

Career and Technical Education: A Primer

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Career and technical education (CTE), sometimes referred to as vocational education, provides occupational and non-occupational preparation at the secondary and postsecondary levels. CTE is a key element of the nation's workforce development system, providing students of all ages 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 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 some 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*.)

CTE is organized into 16 career clusters with various career pathways for each cluster. These clusters include several occupational areas, such as health science and manufacturing. Career clusters are groupings of occupations and broad industries based on commonalities, and there are multiple career pathways within each cluster. Career pathways are a series of connected education and training strategies and support services that help individuals to secure industry-recognized 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, community colleges (via cooperative programs), and detention centers. According to the most recent available federal data (from 2013), the vast majority (88%) of public high school graduates attained at least one CTE credit, and 20% earned at least three CTE credits in a single occupational area. 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 an industry-recognized credential upon completion of a career pathway. Similarly, CTE courses can lead to attainment of industry-recognized credentials after one to two years of postsecondary education or training.

At the postsecondary level, CTE is commonly offered by community colleges, trade schools, and employers through apprenticeships and on-the-job training. CTE commonly refers to programs that lead to credentials at or below the associate's degree. Some CTE programs are terminal (i.e., few courses are transferable for credit toward a more advanced credential), while others may lead to stackable credentials (i.e., a sequence of credentials leading to more advanced qualifications). 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. Pandemic-related labor shortages in areas such as construction, agriculture, and transportation may also be leading to increased enrollment in these specific fields even as overall CTE community college enrollment has declined.

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 nondegree 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 education agencies (LEAs) to support career and technical education (CTE). CTE, sometimes referred to as vocational education,¹ provides occupational and non-occupational² preparation at the secondary and postsecondary levels. A CTE program of study³ 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 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 career pathways 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.”⁴ 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.⁵ 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.⁶

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 deficits⁷ in the

¹ Career and technical education is also referred to as career education, technical and vocational education (TVET), and technical education. CTE 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 Non-occupational CTE includes family and consumer sciences education (i.e., courses that prepare students for roles outside the paid labor market) and general labor market preparation (i.e., courses that teach general employment skills such as word processing and introductory technology skills); see https://nces.ed.gov/surveys/ctes/tables/glossary_secondary.asp.

³ 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.

⁴ For more information, see CRS Report R45897, *The U.S. Land-Grant University System: An Overview*.

⁵ The Smith-Hughes Act was repealed by the Balanced Budget Act of 1997 (P.L. 105-33).

⁶ 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.

⁷ For more recent information on skills deficits and gaps, see CRS Report R47059, *Skills Gaps: A Review of*

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 education was termed "vital to national defense and prosperity."⁸ 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.⁹ 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.¹⁰

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. After adjusting appropriations for inflation, **Figure 1** demonstrates the extent to which funding for CTE via Perkins V has declined since FY1980¹¹, though this decline has plateaued in recent years. In FY2021, the federal government invested \$1.3 billion less in CTE than in FY1980 (after adjusting for inflation).

Underlying Concepts and Evidence.

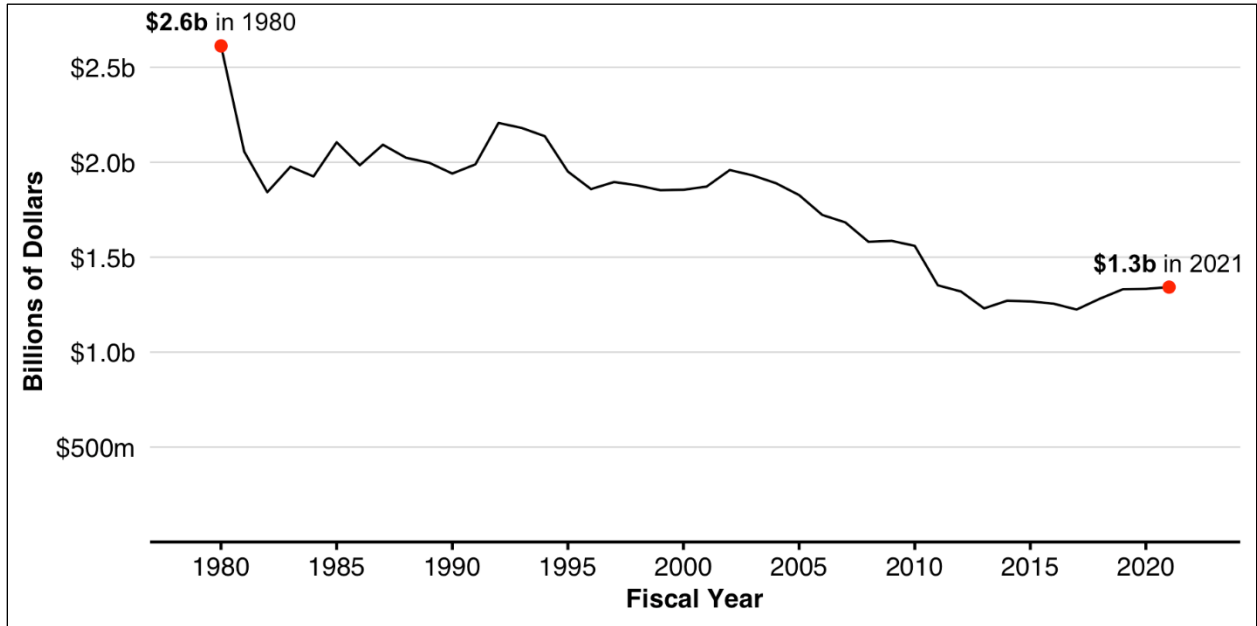
⁸ U.S. Congress, House of Representatives, *Annual Report of the Federal Board for Vocational Education*, 65th Cong., 2nd sess., Doc. No. 16 (Washington, DC: GPO, 1917).

