

Examining high school career and technical education programs and the postsecondary outcomes of career and technical education students in the Round Rock Independent School District

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Examining high school career and technical education programs and the postsecondary outcomes of career and technical education students in the Round Rock Independent School District

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This study investigated the percentage of Round Rock Independent School District (ISD) graduates from 2012/13 through 2017/18 who completed one or more career and technical education (CTE) programs of study. The study also examined the percentage of CTE programs of study in Round Rock ISD that were aligned with high-wage, in-demand career pathways in Central Texas, including the percentage of graduates who completed programs of study aligned with those high-wage, in-demand career pathways, plus the postsecondary outcomes of these graduates who completed a program of study. Round Rock ISD, a suburban district in Austin, Texas, currently offers 33 CTE programs of study. Every high school student in the district has the opportunity to complete CTE programs of study as part of a four-year high school graduation plan by taking a coherent sequence of academic and technical courses that prepare them for careers. Key study findings include the following:

- The percentage of students who graduated with one or more CTE programs of study increased more than 10-fold across the six graduating cohorts, from 4 percent for the 2012/13 cohort to 47 percent for the 2017/18 cohort.
- Seventy-six percent of the CTE graduates completed course requirements in the 13 programs of study aligned with regional high-wage, in-demand career pathways in the Central Texas labor market.
- More than 80 percent of the CTE graduates from each cohort enrolled in two- or four-year colleges or were employed within one year of high school graduation.

Why this study?

Round Rock Independent School District (ISD) wanted to enhance its high school career and technical education (CTE) programming—because of recent decreases in two-year college enrollment and opportunities arising from Perkins V (see call-out box on the next page)—to prepare CTE graduates to either enter high-wage, in-demand careers in Central Texas or continue their education after high school. However, district leaders lacked key information about the district’s CTE programming. Specifically, they were interested in the

alignment of their CTE programs of study (see box 1 for key terms) to regional high-wage, in-demand careers and the preparation of their CTE graduates to step into such careers relative to other CTE

In July 2019, the Strengthening Career and Technical Education for the 21st Century Act (Perkins V) went into effect, changing the way that states implement career and technical education (CTE) programs. Perkins V emphasizes improving CTE program quality by asking state and local education agencies to align CTE programs of study with the needs of industries in the region, community, or local area and incorporate rigorous academic and industry-recognized skill standards into programs of study to improve access to high-quality career paths after high school (Advance CTE & ACTE, 2018; Garcia, 2018).

graduates in Central Texas. District leaders also lacked information on the postsecondary outcomes of their CTE graduates to inform recommendations to the district school board, including making recommendations to open a CTE high school that would allow the district to offer additional programs of study, offer specialty courses not currently within the programs, and fund state-of-the-art equipment that would be difficult to replicate across all high schools.

As a suburban district in Austin, Texas, Round Rock ISD serves approximately 48,000 students and offers CTE programs to its high school students. In 2019/20, the district offered 33 CTE programs of study in 14 of the 16 federally defined career clusters. All high school students in the district can select a CTE program of study as part of their four-year high school graduation plan and can complete that program by earning three or more CTE credits in a program of study (see appendix A for more information on CTE programs). Not all programs of study are offered at each high school. However, students can attend any program, even if it is not offered in their zoned high school. For example, six of the 33 programs of study were offered at every high school, including Business Management & Administration, Biomedical Sciences, Health Science Theory and Practice, Marketing, Computer Science, and Engineering. Nine programs of study were offered at only one high school.

More than half of all Round Rock ISD graduates enroll in a Texas public college; however, from 2013 to 2017, the two-year college enrollment rates of their graduates decreased by 4 percentage points, and four-year college enrollment rates remained steady during the same time period (Texas Public Education Information Resource, 2019). District leaders suspected that this decrease in enrollment was from CTE graduates and wanted to take the opportunity, based on changes from the Strengthening Career and Technical Education for the 21st Century Act (Perkins V), to rethink their CTE programming.

This study investigated the percentage of Round Rock ISD graduates who completed CTE programs of study and the percentage of these CTE programs that were aligned with high-wage, in-demand career pathways in the Central Texas labor market. The study also investigated the percentage of CTE graduates who completed CTE programs of study in high-wage, in-demand career pathways, plus the postsecondary outcomes of CTE graduates.

