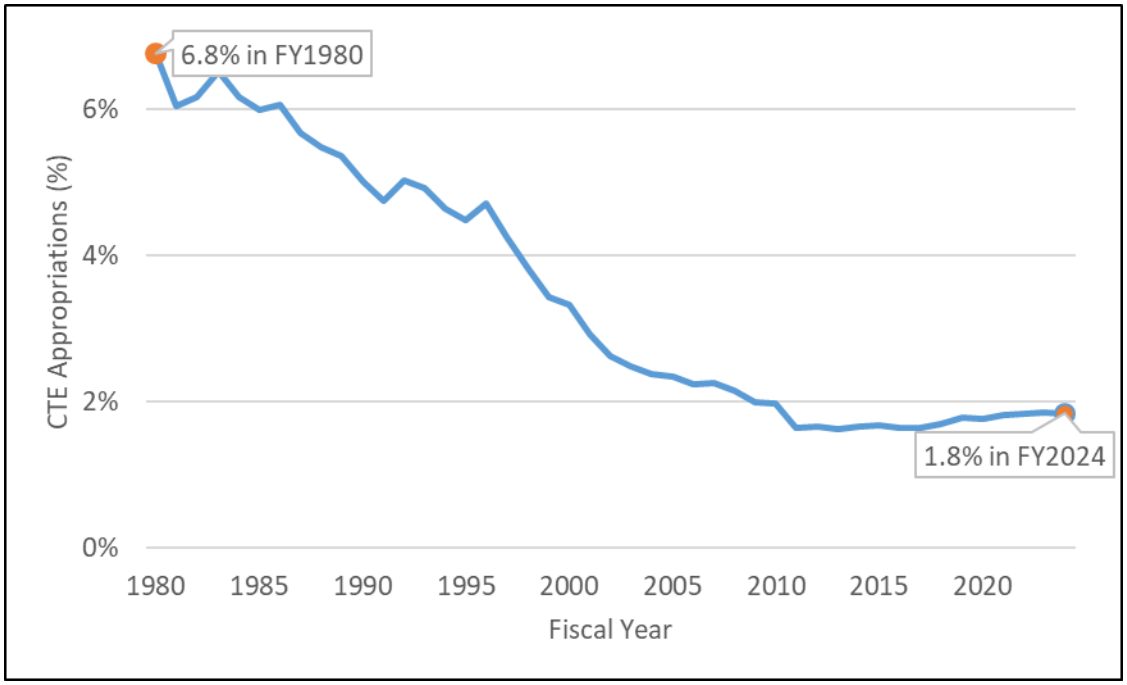
Source: Prepared by CRS based on U.S. Department of Education, Education Department Budget History Table: FY1980 - FY2021 at https://www2.ed.gov/about/overview/budget/history/index.html accessed January 22, 2026; and FY2022, FY2023, and FY2024 Explanatory Statements to the Departments of Labor Health and Human Services, Education, and Related Agencies Appropriations Acts. Inflation adjustments relied on U.S. Bureau of Labor Statistics, Consumer Price Index, Historical CPI-U, December 2025, https://www.bls.gov/cpi/tables/supplemental-files/ (accessed January 22, 2026).

Notes: With exceptions, the FY2025 appropriations act generally provided that FY2025 funding would be for the same purposes, levels, and period of availability as was enacted in the FY2024 appropriations act. Actual FY2025 funding amounts have not been made public as of the cover date of this report.

As shown in **Figure 2**, the percentage of ED discretionary educational appropriations represented by CTE funding via Perkins V has also declined since 1980. Since 2010, the proportion of federal education funding represented by CTE has remained below 2% despite slight increases in recent years.

Figure 2. CTE Appropriations as an Overall Percentage of Discretionary Appropriations of the U.S. Department of Education

FY1980–FY2024



Source: Prepared by CRS based on U.S. Department of Education, Education Department Budget History Table: FY1980 - FY2021 at https://www2.ed.gov/about/overview/budget/history/index.html accessed January 22, 2026; and Department of Education, Budget Tables, FY2022-FY2024 Congressional Action at https://www.ed.gov/about/ed-overview/annual-performance-reports/budget/budget-tables?src=ct (accessed January 22, 2026).

Notes: With exceptions, the FY2025 appropriations act generally provided that FY2025 funding would be for the same purposes, levels, and period of availability as was enacted in the FY2024 appropriations act. Actual FY2025 funding amounts have not been made public as of the cover date of this report.

According to data from ED, nationwide CTE participation has changed from 7.6 million secondary students in 2007-2008 to 7.8 million in 2022-2023 and from 4.3 million postsecondary CTE participants in 2007-2008 to 3.3 million in 2022-2023.[12]According to the 2019 National Assessment of Educational Progress (NAEP) High School Transcript Study (HSTS), graduates earned 0.5 fewer CTE credits in 2019 compared to 1990 (3.3 and 3.8 credits, respectively). Declines in CTE credits earned were larger among Black and female graduates.[13]

Within the context of these national trends, this report serves as a CTE primer in order to support and inform discussion of workforce development.

Overview of CTE

CTE is commonly offered by high schools, area CTE centers, detention centers, community colleges, and trade (vocational or technical) schools, and by employers through apprenticeships and on-the-job training. Generally, CTE occupations require two years or less of postsecondary

[12] U.S. Department of Education, Perkins Collaborative Resource Network, Reports to Congress, at https://cte.ed.gov/accountability/reports-to-congress.

[13] 2019 NAEP High School Transcript Study (HSTS) Results; accessed March 28, 2022, at https://www.nationsreportcard.gov/hstsreport/#coursetaking_0_0_el.

education or training. CTE integrates academic knowledge with a practical or applied purpose, such as nursing, business administration, culinary arts, automotive maintenance, software programming, engineering technology, and cosmetology.

The scope of CTE coursework is organized into career clusters, programs of study, and career pathways to facilitate educational program design and effective use of resources and to foster alignment with business and industry.

Career Clusters, Programs of Study, and Career Pathways

Because of the breadth of subjects covered by CTE, practitioners have organized CTE into career clusters, programs of study, and career pathways to facilitate CTE program development and to help students understand related opportunities. Career clusters contain occupations that are in the same field and require similar skills. They were developed by ED and various stakeholders and have been used for over two decades.[14] Practitioners have developed a broad curriculum framework for academic and technical instruction around each career cluster to support the preparation of students for additional education, employment in a career area, or both.

There are 14 career clusters, which demonstrate the scope and breadth of CTE (see the **Appendix** for a full list and additional detail). For example, the agriculture career cluster concentrates on scientific advancements of agriscience, cultivation, processing, and distribution of agricultural products. Because even a single career cluster covers several areas, career clusters may be further disaggregated into programs of study and career pathways (see text box for statutory definitions).

Programs of study provide a coordinated, nonduplicative sequence of academic and technical content at the secondary and postsecondary level that incorporates state academic standards for secondary students and incorporates technical knowledge and skills aligned with local or state industry needs that progresses in specificity. In addition, programs of study have multiple entry and exit points that incorporate credentialing and culminate in the attainment of a recognized postsecondary credential.[15] (The **Appendix** includes examples of related programs of study for each career cluster.)

Career pathways provide education for success in additional secondary or postsecondary education, training aligned with local or state industry needs, counseling to support the achievement of the individual's education and career goals, and other services to accelerate educational and career advancement. In addition, career pathways enable students to attain a secondary school diploma (or its recognized equivalent) and a recognized postsecondary credential and enter or advance within a specific occupation or occupational cluster.[16]

[14] U.S. Department of Education, "Career Clusters—Cooperative Agreements; Notice Inviting Applications for New Awards for Fiscal Year (FY) 2001; Notice," 65 *Federal Register* 76523-76543, December 6, 2000. The framework was updated in 2024 by AdvanceCTE, https://careertech.org/resource/methodology-modernized-national-career-clusters-framework/.