⁹ 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.

¹⁰ 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*.

¹¹ FY1980 is the earliest year with a historical budget for the 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–FY2021



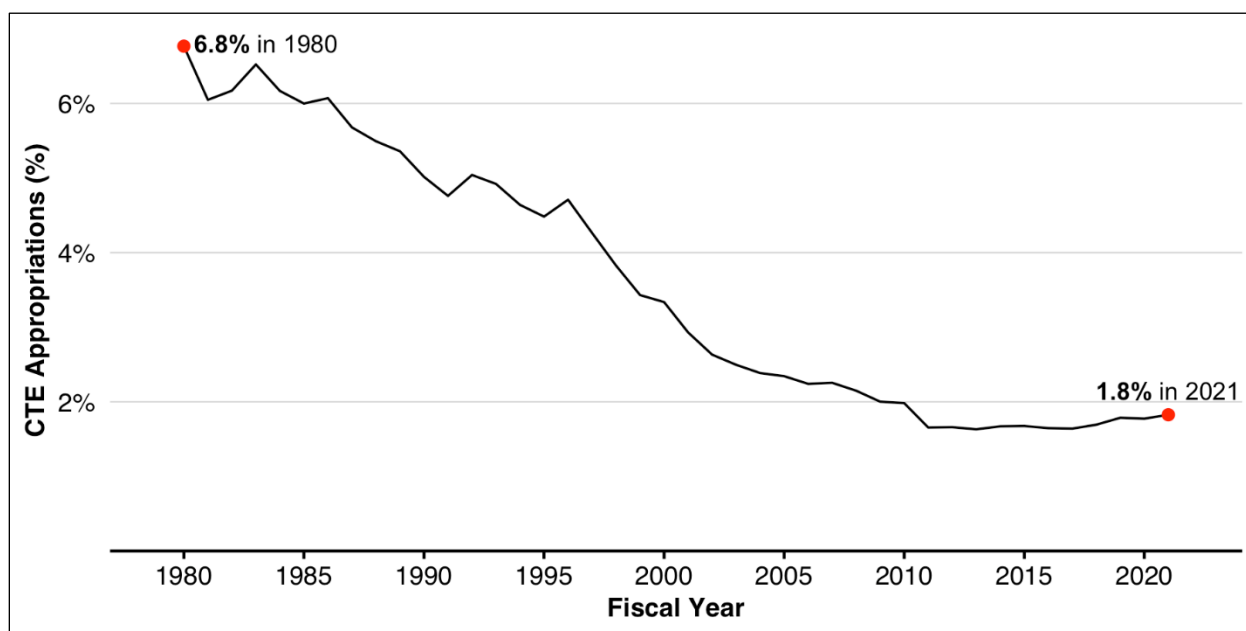
Source: Prepared by CRS based on U.S. Department of Education, Education Department Budget History Table: FY1980 - FY2021; accessed March 28, 2022, at <https://www2.ed.gov/about/overview/budget/history/index.html>. Inflation adjustments relied on the non-seasonally adjusted Consumer Price Index for All Urban Consumers (CPI-U) with FY2021 as the base year; accessed March 28, 2022, at <https://www.bls.gov/data/home.htm>.

Notes: The FY2006 and FY2007 appropriations include the one-time emergency supplemental funds appropriated for recovery from Hurricanes Katrina and Rita. ED spending through federal student aid is not included.

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–FY2021



Source: Prepared by CRS based on U.S. Department of Education, Education Department Budget History Table: FY1980 - FY2021; accessed March 28, 2022, at <https://www2.ed.gov/about/overview/budget/history/index.html>.

Notes: The FY2006 and FY2007 appropriations include the one-time emergency supplemental funds appropriated for recovery from Hurricanes Katrina and Rita. To adjust for inflation, CRS averaged the monthly non-seasonally adjusted CPI-U for each of FY1980 through FY2021. The resulting value for FY2021 was used as the base year.