Round Rock ISD leaders can use the study findings to make recommendations to the district school board to enhance CTE programs, including the possibility of centralizing CTE programs in a new CTE high school that could support Round Rock ISD and other districts in Central Texas. District leaders want to improve access to CTE programs and support course offerings and pathways that may result in better postsecondary preparation and outcomes for students and align with high-wage, in-demand careers in the Central Texas region.

Research questions

This study addressed four research questions.

1. What percentage of Round Rock ISD graduates from 2012/13 through 2017/18 completed one or more CTE programs of study?
 - a. How do the demographic characteristics of CTE graduates compare with those of all district graduates?

- b. In what career clusters did CTE graduates complete programs of study?
 - c. Among CTE graduates, what percentage earned an industry-based certification? Did the percentage differ by CTE career clusters?
2. What percentage of CTE programs of study in Round Rock ISD and other districts in Central Texas in 2015/16 through 2017/18 were aligned with high-wage, in-demand career pathways in the Central Texas labor market? What percentage of CTE graduates completed CTE programs of study aligned with high-wage, in-demand career pathways?
3. What percentage of 2012/13 through 2016/17 Round Rock ISD CTE graduates enrolled in college or were employed or both? Did these percentages change across cohorts and differ by CTE career cluster?
4. What percentage of 2012/13 through 2016/17 Round Rock ISD CTE graduates attained a college credential?

Key terms used in this report are defined in box 1. Descriptions of data sources, the study population, methods, and limitations are summarized in box 2 (see appendix A for additional information).

Box 1. Key terms

Career cluster. A group of careers in the same field of work that require similar skills. The National Career Clusters Framework serves as an organizing tool and includes 16 nationally accepted career clusters that represent 79 workforce career pathways. (Table A2 in appendix A contains a list of career clusters and pathways.) The National Career Clusters Framework was developed by Advance CTE to organize educational delivery of career and technical education (CTE) with career pathways.

Career pathway. A group of occupations within a career cluster that share common skills, knowledge, and interests. For example, Law Enforcement Services is a career pathway under the Law, Public Safety, Corrections & Security career cluster. Occupations in this pathway include animal control workers, detectives, criminal investigators, first-line supervisors of police and detectives, fish and game wardens, forensic science technicians, and police and sheriff patrol officers.

CTE graduate. A graduate from a Texas public high school who had enrolled in a high school CTE program of study as part of a four-year graduation plan and completed one or more programs of study. To complete a program of study, students must take two or more state-approved sequences of CTE courses and earn three or more CTE credits within the program of study.

CTE programs of study. A sequence of courses designed by state or local education agencies, representing a CTE career cluster and pathway. Programs of study focus on challenging academic standards and relevant technical knowledge and skills needed to prepare students for further education and careers (Strengthening Career and Technical Education for the 21st Century [Perkins V] Act, 2018).

High-wage, in-demand career pathways. Career pathways that contain occupations in Central Texas that were identified as meeting three labor market thresholds (see more detail in appendix A). Following the definitions of high-wage, in-demand occupations that the Texas Education Agency used to develop the statewide programs of study, these career pathway thresholds include occupations with an average median annual salary greater than or equal to \$35,339; projected job growth greater than or equal to 17 percent; and median annual regional job openings greater than or equal to 723.

Industry-based certification. An assessment that is administered and recognized by an industry third-party or governing board that validates that an individual possesses certain skills related to an occupation and measured against a set of accepted standards. This study included industry-based certifications approved by the Texas Education Agency for public high school accountability.

Median annual regional job openings. The median number of annual job openings (both part time and full time) in Central Texas based on a 10-year forecast developed by the Texas Workforce Commission for employment by industry and occupation. The 10-year forecast extends from 2016 to 2026.

Projected job growth. The projected percentage increase in job openings from 2016 to 2026 across all occupations **within a career pathway**.

Standard Occupational Classification codes. A federal statistical standard for classifying occupations developed by the U.S. Bureau of Labor Statistics. In 2012, the National Research Center for Career and Technical Education and Advance CTE conducted the Crosswalk Validation project that linked educational programs to occupations with career clusters and career pathways. (Table A2 in appendix A has a crosswalk of career clusters, career pathways, and standard occupational classification codes.)