[15] §3(41) of Perkins V.

[16] §3(7) of the Workforce Innovation and Opportunity Act (WIOA; P.L. 113-128).

Statutory Definitions of Programs of Study and Career Pathways

"The term 'program of study' means a coordinated, nonduplicative sequence of academic and technical content at the secondary and postsecondary level that—

(A) incorporates challenging State academic standards, including those adopted by a State under section 1111(b)(1) of the Elementary and Secondary Education Act of 1965;

(B) addresses both academic and technical knowledge and skills, including employability skills;

(C) is aligned with the needs of industries in the economy of the State, region, Tribal community, or local area;

(D) progresses in specificity (beginning with all aspects of an industry or career cluster and leading to more occupation-specific instruction);

(E) has multiple entry and exit points that incorporate credentialing; and

(F) culminates in the attainment of a recognized postsecondary credential."

20 U.S.C. §2302(41).

"The term 'career pathway' means a combination of rigorous and high-quality education, training, and other services that—

(A) aligns with the skill needs of industries in the economy of the State or regional economy involved;

(B) prepares an individual to be successful in any of a full range of secondary or postsecondary education options, including apprenticeships registered under the Act of August 16, 1937 (commonly known as the 'National Apprenticeship Act'; 50 Stat. 664, chapter 663; 29 U.S.C. 50 et seq.) (referred to individually in this Act as an "apprenticeship", except in section 3226 of this title);

(C) includes counseling to support an individual in achieving the individual's education and career goals;

(D) includes, as appropriate, education offered concurrently with and in the same context as workforce preparation activities and training for a specific occupation or occupational cluster;

(E) organizes education, training, and other services to meet the particular needs of an individual in a manner that accelerates the educational and career advancement of the individual to the extent practicable;

(F) enables an individual to attain a secondary school diploma or its recognized equivalent, and at least 1 recognized postsecondary credential; and

(G) helps an individual enter or advance within a specific occupation or occupational cluster."

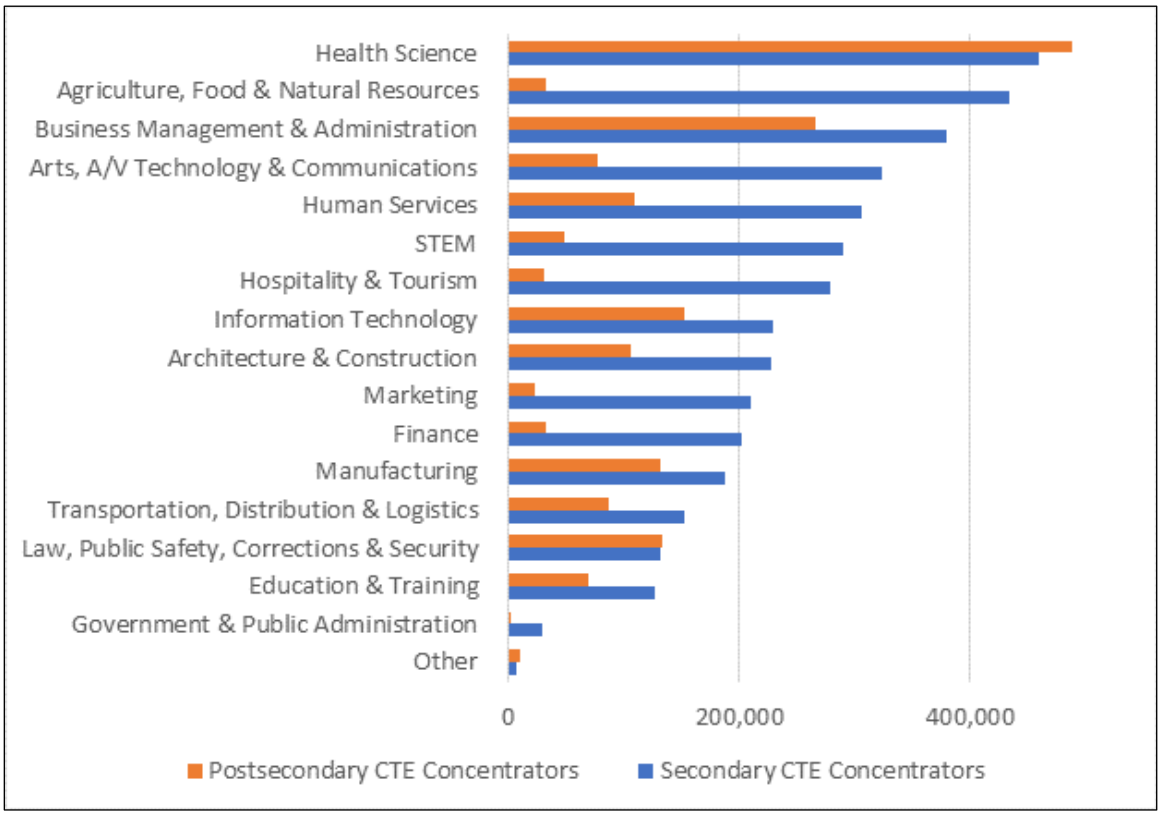
29 U.S.C. §3102(7).

CTE providers may focus on a limited number of career clusters in order to maximize resource efficiency. For example, schools and school districts use the career clusters and pathways to organize small learning communities and career academies because offering programs in some of the clusters, such as manufacturing, can be resource-intensive. Career guidance and academic counseling programs use the career clusters to help students and parents understand and explore broad career pathways within and among the clusters. Students can choose a career cluster in which to explore or specialize while gaining valuable, related skills.

Figure 3 depicts the different career clusters and the number of students concentrating (e.g., students who have taken a threshold number of high school courses or earned a threshold number of postsecondary credits) in those clusters at the secondary and postsecondary levels for CTE programs supported by Perkins V. The most popular cluster is health science at both the secondary and postsecondary levels.

Figure 3. Enrollment of CTE Concentrators by Career Cluster at the Secondary and Postsecondary Levels

Program Year 2022-2023



Source: Prepared by CRS using the U.S. Department of Education 2022-2023 National State Profile Summary, https://cte.ed.gov/accountability/reports-to-congress (accessed January 22, 2026).

Notes: These data are based on data reported to ED by states on the Consolidated Annual Report. The definitions of a "CTE concentrator" at the secondary and postsecondary levels are provided in the Strengthening Career and Technical Education for the 21st Century Act (Perkins V; P.L. 115-224). A concentrator at the secondary level is a student who has completed at least two courses in a single CTE program or program of study. A concentrator at the postsecondary level is a student who has earned at least 12 credits within a CTE program or a program of study, or completed a program that encompasses fewer than 12 credits or the equivalent in total. The data provided in this table include the 50 U.S. states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam.

The relative popularity of various career clusters has changed over time. According to ED's reports to Congress, at the secondary level from program year 2008-2009 to 2022-2023, health science, finance, hospitality and tourism, and STEM (science, technology, engineering, and mathematics), have grown in popularity, while the largest declines are in business management and administration, information technology, and human services. At the postsecondary level from program year 2008-2009 to 2022-2023, information technology has grown in popularity, while the largest declines are in education and training and business management and administration.[17]

[17] U.S. Department of Education, *Carl D. Perkins Career and Technical Education Act of 2006, Report to Congress on State Performance Program Year 2009-10* and *2022-2023 National State Profile Summary*.