A decline in CTE secondary school enrollment mirrors the decline in federal funding. 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.¹² According to data from ED, nationwide CTE participation at the secondary level decreased from 8.9 million students in 2018-2019 to 7.6 million in 2019-2020, though postsecondary CTE participation remained roughly the same at 3.5 million for both academic years.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 offered by high schools, area CTE centers, community colleges, vocational schools, and employers through apprenticeships and on-the-job training. Generally, CTE occupations require two years or less of postsecondary education or training. CTE integrates knowledge from the liberal arts with a practical or applied purpose, such as nursing, business administration, culinary arts, automotive maintenance, software programming, engineering technology, and cosmetology.

¹² 2019 NAEP High School Transcript Study (HSTS) Results; accessed March 28, 2022, at https://www.nationsreportcard.gov/hstsreport/#coursetaking_0_0_el.

¹³ National summaries are available at <https://cte.ed.gov/profiles/national-summary>.

The goal of CTE is preparation for employment, and a key measure of success is the achievement of industry-recognized credentials.

The scope of CTE coursework is organized into career clusters and career pathways to facilitate educational program design and effective use of resources and to foster alignment with business and industry. Non-occupational CTE includes family and consumer sciences (i.e., courses that prepare students for roles outside of the paid labor market) and general labor market preparation (i.e., courses that teach skills such as word processing).

Career Clusters and Career Pathways¹⁴

Because of the breadth of subjects covered by CTE, practitioners have organized it into career clusters 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.¹⁵ 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 16 career clusters, which demonstrate the scope and breadth of CTE (see the **Appendix** for a full list and additional detail). For example, the agriculture, food, and natural resources career cluster comprises the development of agricultural products, including plants, animals, food, textiles, and other consumer products. Because even a single career cluster covers several areas, career clusters are further disaggregated into career pathways.

Career pathways are a series of connected education and training strategies and support services that enable individuals to secure industry relevant certification and obtain employment within an occupational area and to advance to higher levels of education and employment in that area. For example, the agriculture, food, and natural resources career cluster is divided into seven career pathways: food products and processing systems; power, structural, and technical systems; plant systems; natural resource systems; animal systems; environmental service systems; and agribusiness systems. (The **Appendix** includes the related career pathways for each career cluster.)

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.

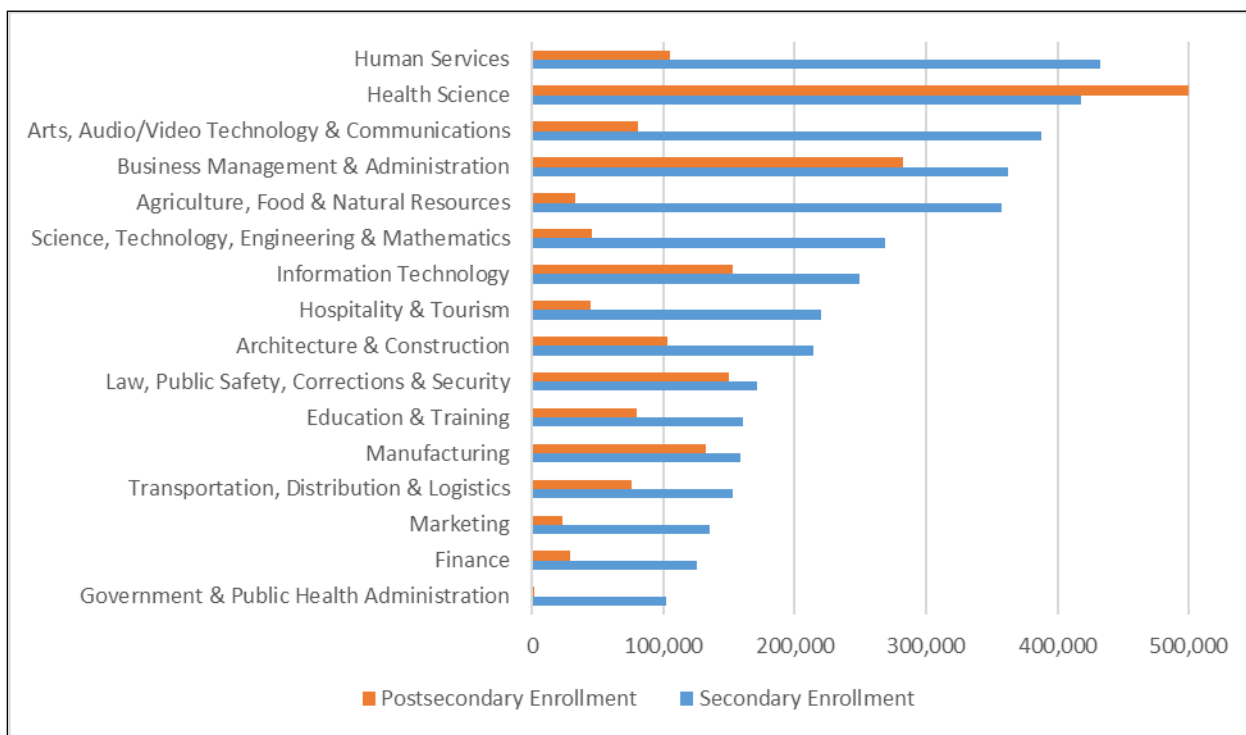
Figure 3 depicts the different career clusters and the number of students concentrating (e.g., students who have taken a threshold number of high school courses or earned a threshold number of postsecondary credits) in those clusters at the secondary and postsecondary levels for CTE programs supported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

¹⁴ The Career Clusters brand is a registered trademark of the National Career Technical Education Foundation, and is managed by the National Association of State Directors of Career Technical Education Consortium (NASDCTEc) on its behalf.