Box 2. Data sources, study population, and methods

Data sources. This study used data from multiple sources. All public high school, postsecondary education, employment, and earnings data were available at the Texas Education Research Center at the University of Texas at Austin. (Table A1 in appendix A has additional information on the data sources.)

- *High school student data from the Texas Education Agency.* Data included students' demographic characteristics; career and technical education (CTE) records, including whether students participated in a CTE program of study; CTE courses completed; and industry-based certifications earned.
- *Postsecondary student data from the Texas Higher Education Coordinating Board and the National Student Clearinghouse.* Data from the Texas Higher Education Coordinating Board included enrollment in all community or technical colleges, public universities, independent colleges or universities, and career schools or colleges in Texas. National Student Clearinghouse data included enrollment and degree attainment for public and private postsecondary institutions across the United States, drawing from records covering 98 percent of students enrolled in higher education nationally.
- *Employment and earnings data from the Texas Workforce Commission.* Data included information for individuals who are paid wages within Texas, including quarterly data on total pretax wages, occupational classifications, the number of employers, and employment locations.
- *Texas labor market statistics.* Data on projected labor market statistics, including projected employment in 2026, the projected change in employment from 2016 to 2026, average annual openings, and the 2017 annual wage for each occupational category were publicly available for download on the Texas Workforce Commission website.
- *A list of occupations crosswalked to career clusters and career pathways publicly available from O*NET.* Occupation data were used to classify Texas occupations by career clusters and career pathways using the crosswalk developed by Advance CTE (see appendix A for more detail).

Study population. The study examined six cohorts of students who graduated from the Round Rock Independent School District (ISD) in Round Rock, Texas. The cohorts represent all graduates from the 2012/13, 2013/14, 2014/15, 2015/16, 2016/17, and 2017/18 school years. The size of the cohorts ranged from 2,912 graduates in 2012/13 to 3,421 graduates in 2017/18. The analytic sample used to address research question 1 included all six cohorts. The analytic sample used to address research question 2 was limited to the three most recent cohorts of CTE graduates because

those cohorts covered the same time period as the labor market projections reported by the Texas Workforce Commission. The analytic sample used to address research questions 3 and 4 included the first five cohorts of CTE graduates because no postsecondary information was available at the time of analyses for the 2017/18 graduates.

Methods. The research team used descriptive statistics to answer all four research questions. To address research question 1, the team calculated the percentage of Round Rock ISD CTE graduates by student demographic characteristics and career cluster. To address research question 2, the research team calculated the percentage of CTE programs of study aligned with high-wage, in-demand career pathways in Central Texas and CTE graduates in programs that aligned with high-wage, in-demand career pathways in the Central Texas labor market for Round Rock ISD and 41 surrounding Central Texas districts. First, the research team crosswalked Standard Occupational Classification codes to one of the 79 career cluster pathways. Second, based on the occupations in the career pathway, the team calculated the average median annual salary of the career pathway, the projected percentage growth of the career pathway during 2016-26, and the average annual Central Texas number of job openings for the career pathway. Finally, the team identified high-wage, in-demand career pathways using the three occupational thresholds that the Texas Education Agency established for its statewide programs of study (Texas Education Agency, 2019; see box 1). For research questions 3 and 4, the research team tracked CTE graduates' college enrollment, attainment of degrees and certificates, and employment up to five years after high school graduation. (Table A3 in appendix A lists the years of data used to track cohorts.) Appendix A has a detailed description of the methods.

Limitations. The study has several limitations. These include the programs of study for each cohort being defined by the district's 2019/20 catalogs of pathways and courses. Second, the research team conducted the mapping of Standard Occupational Classification codes to CTE career clusters and career pathways with the 2010 classification codes. Third, the required education level, job openings, and wages of occupations within career pathways are not all the same. Fourth, the analysis excludes students who pursued out-of-state employment or did not pursue the postsecondary outcomes examined in this study. Fifth, the employment status categories are not precise ways to classify employees when analyzing wages. Sixth, the economic impact brought on by the COVID-19 pandemic may alter labor market statistics presented in this study. Appendix A has additional information on the study limitations.