Recognized Postsecondary Credentials

CTE programs of study and career pathways at the secondary and postsecondary levels are expected to lead to recognized postsecondary credentials. "Within the context of education, workforce development, and employment and training for the labor market," DOL defines "the term credential [as] a verification of qualification or competence issued to an individual by a third party with the relevant authority or jurisdiction to issue such credentials (such as an accredited educational institution, an industry recognized association, or an occupational association or professional society)."[18] A recognized postsecondary credential is an industry-recognized certificate or certification (IRC), a certificate of completion of an apprenticeship, a license recognized by the state or federal government, or an associate or baccalaureate degree.[19]

IRCs are awarded to individuals who demonstrate skills, experience, knowledge, and/or a set of competencies that are recognized as necessary or desired for a particular occupation by the relevant industry. Some IRCs are required in order to work in an occupation, while others may increase income or employability in the occupation. Examples of IRCs include heating, ventilation, and air conditioning (HVAC) repair; programming in computer languages such as Java; heavy machinery operation; and phlebotomy.

Career and Technical Student Organizations (CTSOs)

CTSOs are nonprofit organizations that often provide co-curricular programs to give students practical experience, instruction, and opportunities to network with industry and business leaders. The organizations are generally led by national officers through state and local chapters. Local chapters are often advised by a local CTE teacher.

In 1950, Congress chartered one of these CTSOs, the Future Farmers of America (now known as the FFA).[20] If requested by the board of directors, the Secretary of Education may make ED personnel, services, and facilities available to promote, administer, or assist in the administration of the activities of the FFA.[21] Other major CTSOs that specifically relate to one or more of the 14 career clusters include the following:

- Business Professionals of America (BPA);
- DECA (formerly Distributive Education Clubs of America);
- Future Business Leaders of America—Phi Beta Lambda;
- Family, Career, and Community Leaders of America (FCCLA);
- HOSA-Future Health Professionals;
- SkillsUSA; and
- the Technology Student Association (TSA).[22]

[18] U.S. Department of Labor, Employment and Training Administration, *Increasing Credential, Degree, and Certificate Attainment by Participants of the Public Workforce System*, TEGL No. 15-10, Washington, DC, December 15, 2010, p. Attachment 2, http://wdr.doleta.gov/directives/attach/TEGL15-10.pdf.

[19] §3(52) of WIOA.

[20] See P.L. 81-740.

[21] 36 U.S.C. §70901 et seq.

[22] List is according to the National Coordinating Council for Career and Technical Student Organizations (NCC-CTSO), http://www.ctsos.org.

CTE at the Secondary Level

Secondary school level CTE provides students with opportunities to explore a career while learning a set of technical and employability skills that integrate into or complement their academic studies. Secondary schools often offer occupational and non-occupational CTE, the latter of which includes family and consumer sciences education and general labor market preparation. Family and consumer sciences education prepares students for roles outside the paid labor market, while general labor market preparation teaches skills such as word processing and introductory technology skills. Occupational CTE at the secondary level prepares individuals for specific fields and may prepare individuals for immediate labor market entry after high school completion, or postsecondary education may be required before they are prepared to enter the labor market. CTE is seldom offered at the elementary school level.

Secondary CTE providers include

- public and private comprehensive high schools,[23] including Bureau of Indian Education (BIE) schools;
- career academies that are within comprehensive high schools and organize a multiyear academic and CTE curriculum around a particular career theme;
- area CTE schools, which are specialized schools or departments of secondary or postsecondary schools, used exclusively or principally for the provision of CTE;
- technical and vocational high schools that teach core academics in the context of specific career pathways;
- juvenile justice facilities; and
- cooperative programs with technical or community colleges.

CTE was offered by the overwhelming majority (98%) of public school districts according to a nationally representative survey conducted in 2017,[24] but the delivery models for these programs varied widely. Most (83%) CTE programs were offered at the district's regular comprehensive high school, while 12% of districts offered programs at CTE-focused high schools that students attended full-time. CTE program opportunities also varied by geography. For example, urban districts were more likely to offer work-based learning than rural districts.

According to the most recent available data, the vast majority (85%) of 2019 public and private high school graduates attained at least one CTE unit.[25] American Indian/Alaska Native students were the racial/ethnic group most likely to participate (87%), while Asian students were the least likely to participate (77%). Female students were less likely to participate than male students (82% compared to 87%). Students enrolled in schools located in rural areas (92%) had higher participation rates than those in cities (80%). Though most students participated in CTE, 37% decided to concentrate in CTE. American Indians/Alaska Native students were the racial/ethnic group most likely to concentrate (45%), while Asian students were the least likely to concentrate

[23] Comprehensive high schools are the most common type of high school. They generally focus on academics but maintain a flexible and diverse curriculum to accommodate the needs and interests of most students.

[24] The public school data were based on the 2017 survey reported in L. Gray, L. Lewis, and J. Ralph, *Career and Technical Education in Public School Districts: 2016-2017;* National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education, Washington, DC, 2018.

[25] U.S. Department of Education, *Digest of Education Statistics 2022*, Table 225.25. A "unit" refers to a Carnegie unit, which is a standard of measurement that represents one credit for the completion of a one-year course.

(27%). Female students were less likely to concentrate than male students (33% compared to 40%).[26]

CTE in Postsecondary Education

CTE at the postsecondary level generally consists of subbaccalaureate postsecondary programs designed to impart relevant knowledge and skills that relate to the requirements of specific occupations or careers. CTE students may pursue an associate's degree, an IRC or other certificate, noncredit courses to improve knowledge and skills or signal knowledge to employers, noncredit training customized for a particular employer, or continuing education credits to maintain licensure or certification.

Postsecondary CTE providers include

- technical colleges (public and private less-than-two-year);
- community colleges (public two-year) and private two-year colleges;
- public and private four-year universities;
- employers, labor organizations, and industry groups through pre-apprenticeships, apprenticeships, and other training programs;
- regional training centers (RTCs), which are public or nonprofit centers coordinating workforce development, education, and training;
- area CTE schools;
- adult workforce education centers, which provide customizable, labor market-driven, postsecondary workforce education and training services; and
- detention centers and correctional facilities.

Some CTE programs are terminal, while others may be used as a stepping stone to obtain a more advanced credential (i.e., stackable credentials). While a terminal CTE program is designed to lead directly to employment, many highly specialized courses are not transferable for credit toward a more advanced credential.[27] In contrast, DOL defines a *stackable credential* as "part of a sequence of credentials that can be accumulated over time to build up an individual's qualifications and help them to move along a career pathway or up a career ladder to different and potentially higher-paying jobs."[28] For example, an associate's degree in respiratory therapy can lead to employment as a respiratory therapist, or it may be transferred toward a bachelor's degree in respiratory therapy.[29]

Figure 4 presents the top 10 most popular subject areas in which CTE graduates received associate's degrees or subbaccalaureate certificates from IHEs that participated in Higher

[26] U.S. Department of Education, *Bridging the Skills Gap: Career and Technical Education in High School*, September 2019, accessed March 28, 2022, at https://www2.ed.gov/datastory/cte/index.html#WHATISCTE.

[27] The ability to transfer courses is determined by the school based on curricula. Unless one school specifically states that certain courses from certain schools are transferrable within specified limits, there is no guarantee that a course is transferable to another program.