¹⁵ 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.

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

Program Year 2018-2019



Source: Created by CRS based on U.S. Department of Education, Office of Career, Technical, and Adult Education, Perkins Data Explorer. Accessed December 23, 2021, at <https://perkins.ed.gov/pims/DataExplorer>.

Notes: These data are based on participation in CTE programs supported by Perkins V funds; thus, they may not represent total enrollment or concentration in career clusters across the nation. Career clusters are based on the National Career Clusters Framework at <http://www.careertech.org/career-clusters>. Each career cluster represents a distinct grouping of occupations and industries based on the knowledge and skills CTE students require. 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, Guam, and the Republic of Palau.

According to the NAEP HSTS, at the secondary level from 2010 to 2019, health science, information technology, and hospitality and tourism have grown in popularity, while the largest declines are in business and marketing, architecture and construction, and manufacturing.¹⁶ At the postsecondary level from 2010 to 2019, finance, information technology, and manufacturing have grown in popularity, while the largest declines are in health science; business and marketing; and law, public safety, and security.¹⁷

¹⁶ 2019 National Assessment of Educational Progress (NAEP) High School Transcript Study (HSTS) Results; accessed March 28, 2022, at https://www.nationsreportcard.gov/hstsreport/#coursetaking_0_0_el.

¹⁷ As analyzed by CRS using data from the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS).

Industry-Recognized Credentials (IRCs)

CTE provider collaborations with business and industry have enabled the development of education programs that lead to or prepare individuals for IRCs. 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. “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 Some IRCs are required in order to work in an occupation, while others may increase income or employability in the occupation.

There are different types of IRCs and different requirements. IRCs include postsecondary degrees, postsecondary certificates, licenses, certifications, and Registered Apprenticeship certificates. Standards may be developed by an industry, industry association, state government, or product manufacturer. IRCs may require a certain amount of formal classroom instruction, hands-on experience, and/or a licensing or certification test. Some IRCs are recognized nationally, while others are recognized only regionally or locally. 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).¹⁹ 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.²⁰ Other major CTSOs that specifically relate to one or more of the 16 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).²¹

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 See P.L. 81-740.

²⁰ 36 U.S.C. §70901 et seq.

²¹ 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 school level CTE is meant to connect with and lead to postsecondary programs of study or additional training after high school, which may include more specialized technical instruction.²² Occupational CTE at the secondary level may prepare an individual for immediate labor market entry after high school completion, or postsecondary education may be required before the individual is prepared to enter the labor market. CTE is seldom offered at the elementary school level.

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 education prepares individuals for specific fields.

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;
- CTE-specific 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 tracking over 23,000 9th-grade students from 2009 to 2013, 77% of all high school students earned at least one credit in CTE.²⁵ White students were the

²² U.S. Department of Education, *Bridging the Skills Gap: Career and Technical Education in High School*, September 2019, at <https://www2.ed.gov/datastory/cte/index.html#WHATISCTE>.

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 Results are from 2013 data found in the National Center for Education Statistics' High School Longitudinal Study (HSLs) of 2009. Data collection for a new and updated HSLs began in fall 2022 (see <https://surveys.nces.ed.gov/hsb22> for more information). CTE participants are those earning at least one credit. CTE concentrators earn at least two credits in a single CTE career cluster.

racial/ethnic group most likely to participate (80%), while Asian students were the least likely to participate (71%). Female students were less likely to participate than male students (73% compared to 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 (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 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;
- 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

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.