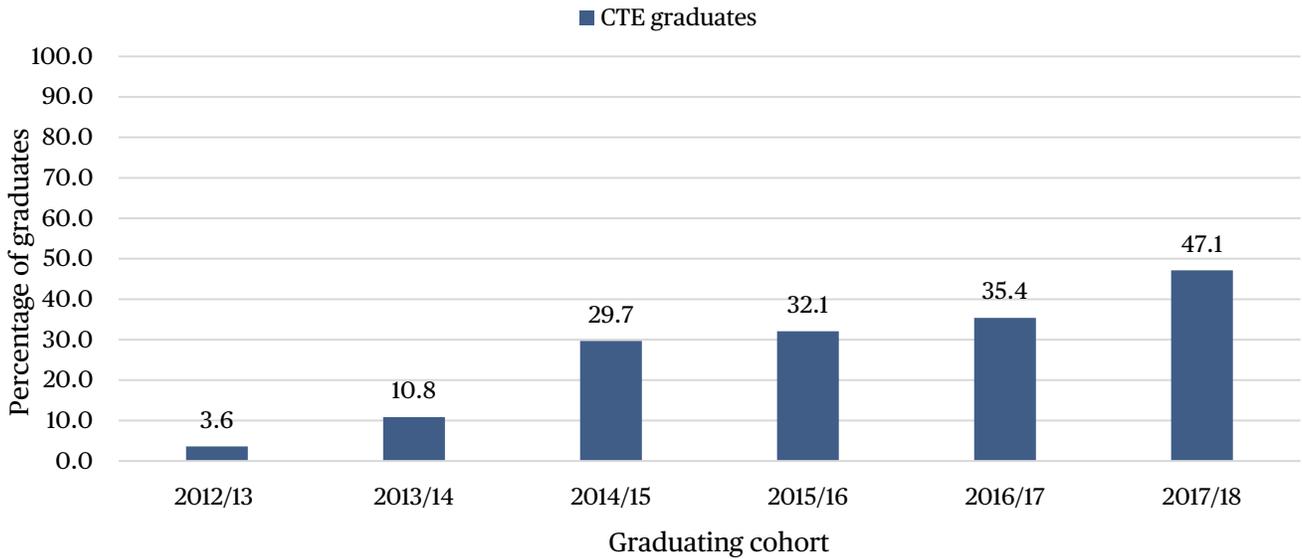
Findings

This section presents the main findings from the four research questions.

The percentage of Round Rock Independent School District graduates who completed one or more career and technical education programs of study in high school increased each year

Approximately 3,000 students graduated from Round Rock ISD in each year examined (table A4 in appendix A). The percentage of students who graduated with one or more CTE programs of study increased more than 10-fold across the six graduating cohorts, from 4 percent for the 2012/13 cohort to 47 percent for the 2017/18 cohort (figure 1). The largest annual percentage point increase, 18.9 percentage points, came between 2013/14 and 2014/15. Students enrolled in the federal Tech Prep program were excluded from the 2012/13 and 2013/14 calculation. Although this federal program ended in 2011, it is possible that program dissolution accounted for additional interest in completing a CTE program of study starting with the 2014/15 cohort when CTE became the only program available.

Figure 1. Almost half of 2017/18 Round Rock Independent School District graduates completed one or more career and technical education programs of study, an increase of more than 40 percentage points compared with graduates in 2012/13



CTE is career and technical education.

Note: Students enrolled in the federal Tech Prep program were excluded from the 2012/13 and 2013/14 calculation of CTE graduates. Tech Prep had a defined sequence of study that included two years in a postsecondary institution and culminated in an associate’s degree. The data available for this study did not include Tech Prep program participation. This program ended in 2011, and the Texas Education Agency stopped tracking this indicator with the 2013/14 cohort. It is possible that program dissolution accounted for additional interest in completing a CTE program of study starting with the 2014/15 cohort.