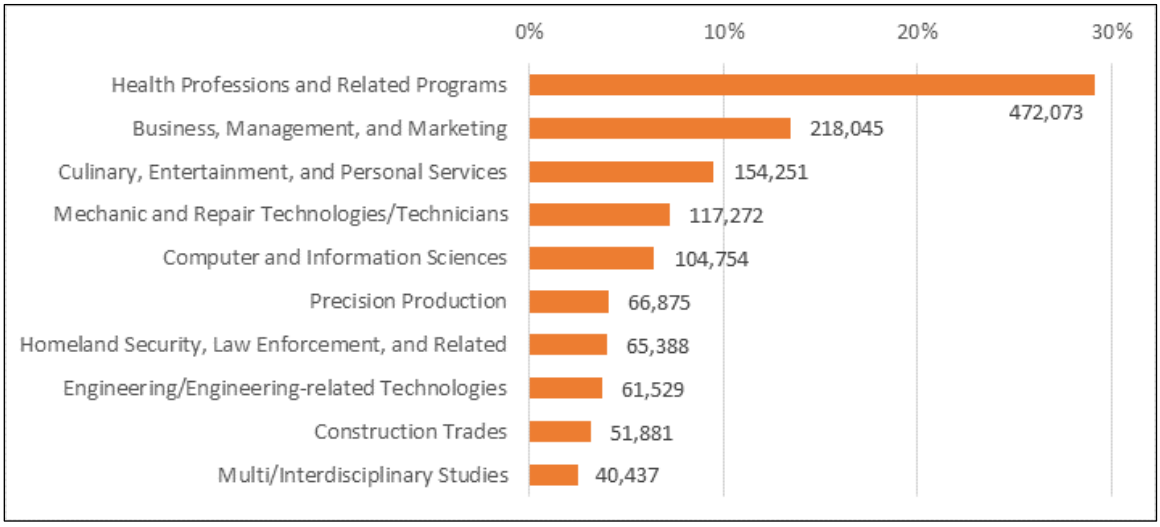
[28] Assistant Secretary Jane Oates, *Training and Employment Guidance Letter No. 15-10*, U.S. Department of Labor, Employment and Training Administration, Advisory System, TEGL 15-10, Washington, DC, December 15, 2010, http://wdr.doleta.gov/directives/attach/TEGL15-10.pdf.

[29] In one study of students in Virginia, earning two or more stackable community college certificates or degrees increased employment by four percentage points and increased quarterly wages by 4%. See Katharine Meyer, Kelli A. Bird, and Benjamin L. Castleman. "Stacking the Deck for Employment Success: Labor Market Returns to Stackable Credentials." EdWorking Paper 20-317 (2020), at https://www.edworkingpapers.com/sites/default/files/ai20-317.pdf.

Education Act (HEA) Title IV federal student financial aid programs during the 2023-2024 academic year.[30] The figure does not include subbaccalaureate certificates earned at other educational institutions or training establishments. The largest proportion (almost 30%) of graduates completed programs in the health professions and related fields, followed by the 13% of graduates completing programs in business, management, and marketing. These 10 fields represented 83% of all associate's degrees and certificates awarded.

Figure 4. Percentage of Associate's Degrees and Subbaccalaureate Certificates Awarded in the 10 Most Popular Subject Areas, by Classification of Instructional Programs (CIP) Codes

Degrees and Certificates Awarded from July 1, 2023, to June 30, 2024



Source: Figure prepared by CRS based on data downloaded from the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS) on institutions in the 50 states, the District of Columbia, and Puerto Rico that participated in the federal student aid programs authorized by Title IV of the Higher Education Act (HEA), as amended.

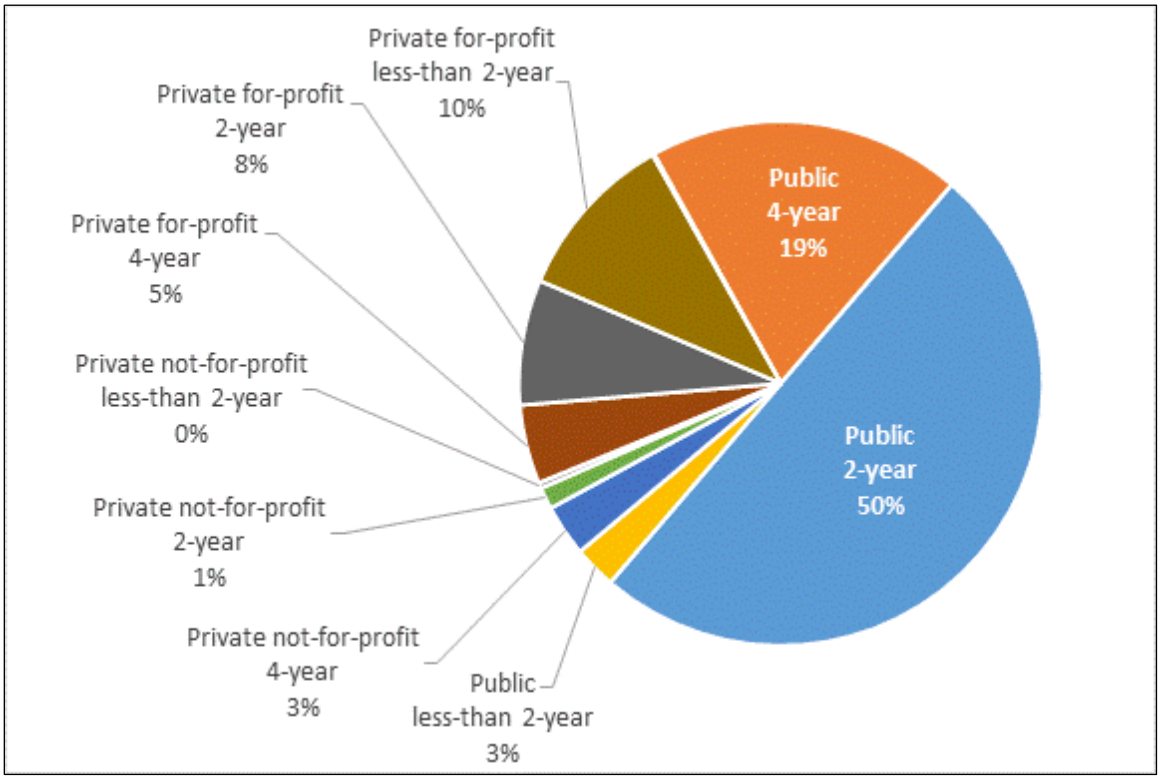
Notes: Numbers indicate the total numbers of degrees and certificates awarded. The following CIP codes that represent non-CTE areas were excluded from the graph: Liberal Arts and Sciences—General Studies and Humanities; Social Sciences; English Language and Literature/Letters; Theology and Religious Vocations; History; Area, Ethnic, Cultural, Gender, and Group Studies; Foreign Languages, Literatures, and Linguistics; and Philosophy and Religious Studies. Precision production trades include occupations such as woodworking; heating, ventilation, and air conditioning (HVAC) services; and metalworking. The data do not reflect completions at institutions that are not Title IV-participating and are distinct from the data presented in **Figure 3**, which depicts initial enrollment in CTE.

Figure 5 shows the types of IHEs at which individuals completed CTE programs during the 2023-2024 academic year. Individuals who completed programs through trade schools, apprenticeships, RTCs, workforce education centers, correctional facilities, and other postsecondary institutions are not reflected in the figure. Over two-thirds (69%) of CTE associate's degrees and subbaccalaureate certificates were awarded by public two- or four-year institutions. For-profit institutions (either four-year, two-year, or less-than-two-year) accounted for 23% of awards.

[30] The federal student financial aid programs are authorized by Title IV of the HEA, as amended, and include such programs as federal Pell Grants and Direct Loans. For more information, see CRS In Focus IF12780, *Federal Student Aid Authorized by Title IV of the Higher Education Act*.

Figure 5. Percentage of CTE Program Completions for Associate's Degrees and Subbaccalaureate Certificates, by Institutional Sector

Degrees and Certificates Awarded from July 1, 2023, to June 30, 2024



Source: Figure prepared by CRS based on data downloaded from the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS) on institutions in the 50 states, the District of Columbia, and Puerto Rico that participated in the federal student aid programs authorized by Title IV of the Higher Education Act (HEA), as amended

Notes: Percentages indicate the percentage of the total number of CTE associate's degrees and subbaccalaureate certificates awarded. The following CIP codes that represent non-CTE areas were excluded from the graph: Liberal Arts and Sciences—General Studies and Humanities; Social Sciences; English Language and Literature/Letters; Theology and Religious Vocations; History; Area, Ethnic, Cultural, Gender, and Group Studies; Foreign Languages, Literatures, and Linguistics; and Philosophy and Religious Studies. The data do not reflect completions at institutions that are not Title IV-participating and are distinct from the data presented in **Figure 3**, which depicts initial enrollment in CTE.