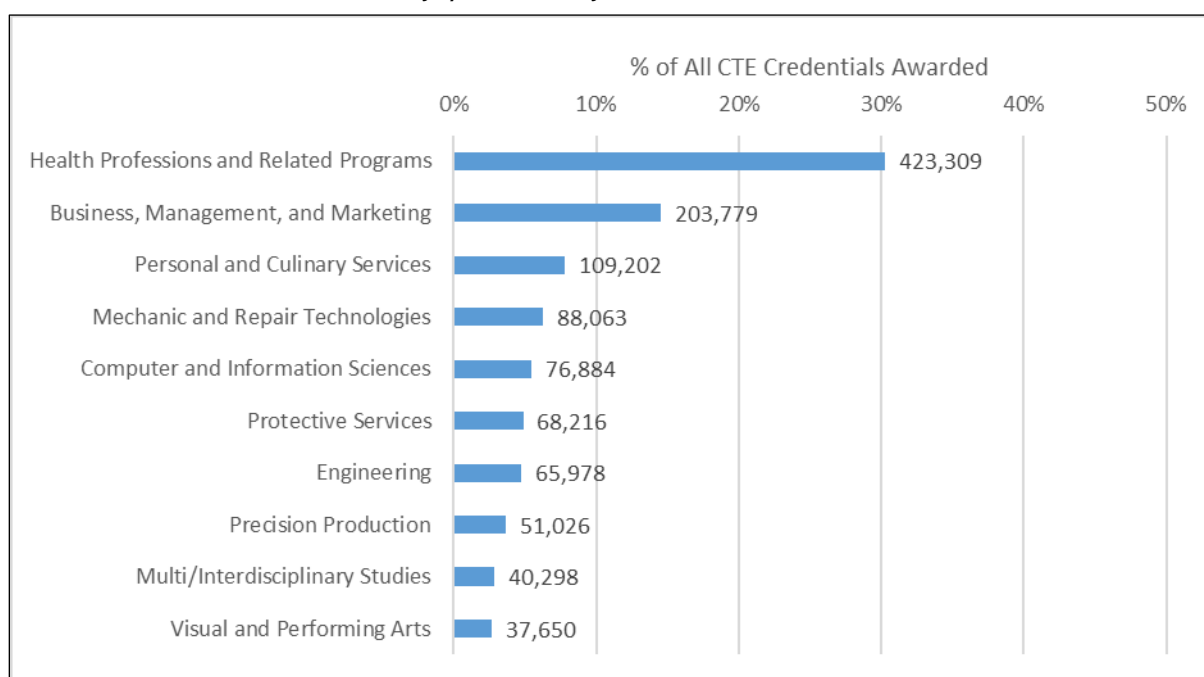
²⁸ Assistant Secretary Jane Oates, *Training and Employment Guidance Letter No. 15-10*, U.S. Department of Labor, Employment and Training Administration, Advisory System, TEGL 15-10, Washington, DC, December 15, 2010, <http://wdr.doleta.gov/directives/attach/TEGL15-10.pdf>.

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.

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 Education Act (HEA) Title IV federal student financial aid programs during the 2019-2020 academic year.³⁰ The figure does not include subbaccalaureate certificates earned at other educational institutions or training establishments. The largest proportion (over 20%) of graduates completed programs in the health professions and related fields, followed by the 14% 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

July 1, 2019, to June 30, 2020



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 the liberal arts (non-CTE) 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**, as these are credentials awarded instead of initial enrollment.

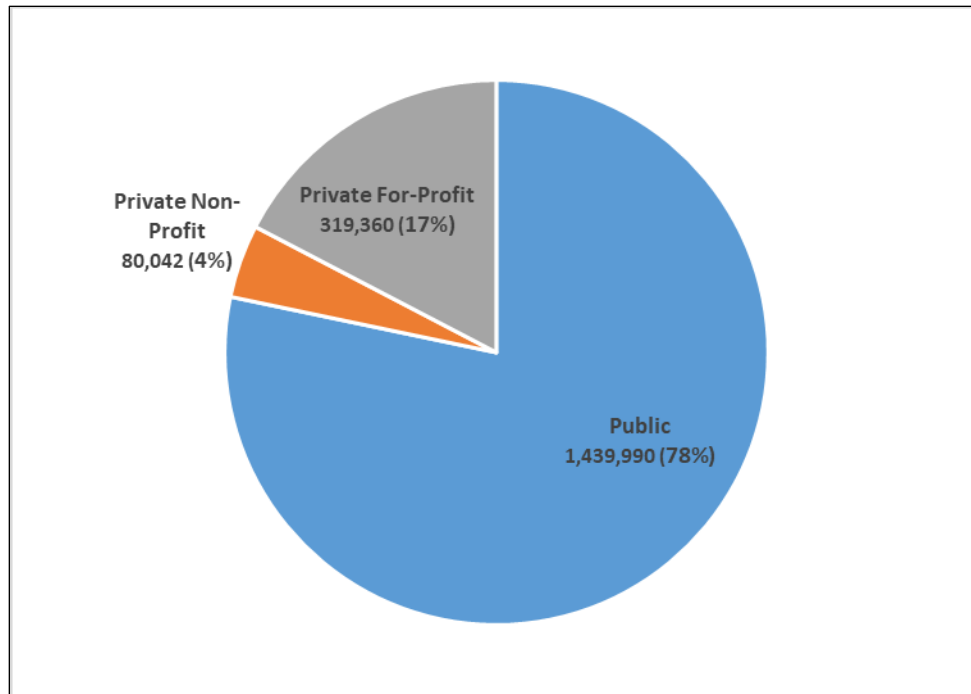
Bird, and Benjamin L. Castleman. "Stacking the Deck for Employment Success: Labor Market Returns to Stackable Credentials." EdWorking Paper 20-317 (2020), at <https://www.edworkingpapers.com/sites/default/files/ai20-317.pdf>.