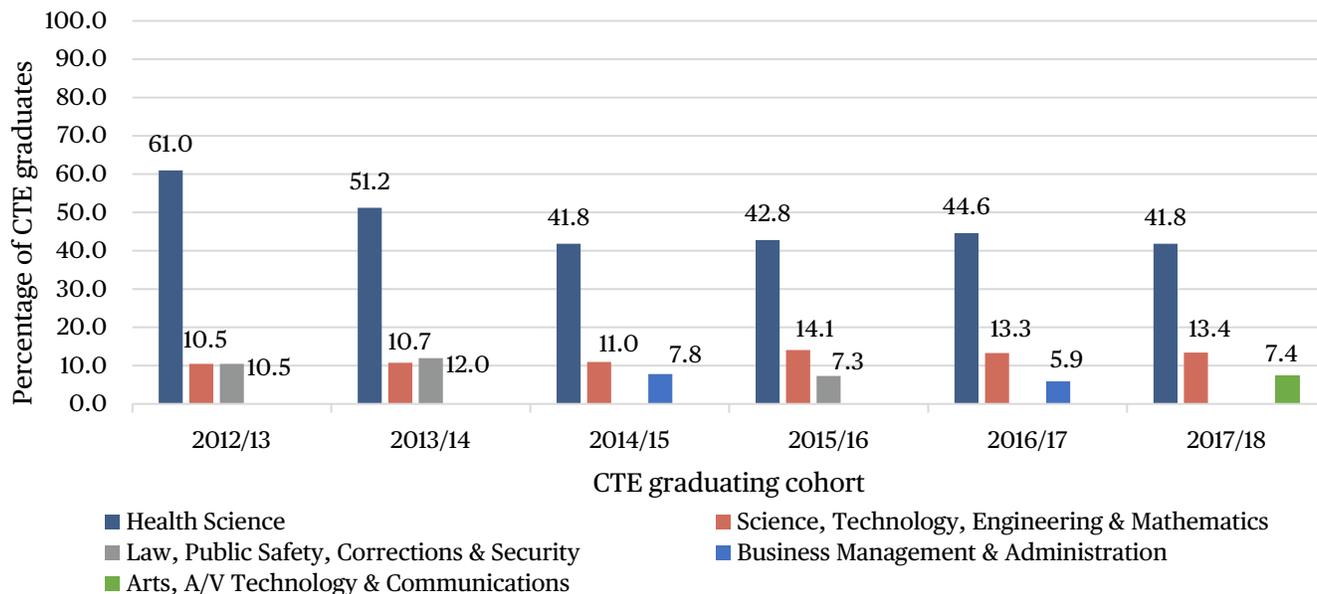
Source: Authors’ analysis based on data described in appendix A.

Of Round Rock ISD graduates in 2017/18, a lower percentage of students in historically disadvantaged groups were CTE graduates. Forty-one percent of students who were economically disadvantaged were CTE graduates compared with 49.2 percent of students who were not economically disadvantaged. Fewer students in special education (33.2 percent) and English learner students (23.2 percent) were CTE graduates than students not in special education programs (48.7 percent) and non-English learner students (48.6 percent). In terms of race/ethnicity, less than half of African American and Hispanic students (42.3 and 45.6 percent, respectively) were CTE graduates, and slightly more than half of Asian students (52.4 percent) were CTE graduates (table B1 in appendix B).

The majority of Round Rock Independent School District career and technical education graduates in each cohort had completed programs of study in the Health Science or the Science, Technology, Engineering & Mathematics career clusters

Across the six graduating cohorts examined, more than 40 percent of CTE graduates completed a program of study in the Health Science career cluster. The Health Science plus Science, Technology, Engineering & Mathematics career clusters ranked in the top three career clusters each year out of 14 total clusters, comprising more than 50 percent of CTE graduates each year (figure 2; table B2 in appendix B). Three other career clusters represent the top three in one or more of the years examined, including Law, Public Safety, Corrections & Security; Business Management and Administration; and Arts, A/V Technology & Communications.