CTE Program Challenges

This section discusses challenges that CTE program providers have experienced with program delivery, increasing student access, and replicating evidence-based practices, as well as resources that have been used to address these challenges.[31]

[31] This section relies on information from two reports produced by the General Accountability Office (GAO): GAO, *Career and Technical Education: Perspectives on Program Strategies and Challenges*, GAO-22-104544, March 2022; and GAO, *STEM Education: Selected Federal Initiatives, Challenges, and Approaches to Supporting Rural Populations*, GAO-25-107371, July 2025.

Delivery, Access, and Replication Challenges

In recent years, the General Accountability Office (GAO) has conducted interviews with stakeholders and reviewed federal initiatives to determine existing challenges with CTE at both the secondary and postsecondary levels. These included challenges with providers delivering CTE programs, students accessing these programs, and states and providers replicating best practices in the programs.

Delivery challenges at both the secondary and postsecondary levels included

- securing adequate funding, especially for leading edge technology and replicating effective program models[32];
- staffing challenges and limited access to resources (e.g., broadband, materials, and career exploration experiences) in rural schools with small student populations and budgets;
- difficulty recruiting diverse teachers with experience in hard-to-staff subjects such as computer science and math;
- retaining industry-experienced CTE teachers once hired, as they often earn lower wages while also needing training to support the transition from industry to the classroom; and
- negative perceptions of CTE, specifically that CTE is only for students who underperform academically, or that CTE will lead to low-wage jobs.

Access challenges included

- a lack of transportation for work-based learning[33];
- language barriers, such as state websites only being available in English;
- a lack of support services such as childcare;
- inflexible scheduling[34];
- program screening criteria, such as tests that act as barriers to enrollment; and
- financial challenges, such as accessing federal financial aid for postsecondary nondegree education.

Replication challenges centered on

- limitations with long-term outcome data, making it difficult to examine whether students who progress through a career pathway eventually work in that field; and
- limited information on evidence-based strategies, such as not knowing how many hours a student should participate in work-based learning in order to have a quality experience.

[32] One such model is Washington State's Integrated Basic Education Skills and Training (I-BEST) program, which allows adults to complete their training program faster and was found to be effective at increasing credential completion, earnings, and employment, according to three rigorous studies that meet the standards of the What Works Clearinghouse. For more information, see https://ies.ed.gov/ncee/wwc/InterventionReport/706.

[33] One school district administrator used Perkins V funding to hire a work-based learning coordinator to help students find transportation. For more information on Perkins V, see CRS Report R47071, *Strengthening Career and Technical Education for the 21st Century Act (Perkins V): A Primer*.

[34] According to stakeholders, online instruction provided greater flexibility to students with scheduling and transportation issues.

Some state and CTE program officials struggled to link data across state systems in order to follow students through their education and career trajectories. Program providers wanted more information on evidence-based strategies to reach specific student populations, including students with disabilities.[35] Rigorous studies on such topics are limited.[36]

CTE Teacher Staffing Shortages

There is little reliable data on the extent of CTE teacher shortages, as states are only required to identify areas for which there are shortages to ED and do not have to specify the number of open positions.[37] Furthermore, rather than reporting a teacher shortage, a CTE provider may instead change its program offerings in response to teacher vacancies by eliminating programs of study.

Advance CTE,[38] the longest-standing national nonprofit organization that represents state CTE directors and state leaders responsible for secondary and postsecondary CTE, conducted an annual survey of its members on the issue of CTE teacher shortages from 2008 to 2017 (this survey represents the most recent available data). The survey found the largest reported shortages in science, technology, engineering, and mathematics (STEM), health sciences, and manufacturing, with over 50% of state CTE directors reporting shortages in these areas every year. Similar to limitations with official ED data, the survey did not ask directors to quantify the number of vacant positions.

ED has pursued a variety of strategies to address teacher shortages, though these initiatives have not specifically targeted CTE subject areas.[39] Some states provide higher salaries or bonuses for teachers of courses for which there is a shortage. Some teachers may cover multiple courses for which there is a shortage, regardless of their expertise.

Resources and Strategies Used to Address Challenges

The federal government and educational stakeholders have adopted practices to address the above challenges with delivery, access, and replication.

According to a 2022 GAO report,[40] key ED grants that CTE providers reported using included

- Adult Education State Grants[41];

[35] One longitudinal Washington State study with a sample of 5,133 10th grade students who received special education services during either the 2009-2010 or 2010-2011 school years found that those who earned four or more CTE credits in high school were 3%-4% more likely to be graduate from high school, 3%-4% more likely to be employed after graduation, and 6% more likely to attend college than those who did not concentrate in CTE (defined as earning four or more credits). See Roddy J. Theobald, et al. "Career and technical education, inclusion, and postsecondary outcomes for students with learning disabilities." *Journal of Learning Disabilities 52*.2 (2019): 109-119.

[36] According to ED officials cited in GAO, *Career and Technical Education: Perspectives on Program Strategies and Challenges*, GAO-22-104544, March 2022.

[37] Shortage areas nationally and by state can be accessed at https://tsa.ed.gov/#/home/.

[38] More information is available at https://careertech.org.

[39] For more information, see https://www.ed.gov/news/press-releases/us-education-secretary-miguel-cardona-calls-states-districts-higher-ed-institutions-address-nationwide-teacher-shortage-and-bolster-student-recovery-american-rescue-plan-funds.

[40] GAO, *Career and Technical Education: Perspectives on Program Strategies and Challenges*, GAO-22-104544, March 2022.

[41] These grants can be used for integrated education and training that includes literacy activities and workforce training. For more information, see CRS Report R43789, *Adult Education and Family Literacy Act: Major Statutory Provisions*.

- Student Support and Academic Enrichment Grants[42];
- Supporting Effective Instruction State Grants[43]; and
- Perkins Innovation and Modernization Grants.[44]

Technical assistance to states and CTE program providers includes resources through ED's Perkins Collaborative Resource Network (PCRN),[45] such as webinars on different CTE topics. The PCRN is a virtual hub for CTE programs, with a learning center, reports, and other resources to assist with implementation of CTE programs. For state policymakers, the PCRN offers information on other states' plans and outcomes via the Perkins Data Explorer as well as strategies for collecting data on work-based learning opportunities.

Partnerships may bolster educational programs:

- Federal agency collaborations are used to share information and innovative practices and may develop resources and provide technical assistance to stakeholders in the field.[46]
- Rural schools collaborate to share resources such as travelling buses with high-speed internet access or grant writing staff.

To address the limitations of existing CTE research, particularly research focused on evidence-based strategies, ED's Institute of Education Sciences is undertaking new studies of work-based learning,[47] career development, and counseling strategies, with publication expected by 2026.[48] This work is to be included as part of a national evaluation of CTE.[49]

To address CTE teacher shortages, federal agencies and states have initiated various efforts to recruit, train, and retain qualified teaching staff. Federal funding can be leveraged for these

[42] School districts can use these grants for a variety of activities, including career preparation activities. For more information, see CRS In Focus IF10910, *Student Support and Academic Enrichment (SSAE) Grants*.

[43] School districts can use these grants to provide professional development for teachers on strategies to integrate academic content, CTE, and work-based learning. For more information on supporting effective instruction, see CRS Report R45977, *The Elementary and Secondary Education Act (ESEA), as Amended by the Every Student Succeeds Act (ESSA): A Primer*.

[44] For more information, see CRS Report R47071, *Strengthening Career and Technical Education for the 21st Century Act (Perkins V): A Primer*.