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 Stafford loans. For more information, see CRS Report R43351, *The Higher Education Act (HEA): A Primer*.

Figure 5 shows the types of IHEs at which individuals completed CTE programs during the 2019-2020 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. The vast majority (90%) of CTE associate's degrees and subbaccalaureate certificates were awarded by public two- or four-year institutions and private not-for-profit four-year institutions. For-profit institutions (either four-year, two-year, or less-than-two-year) made up 8% of awards.

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

Degrees and Certificates Awarded from July 1, 2019, to June 30, 2020



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 the liberal arts (non-CTE) 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**, as these are credentials awarded instead of initial enrollment.

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.

Delivery, Access, and Replication Challenges

In FY2021, Congress requested that GAO conduct interviews with state officials, CTE program providers, and other stakeholders, including representatives from business and industry, to determine existing challenges with CTE at both the secondary and postsecondary levels.³¹ 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 models³²;
- staff capacity issues, particularly for rural schools with fewer staff to provide career counseling, navigate employer partnerships, and pursue federal grants;
- 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 learning³³;
- language barriers, such as state websites only being available in English;
- a lack of support services such as childcare;
- inflexible scheduling³⁴;
- 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

³¹ GAO, *Career and Technical Education: Perspectives on Program Strategies and Challenges*, GAO-22-104544, March 2022.

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.

- 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.

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 empty 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.

Resources and Strategies Used to Address Challenges

To address the above challenges with delivery, access, and replication, ED supports CTE programs through the administration of grants, technical assistance to states and CTE program providers, partnerships with DOL, and research and dissemination of evidence-based strategies.

According to the 2022 GAO report, key ED grants that CTE providers reported using included

- Adult Education State Grants³⁹;
- Student Support and Academic Enrichment Grants⁴⁰;

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 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*.

⁴⁰ 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*.

- Supporting Effective Instruction State Grants⁴¹; and
- Perkins Innovation and Modernization Grants.⁴²

Technical assistance to states and CTE program providers includes resources through the Perkins Collaborative Resource Network (PCRN),⁴³ 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 between ED and other departments and agencies include

- youth apprenticeships and other workforce initiatives, such as monthly calls with DOL's Employment and Training Administration staff to discuss activities related to career pathways;
- community-based rehabilitation programs with the Department of Justice, including a diversion project to help redirect young adults from arrest, prosecution, sentencing, or incarceration to community-based rehabilitation programs; and
- cybersecurity training via a professional development initiative for secondary CTE teachers, developed with the U.S. Department of Homeland Security, the National Institute of Standards and Technology, and the National Security Agency.

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,⁴⁴ career development, and counseling strategies, with publication expected by 2025. This work is to be included as part of a national evaluation of CTE.⁴⁵

To address CTE teacher shortages, states and localities can leverage Perkins V funding to recruit, train, and retain qualified teaching staff.⁴⁶ ED has pursued a variety of strategies to address teacher shortages, though these initiatives have not specifically targeted CTE subject areas.⁴⁷

⁴¹ 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*.

⁴² For more information, see CRS Report R47071, *Strengthening Career and Technical Education for the 21st Century Act (Perkins V): A Primer*.

⁴³ For more information, see <https://cte.ed.gov>.

⁴⁴ 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/>.

⁴⁵ GAO, *Career and Technical Education: Perspectives on Program Strategies and Challenges*, GAO-22-104544, March 2022.

⁴⁶ These have historically been allowable activities under Perkins Acts. 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*.

⁴⁷ For more information, see <https://www.ed.gov/news/press-releases/us-education-secretary-miguel-cardona-calls->

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

There is a robust evidence base for the economic returns of earning a bachelor's degree.⁴⁸ Earnings generally increase with educational attainment. 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.⁴⁹ 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 2021, workers age 25 and over who attained less than a high school diploma had the lowest median weekly earnings (\$626) and the highest unemployment rate (8.3%). Workers with some college, such as a nondegree certificate, made \$90 more weekly on average and had 0.7% higher employment than those with only a high school diploma, as shown in **Figure 6**.