Figure 2. Health Science Plus Science, Technology, Engineering & Mathematics were consistently in the top three career clusters that career and technical education graduates completed



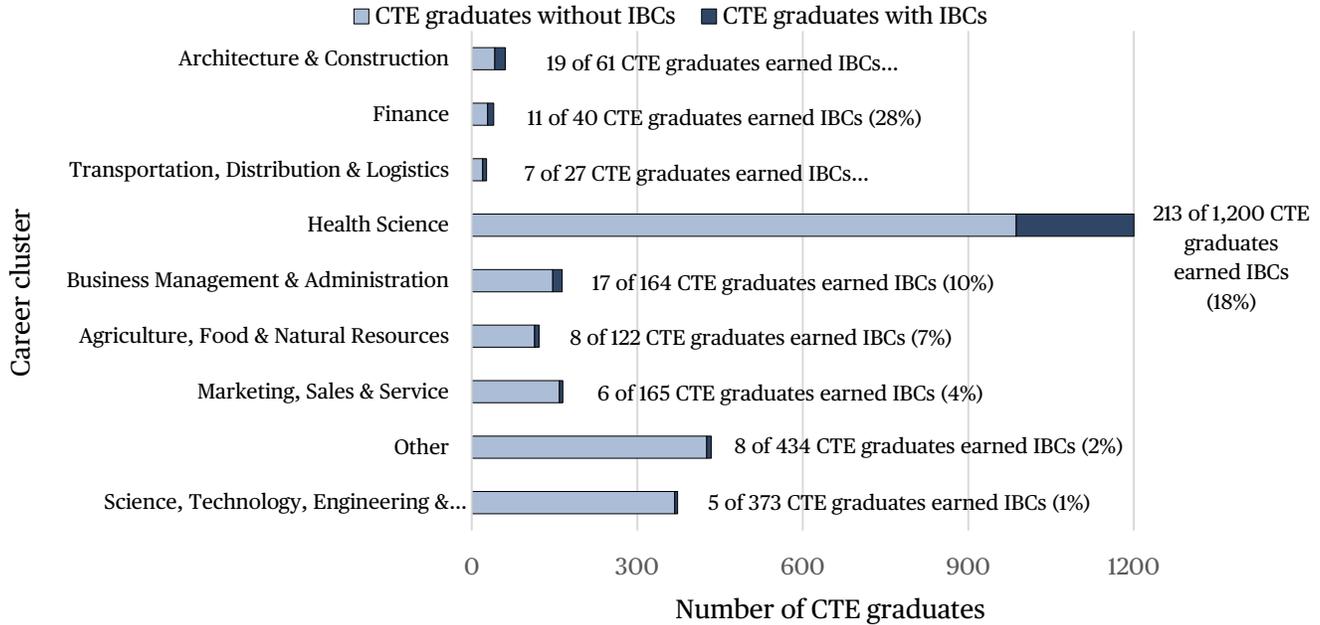
CTE is career and technical education.

Source: Authors' analysis based on data described in appendix A.

Eighteen percent of 2017/18 Round Rock Independent School District career and technical education graduates earned at least one industry-based certification before graduating from high school

Eighteen percent of the 2017/18 CTE graduates (the only cohort with available data) earned industry-based certifications. CTE graduates earned industry-based certifications in 11 of the 14 career clusters offered in Round Rock ISD, with the largest number of CTE graduates earning certifications in the Health Science career cluster (figure 3). The percentage of CTE graduates who earned industry-based certifications varied across career clusters. CTE graduates who completed programs of study in the Architecture & Construction career cluster earned the highest percentage of industry-based certifications (31 percent). Although industry-based certifications are not available in the Science, Technology, Engineering & Mathematics career cluster, 1 percent of CTE graduates completing programs of study in this career cluster earned an industry-based certification from another career cluster.

Figure 3. The percentage of 2017/18 Round Rock ISD career and technical education graduates who earned industry-based certifications varied by career cluster



CTE is career and technical education; IBC is industry-based certification.