[45] For more information, see https://cte.ed.gov.

[46] For example, ED and DOL's Employment and Training Administration staff regularly discuss activities related to career pathways to support youth apprenticeships and other workforce initiatives; and ED, U.S. Department of Homeland Security, the National Institute of Standards and Technology, and the National Security Agency have developed cybersecurity training via a professional development initiative for secondary CTE teachers.

[47] Work-based learning has been linked to higher wages as well as greater career satisfaction according to analysis from Strada Education Network; accessed April 25, 2022, at https://cci.stradaeducation.org/pv-release-march-16-2022/. This analysis relies on the Baccalaureate and Beyond Longitudinal Study (B&B) using data from a cohort of over 10,000 students who completed their bachelor's degree in 2015–2016 and were followed in 2017 and 2020. B&B is a nationally representative longitudinal study of students who completed the requirements for a bachelor's degree in a given academic year. For more information, see https://nces.ed.gov/surveys/b&b/.

[48] For more information, see https://ies.ed.gov/use-work/evaluations/national-evaluation-career-and-technical-education-under-perkins-v-nectep,

[49] GAO, *Career and Technical Education: Perspectives on Program Strategies and Challenges*, GAO-22-104544, March 2022.

purposes.[50] In addition, federal agencies, alone and in collaboration, develop professional development resources, including virtual resources.

Benefits of CTE Credentials

This section describes the benefits to students of participating in and completing CTE programs. The first section describes broad education and labor market returns with a discussion of the median annual wages for occupations that require a postsecondary CTE nondegree award, followed by the latest evidence on wage returns to nondegree certificates. The second section discusses the findings of state-level secondary studies that track students over time.

Education, Wages, and Employment

Earnings generally increase with educational attainment. There is a robust evidence base for the economic returns of earning a bachelor's degree.[51] A bachelor's degree holder earns in excess of 1 million dollars more on average over their lifetime compared to a high school diploma or GED holder.[52] Although wages are substantially lower for nondegree certificate holders than for those with bachelor's degrees or higher, wages for nondegree certificate holders are still higher than wages for high school degree or GED holders.

According to the most recent available data from the Bureau of Labor Statistics (BLS), higher education continues to be related to higher average pay and a reduction in unemployment. In 2024, workers age 25 and over who attained less than a high school diploma had the lowest median weekly earnings ($738) and the highest unemployment rate (6.2%). Workers with some college, such as a nondegree certificate, made $282 more weekly on average and had an unemployment rate that was 2.4 percentage points lower than those with only a high school diploma, as shown in **Figure 6**.

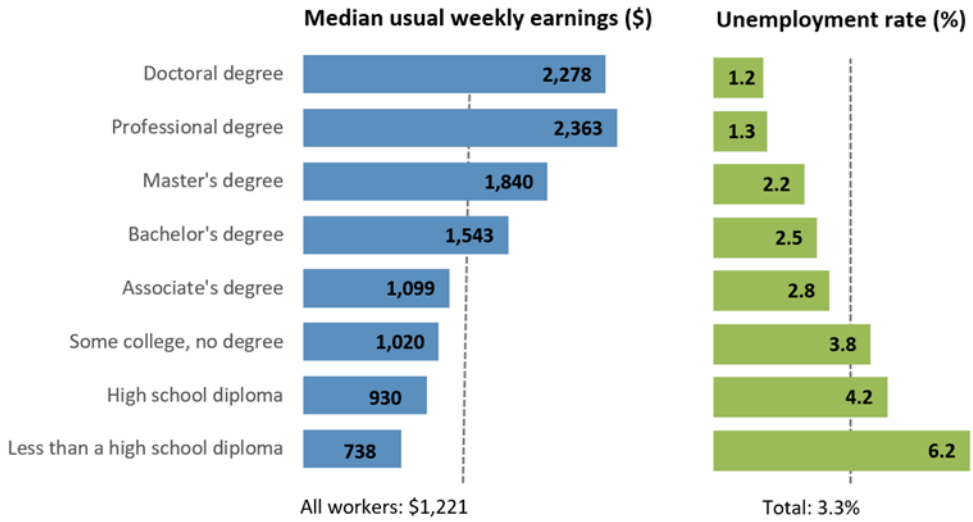
[50] For example, Perkins V funds may be used for professional development and instructional supports. For more information on allowable activities under Perkins V, see CRS Report R47071, *Strengthening Career and Technical Education for the 21st Century Act (Perkins V): A Primer*.

[51] See, for example, the usual weekly earnings by educational attainment at https://www.bls.gov/charts/usual-weekly-earnings/usual-weekly-earnings-by-quartiles-and-selected-deciles-by-education.htm.

[52] Anthony P. Carnevale et al., Learning and Earning by Degrees: Gains in College Degree Attainment Have Enriched the Nation and Every State, but Racial and Gender Inequality Persists, (Washington, DC: Georgetown University Center on Education and the Workforce, 2024), p. 22., http://cew.georgetown.edu/AttainmentGains.

Figure 6. Earnings and Unemployment Rates by Educational Attainment, 2024

Median Usual Weekly Earnings and Unemployment Rate



Source: U.S. Bureau of Labor Statistics, Current Population Survey, https://www.bls.gov/emp/chart-unemployment-earnings-education.htm as of January 26, 2026.

Notes: Data are for persons age 25 and over. Earnings are for full-time wage and salary workers.

People with less educational attainment can earn more than those with higher levels of educational attainment. For instance, 23.1% of those with only some college, such as a nondegree certificate, earned more than the median bachelor's degree holder, and 28.2% of those with associate's degrees earned more than the median bachelor's degree holder.[53]

Proponents of CTE as occupational preparation point to the high wages and growth of some CTE occupations, which can exceed the wages of some bachelor's degree holders. Proponents of CTE also note that not everyone wants to or has the capacity to pursue a bachelor's degree. On the other hand, others point to the downsides of earning nontransferable CTE credits, particularly if students earn credits in lower wage or non-growth occupations.

Median Wages for Postsecondary Nondegree Recipients

Though the median wage returns to bachelor's degrees—whether in CTE or a non-CTE field—are higher than sub-baccalaureate degrees, certificates may allow graduates to realize positive labor market returns at a fraction of the cost, and some can be completed within a relatively short time frame. These returns may be particularly robust and durable over time in fields with high growth potential and high median wages, though not all of these fields employ high numbers of workers.

The Bureau of Labor Statistics provides employment data for occupations that typically require a postsecondary nondegree award and provide median annual wages, as shown in **Table 1**. The fastest-growing among such occupations include several in the health science career cluster (e.g., psychiatric technicians and ophthalmic medical technicians) as well as in human services (e.g., massage therapists and makeup artists, theatrical and performance). The largest projected growth

[53] According to the Georgetown University Center on Education and the Workforce analysis of the U.S. Census Bureau, American Community Survey (ACS), 2009-2019, https://cew.georgetown.edu/cew-reports/the-college-payoff/.

in job openings, in terms of percentage change, is for wind turbine service technicians (49.9%), while the highest median wage among these occupations is earned by avionics technicians ($81,390). Both of these occupations employ a relatively small number of workers, however, and the fields with the largest numbers of workers with CTE nondegree credentials (i.e., medical assistants) have median annual wages below $45,000.