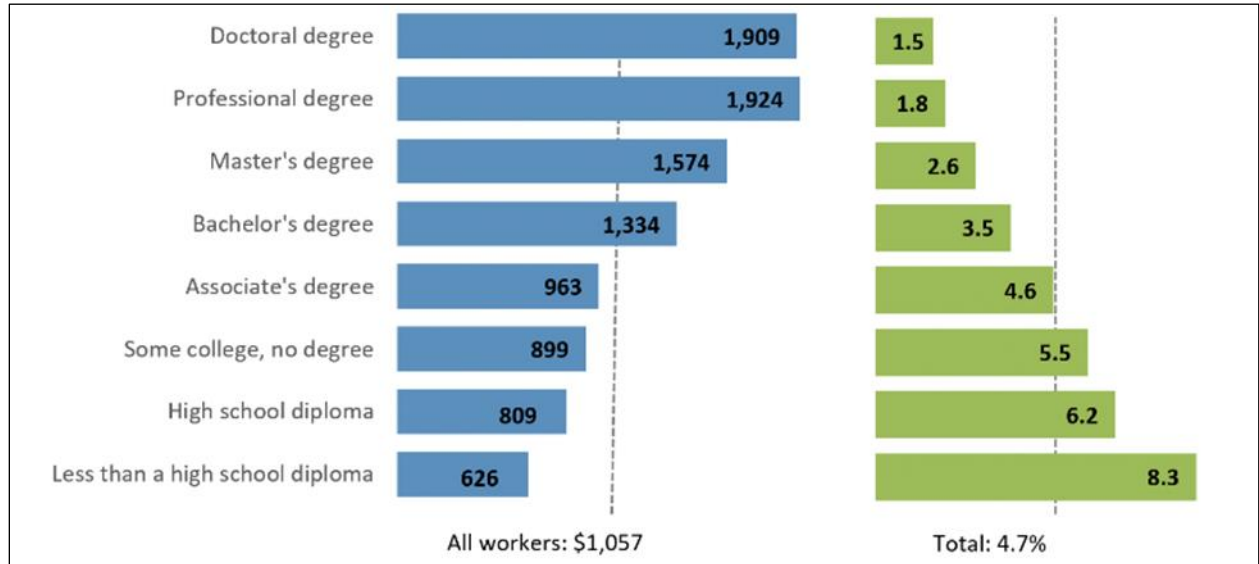
states-districts-higher-ed-institutions-address-nationwide-teacher-shortage-and-bolster-student-recovery-american-rescue-plan-funds.

⁴⁸ 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>.

⁴⁹ 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/>.

Figure 6. Earnings and Unemployment Rates by Educational Attainment, 2021

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>

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. For instance, 23.1% of those with only some college, such as a nondegree certificate, earn more than the median bachelor's degree holder. 28.2% of those with associate's degrees earn more than the median bachelor's degree holder.⁵⁰

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 downsides to 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 they 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 categorizes 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 (medical assistants and phlebotomists) as well as in human services (makeup artists, manicurists, and massage therapists). The largest projected growth in job openings, in terms of percentage change, is for

⁵⁰ 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/>.

wind turbine service technicians, while the highest median wage among these occupations is earned by makeup artists. 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 (e.g., personal services such as cosmetologists) have median annual wages below \$30,000.

Table 1. Median Wages for Occupations Requiring a Postsecondary Nondegree Award and Estimated to Have the Highest Employment Growth from 2020 to 2030

(employment numbers in thousands; sorted by percentage change)

Occupation	2020 Employment (Actual)	2030 Employment (Projected)	Percentage Change	Median Wage
Wind turbine service technicians	6.9	11.7	68.2	\$56,230
Makeup artists, theatrical and performance	3.1	4.2	37.0	\$106,920
Manicurists and pedicurists	123.0	163.1	32.6	\$27,870
Massage therapists	144.6	191.1	32.2	\$43,620
Skincare specialists	68.7	88.4	28.8	\$36,510
Computer numerically controlled tool programmers	27.1	34.5	27.4	\$57,740
Audio and video technicians	73.9	93.3	26.2	\$47,920
Phlebotomists	129.6	158.4	22.2	\$36,320
Hairdressers, hairstylists, and cosmetologists	569.6	680.1	19.4	\$27,380
Medical assistants	720.9	853.5	18.4	\$35,850

Source: Employment Projections program, U.S. Bureau of Labor Statistics, September 8, 2021, available at <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.⁵¹

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 \$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.⁵²

For example, one of the above studies conducted in Virginia and North Carolina examined first-time community college students from 2006-2009 (comprising 165,884 students in North Carolina and 67,735 students in Virginia). The authors defined short-term certificates as those taking less than one year of full-time study to complete, and long-term certificates as taking one year or more of full-time study to complete. Findings were not consistent between these two states. In North Carolina, short-term certificates were related to a \$1,112 annual increase in earnings, but in Virginia, the increase was \$612. Long-term certificates yielded larger gains—\$3,812 in North Carolina and \$800 in Virginia. Associate's degrees yielded even higher returns—\$5,024 in North Carolina and \$3,092 in Virginia.

These results also varied widely by program of study. In North Carolina, allied health long-term certificate holders saw large earnings gains of \$7,296 annually even as information science, communication, and design long-term certificate holders in the same state saw a decline of \$3,272 compared to students who attended community colleges but exited without earning any credential.⁵³ 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.

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.⁵⁴

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.⁵⁵ Those who were employed had 11% lower earnings than students who attended public institutions. These results incorporated all

⁵¹ 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.

⁵² 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.

⁵³ Di Xu and Madeline Trimble, “What About Certificates? Evidence on the Labor Market Returns to Nondegree Community College Awards in Two States,” *Educational Evaluation and Policy Analysis* 38, no. 2 (2016), pp. 272-292.

⁵⁴ 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>.