Table 1. Median Wages for Occupations Requiring a Postsecondary Nondegree Award and Estimated to Have the Highest Employment Growth from 2024 to 2034

(employment numbers in thousands; sorted by percentage change)

Occupation	Employment, 2024	Projected Employment, 2034	Projected Employment Change, 2024 to 2034	Median Annual Wage, 2024
Wind turbine service technicians	13.6	20.5	49.9%	$62,580
Psychiatric technicians	144.5	173.3	20.0%	$42,590
Ophthalmic medical technicians	78.8	94.4	19.8%	$44,080
Massage therapists	168.0	193.9	15.4%	$57,950
Computer numerically controlled tool programmers	28.3	31.9	12.8%	$65,670
Medical assistants	811.0	912.2	12.5%	$44,200
Commercial divers	4.2	4.5	8.5%	$61,130
Avionics technicians	21.4	23.1	8.2%	$81,390
Heating, air conditioning, and refrigeration mechanics and installers	425.2	459.7	8.1%	$59,810
Makeup artists, theatrical and performance	7.0	7.6	8.1%	$50,280

Source: Employment Projections program, U.S. Bureau of Labor Statistics, January 26, 2026, https://www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm.

Notes: Wage data are from the Occupational Employment and Wage Statistics program, U.S. Bureau of Labor Statistics. These data cover non-farm wage and salary workers and do not cover the self-employed, owners and partners in unincorporated firms, or household workers. Median wages are for all workers in a given occupational category.

Nondegree Certificate Wage Returns

Compared to the robust evidence on the wage returns of bachelor's degrees, there are fewer rigorous studies on the wage returns of nondegree certificates. Findings vary widely depending on institutional sector, geographic area, program length, and program of study. Overall, vocational certificates are more sensitive to economic fluctuations across industries and occupations than associate's or bachelor's degrees.[54] Considering these wide variations, it is difficult to draw any conclusions about the wage returns of certificates nationally without examining specific programs of study and local labor market conditions.

A synthesis of findings across eight studies conducted in Kentucky, Michigan, North Carolina, California, Ohio, Virginia, Washington, and Arkansas revealed an average annual earnings gain of

[54] According to Clive R. Belfield and Thomas R. Bailey, "The Labor Market Value of Higher Education: Now and in the Future," *Higher Education: Handbook of Theory and Research*, 2019, pp. 373-414.

$2,120 for male students and $2,960 for female students who completed any certificate program. However, different types of certificates in different states yielded different returns. The length of certificate programs in these studies also varied widely, making it difficult to generalize across certificate programs and types.[55] For example, one of the above studies conducted in Virginia and North Carolina on first-time community college students from 2006-2009 (comprising 165,884 students in North Carolina and 67,735 students in Virginia) reported long-term certificates (i.e., one year or more of full-time study) yielded a $3,812 annual increase in earnings in North Carolina and $800 in Virginia.

A recent report analyzing students who received a for-credit certificate from a New Mexico higher education institution between 2016 and 2023 reinforced the variability in outcomes for CTE certificates. Individuals with one for-credit certificate in (1) culinary, entertainment, and personal services or (2) business, management, and marketing witnessed a median increase in their wages compared to their pre-enrollment wages of less than $3,000 annually compared to over $17,000 for education and over $27,000 for homeland security, law enforcement, and firefighting. Stacking certificates as part of a progression to a terminal certificate or degree resulted in larger wage gains. [56]

For-Profit Institutions Versus Public Institutions

Findings are more consistent when directly comparing for-profit to nonprofit certificate-granting institutions as "the vast majority of studies on employment and earnings gains for students in for-profits find worse outcomes for for-profit students relative to similar students in other sectors," particularly relative to community colleges.[57]

One often-cited 2019 study that included nearly all federally aided students who exited a for-profit postsecondary institution between 2006 and 2008, as well as nondegree students in other sectors, found that certificate-seeking students at for-profit institutions were 1.5% less likely to be employed than certificate-seeking students at public institutions.[58] Those who were employed had 11% lower earnings than students who attended public institutions. These results incorporated all certificate-seeking students, including students pursuing non-CTE certificates and those who dropped out.

The top 10 most popular fields, representing 83.7% of all enrollment at for-profit institutions, were in CTE. Wage returns for those pursuing health diagnostic certificates at for-profit institutions were the lowest among these fields of study,[59] resulting in $6,021 less in annual earnings compared to health diagnostic certificate earners at public institutions. Dental support certificate earners earned $3,736 less. Among the top 10 most popular fields, higher earnings at for-profit institutions compared to those earned at public institutions were experienced only by

[55] Clive R. Belfield and Thomas R. Bailey, "The Labor Market Value of Higher Education: Now and in the Future," *Higher Education: Handbook of Theory and Research*, 2019, pp. 373-414.

[56] New Mexico Legislative Finance Committee, *Postsecondary Certificates*, Program Evaluation No. 24-04, September 17, 2024, pp. 15-20, https://www.nmlegis.gov/Entity/LFC/Documents/Program_Evaluation_Reports/Program%20Evaluation%20Postsecondary%20Certificates.pdf.

[57] Stephanie Riegg Cellini, "For-Profit Colleges in the United States: Insights from Two Decades of Research," Annenberg Institute at Brown University, 2021, https://edworkingpapers.com/sites/default/files/ai21-398.pdf.

[58] Stephanie Riegg Cellini and Nicholas Turner, "Gainfully Employed? Assessing the Employment and Earnings of For-Profit College Students Using Administrative Data," *Journal of Human Resources*, vol. 54(2), 2019, pp. 342-370.

[59] The top 10 fields for certificate study in for-profit schools were health and medical assisting, cosmetology, health administration, vehicle maintenance, therapeutic services, dental support, practical nursing, health diagnostics, culinary arts, and HVAC repair.

students in cosmetology, who saw a $271 annual wage increase. Beyond this exception, wage returns were higher for students who attended public certificate-granting institutions.

State-Level Studies of CTE in Secondary Education

This section briefly reviews the findings of selected states that have leveraged longitudinal data systems to examine the effects of CTE over time. The federal government has incentivized the creation of state longitudinal data systems through two grant programs: the Workforce Data Quality Initiative and the Statewide Longitudinal Data Systems Grant Program.[60] The goal of these grants is to collect and analyze the data necessary determine the impact and efficacy of CTE investments over time.

This section is not a comprehensive literature review; instead, it focuses on studies with large sample sizes that have been published since 2016. There are limitations to the estimates presented because students typically are not randomly assigned to enroll in CTE programs, and studies do not typically employ experimental designs. The results may not be replicable under differing circumstances with different students. Furthermore, the definition of *CTE concentrator* varies across these studies.

Overall, these studies find positive relationships between CTE concentration and graduation, enrollment, employment, and earnings outcomes, although the results are not always particularly large in magnitude. In some cases, positive outcomes are limited to male students only.

Arkansas

Arkansas provides an interesting case study of CTE policies because of statewide changes made effective in 2014 that require all high school students to take six units of "career focus" coursework to graduate, which they can fulfill with CTE. The number of students taking CTE increased in anticipation of the 2014 requirement; most students (89%) across the three cohorts that graduated in 2012, 2013, and 2014 took at least one CTE course in high school.

An examination of over 100,000 9th grade students across these three cohorts[61] revealed CTE concentrators[62] were 21% more likely to graduate from high school, 1% more likely to enroll in a two-year college, 1% more likely to be employed, and better compensated by $45 per quarter in the year after high school compared to comparison groups of similar non-concentrators. Male students saw slightly larger wage benefits than female students—a difference of $89 quarterly.[63]

[60] For more information, see CRS Report R43398, *The Education Sciences Reform Act*; and https://www.dol.gov/agencies/eta/performance/wdqi.

[61] These students graduated in 2012, 2013, and 2014, as noted above, and were followed until one year after their anticipated high school graduation.

[62] "CTE concentrator" was defined in this study as earning three or more credits in a formal, coordinated program of study.

[63] Shaun M. Dougherty, *Career and Technical Education in High School: Does It Improve Student Outcomes?*, Thomas B. Fordham Institute, April 2016, https://fordhaminstitute.org/national/research/career-and-technical-education-high-school-does-it-improve-student-outcomes. Estimates are of the effects of concentrating, compared to otherwise identical students based on characteristics such as gender, race/ethnicity, free lunch eligibility, disability, and English language learner status, as well as measures of standardized test performance and attendance in the 8th grade, who were in the similar income group, and who took the same number of courses but did not concentrate in a single program of study.

Connecticut

Similar to Arkansas, Connecticut's longitudinal data system enabled the tracking of nearly all (95%) 8th graders who applied to a technical high school from 2006 to 2014. The 16 stand-alone CTE high schools within the Connecticut Technical High School System (CTHSS) use a strict cutoff score when deciding which applicants to admit. This scoring process allowed researchers to compare admitted students with scores just above the threshold to non-admitted students whose scores were just below it.

Among 57,658 8th grade students from 2006 to 2014, male students who were admitted to the CTHSS were 10% more likely to graduate from high school, and they had average quarterly earnings that were 32% higher[64] than those who just missed the minimum admissions score. A key critique of CTE is that it provides specific skills at the expense of general skills, meaning that labor market gains may be temporary. But for CTHSS graduates, these large earnings gains persisted for male students in the sample who were age 23 or older. However, female students saw no earnings increases.[65]

Indiana and Minnesota

In both Indiana and Minnesota, the state educational agency, state higher education agency, and state workforce agency partnered with the Regional Educational Laboratory Midwest to examine whether public high school graduates in each state had different college and workforce outcomes depending on whether they concentrated in CTE. Across 333,380 graduates in Indiana and 350,191 graduates in Minnesota from 2013 to 2018, the study found that high school CTE concentrators[66] were more likely to enroll in two-year rather than four-year colleges.[67] For the 2012-2013 cohort, six years after their high school graduation date, concentrators earned a bachelor's degree at a lower rate than the comparison group of graduates with similar demographics who did not concentrate in CTE. However, concentrators were more likely than non-concentrators to earn a certificate or an associate's degree.

In both states, CTE concentrators had higher employment rates and earnings than non-concentrators during the first five years after high school graduation. CTE concentrators earned $2,631 more in Indiana and $1,536 more in Minnesota annually than non-concentrators, and they were 3.2% and 4.1% more likely to be employed, respectively.

[64] These earnings occur during the time frame of six quarters after expected high school graduation until the quarter prior to turning age 23.

[65] E. Brunner et al., *The effects of career and technical education: Evidence from the Connecticut Technical High School System*, National Bureau of Economic Research, No. w28790, May 2021, https://www.nber.org/system/files/working_papers/w28790/w28790.pdf.

[66] Definitions of "CTE concentrator" differed slightly between Indiana and Minnesota. In Indiana, concentrators were as defined in Perkins V (two or more CTE credits completed). In Minnesota, concentrators were defined as students who completed at least 150 hours of instruction (the approximate amount of instruction time for a full-year course that meets 51 minutes every day and five days per week; roughly equivalent to two semester credits) in CTE courses in one of the state's 79 career pathways.

[67] Jim Lindsay et al., *Indiana and Minnesota Students Who Focused on Career and Technical Education in High School: Who Are They, and What Are Their College and Employment Outcomes?*, Regional Educational Laboratory Midwest, REL 2021-090, June 2021, https://ies.ed.gov/ncee/rel/regions/midwest/pdf/REL_2021090.pdf.

North Carolina

In North Carolina, eligible high school students can earn credentials and college credits tuition-free from North Carolina colleges and universities through Career & College Promise (CCP), a statewide dual enrollment program.[68] Participating students choose among three CCP pathways:

- College Transfer, where students take dual enrollment classes that lead to an associate's degree to meet the general education requirements of a four-year college;
- CTE, where students take dual enrollment classes to earn college credits leading to credentials or workforce-based careers; or
- Cooperative Innovative High Schools, where students earn an associate's degree or two years of college credit at an approved high school partnered with a college or university.

A study of 525,000 students in grades 11 and 12 compared students who participated in North Carolina's CCP CTE Pathway from the 2012-2013 to 2018-2019 school years with those who did not participate. Students who participated in CCP over seven years earned six times more college credits than the comparison group, were 2% more likely to graduate from high school, and were 9% more likely to enroll in any college. These graduation and enrollment gains were slightly larger (3% and 11%, respectively) for economically disadvantaged students.

[68] This is a statewide dual enrollment curriculum program in partnership with all North Carolina community colleges leading to a certificate or diploma aligned with a particular high school career cluster. Students earn college credits leading to technical credentials or workforce-based careers. For more information, see https://cteresearchnetwork.org/sites/default/files/2022-02/CCP-CTE-Infog-508_1.pdf.

Appendix. Career Clusters and Programs of Study

Table A-1. Career Clusters and Sample Programs of Study

Career Cluster	Description	Sample Programs of Study
Advanced Manufacturing	A blend of innovative technologies and practices to enhance design and production.	Engineering & Technology Apparel & Textile Production Safety & Environmental Assurance
Agriculture	A concentration on scientific advancement of agriscience, cultivation, processing, and distribution of agricultural products, employing advanced technologies and sustainable practices to optimize global food systems.	Agribusiness Animal Nutrition Aquaculture
Arts, Entertainment, & Design	A focus on creating, producing, and sharing artistic and design work across multiple platforms, aiming to entertain, inform, beautify, and inspire.	Digital Animation Audio & Visual Technology Performing Arts
Construction	A focus on professions involved in designing, planning, managing, and executing projects in the built environment.	Architectural Design Diesel Mechanics Carpentry
Digital Technology	A focus on developing digital systems for communication and data storage using critical technologies such as artificial intelligence (AI), data analytics, and cybersecurity.	Applied Data Science & Analytics Computer Networking Cloud Computing
Education	An emphasis on quality education standards and lifelong learning, preparing individuals for success through all life stages by nurturing knowledge, skills, and critical thinking and encouraging personal and societal growth in a constantly evolving world.	Early Childhood Education Professional Support Services Principles of Teaching
Energy & Natural Resources	A focus on efficient and responsible resource management, including conservation, transmission, distribution, and storage to minimize environmental impacts and meet global energy needs.	Renewable Energy Environmental Engineering Telecommunications
Financial Services	A focus on contributions to economic stability and growth by supporting the financial health of individuals and organizations.	Accounting Business Administration Real Estate
Healthcare & Human Services	A focus on enhancing the overall health and resilience of individuals, families, and communities by addressing social determinants of health and leveraging health data and science.	Counseling & Mental Health Services Health Informatics Allied Health
Hospitality, Events & Tourism	A focus on delivering quality customer service, memorable experiences, and seamless logistics to cater to the needs and preferences of guests, tourists, and event participants.	Hospitality & Management Culinary Services Outdoor Recreation

Career Cluster	Description	Sample Programs of Study
Management & Entrepreneurship	A focus on skills and occupations that are essential across all industries, focusing on business administration, operations optimization, strategic planning, workforce management, and entrepreneurship.	Business Technology Applications Business Essentials Business Law
Marketing & Sales	A focus on promoting products, understanding consumer needs, engaging with communities, and driving sales.	Marketing Research Marketing Business Communications
Public Service & Safety	A focus on roles in local, state, and federal government; legal and justice systems; security; and military operations, all aimed at promoting civic responsibility and ensuring the well-being, security, functionality, and resilience of communities, states, and countries.	Emergency & Fire Management Services Economics Criminal Justice
Supply Chain & Transportation	A focus on the transfer, coordination, and management of goods from production to consumption, ensuring efficient movement across various modes of transportation including air, ground, and water, as well as maintenance of the respective transport modes.	Aviation Technology Auto Body Technology Business Administration

Source: Advance CTE, Guidebook: The Modernized National Career Clusters Framework, downloaded on January 22, 2026, from https://careertech.org/wp-content/uploads/2025/06/Guidebook-National-Career-Clusters-Framework.pdf.

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