⁵⁵ 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.

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 the top 10 fields of study,⁵⁶ 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 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.⁵⁷ 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 cohorts⁵⁸ revealed CTE concentrators⁵⁹ were 21% more likely to graduate from high school, 1% more likely to enroll in a

⁵⁶ 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.

⁵⁷ For more information, see CRS Report R43398, *The Education Sciences Reform Act*; and <https://www.dol.gov/agencies/eta/performance/wdqi>.

⁵⁸ These students graduated in 2012, 2013, and 2014, as noted above, and were followed until one year after their anticipated high school graduation.

⁵⁹ *CTE concentrator* was defined in this study as earning three or more credits in a formal, coordinated program of study.

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.⁶⁰

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% higher⁶¹ 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.⁶²

Indiana and Minnesota

In both Indiana and Minnesota, the state education 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 concentrators⁶³ were more likely to enroll in two-year rather than four-year colleges.⁶⁴ 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

⁶⁰ 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.

⁶¹ These earnings occur during the time frame of six quarters after expected high school graduation until the quarter prior to turning age 23.

⁶² E. Brunner, S. Dougherty, and S. L. Ross, *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.

⁶³ 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.

⁶⁴ 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.

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.

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.⁶⁵ Participating students choose among three CCP pathways:

1. 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;
2. CTE, where students take dual enrollment classes to earn college credits leading to credentials or workforce-based careers; or
3. 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. Female students were slightly more likely than males to participate in CTE dual enrollment during the 2018-2019 school year; 10% of all female students participated compared to 8% of all males.

⁶⁵ 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 Career Pathways

Table A-1. Career Clusters and Career Pathways

Career Cluster	Description	Career Pathways
Agriculture, Food & Natural Resources	The production, processing, marketing, distribution, financing, and development of agricultural commodities and resources including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.	Food Products and Processing Systems Plant Systems Animal Systems Power, Structural & Technical Systems Natural Resources Systems Environmental Service Systems Agribusiness Systems
Architecture & Construction	Careers in designing, planning, managing, building, and maintaining the built environment.	Design/Pre-construction Construction Maintenance/Operations
Arts, Audio/Video Technology & Communications	Designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.	Audio and Video Technology and Film Printing Technology Visual Arts Performing Arts Journalism and Broadcasting Telecommunications
Business Management & Administration	Careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.	General Management Business Information Management Human Resources Management Operations Management Administrative Support
Education & Training	Planning, managing and providing education and training services, and related learning support services.	Administration and Administrative Support Professional Support Services Teaching/Training
Finance	Planning, services for financial and investment planning, banking, insurance, and business financial management.	Securities & Investments Business Finance Accounting Insurance Banking Services
Government & Public Administration	Planning and performing government functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.	Governance National Security Foreign Service Planning Revenue and Taxation Regulation Public Management and Administration

Career Cluster	Description	Career Pathways
Health Science	Planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.	Therapeutic Services Diagnostic Services Health Informatics Support Services Biotechnology Research and Development
Hospitality & Tourism	Preparing individuals for employment in career pathways that relate to families and human needs such as restaurant and food/beverage services, lodging, travel and tourism, recreation, and amusement and attractions.	Restaurants and Food/Beverage Services Lodging Travel & Tourism Recreation, Amusements & Attractions
Human Services	Preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care, and consumer services.	Early Childhood Development & Services Counseling & Mental Health Services Family & Community Services Personal Care Services Consumer Services
Information Technology	Building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support and management of hardware, software, multimedia, and systems integration services.	Network Systems Information Support and Services Web and Digital Communications Programming and Software Development
Law, Public Safety, Corrections & Security	Planning, managing, and providing legal, public safety, protective services and homeland security, including professional and technical support services.	Correction Services Emergency and Fire Management Services Security & Protective Services Law Enforcement Services Legal Services
Manufacturing	Planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.	Production Manufacturing Production Process Development Maintenance, Installation & Repair Quality Assurance Logistics & Inventory Control Health, Safety, and Environmental Assurance
Marketing	Planning, managing, and performing marketing activities to reach organizational objectives.	Marketing Management Professional Sales Merchandising Marketing Communications Marketing Research
Science, Technology, Engineering & Mathematics	Planning, managing, and providing scientific research and professional and technical services (e.g., physical science, social science, engineering) including laboratory and testing services, and research and development services.	Engineering and Technology Science and Math

Career Cluster	Description	Career Pathways
Transportation, Distribution & Logistics	Planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional and technical support services such as transportation infrastructure planning and management, logistics services, mobile equipment and facility maintenance.	Transportation Operations Logistics Planning and Management Services Warehousing and Distribution Center Operations Facility and Mobile Equipment Maintenance Transportation Systems/Infrastructure Planning, Management, and Regulation Health, Safety, and Environmental Management Sales and Service

Source: National Association of State Directors of Career Technical Education Consortium, Career Clusters & Pathways, downloaded from <https://careertech.org/career-cluster>.

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