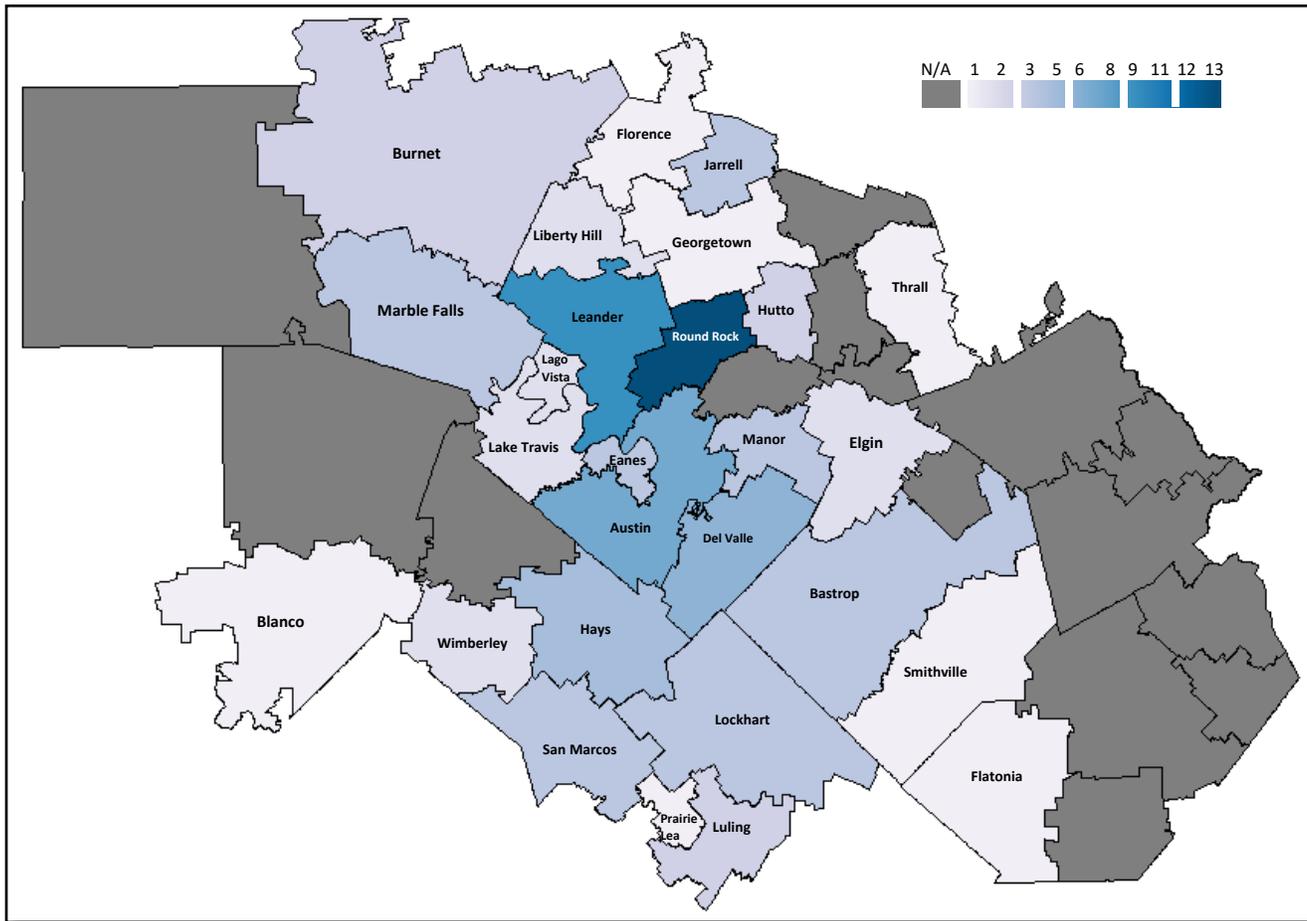
Note: Three career clusters were grouped into “Other” because of small sample sizes. Career clusters are sorted by the percentage of IBCs earned.

Source: Authors’ analysis based on data described in appendix A.

Thirteen of 32 career and technical education programs of study completed by Round Rock Independent School District graduates aligned with high-wage, in-demand career pathways

Of the 73 career pathways crosswalked to all occupations in Texas, 13 met all three thresholds for high-wage, in-demand career pathways in Central Texas (see bolded career pathways in figure B1 in appendix B). CTE graduates completed 32 of 33 CTE programs of study offered by the district from 2015/16 through 2017/18. Thirteen of the 33 CTE programs of study aligned to a high-wage, in-demand career pathway in Central Texas (table B3 in appendix B), which was the highest number of programs aligned to a high-wage, in-demand career pathway in the region. Of the 32 districts offering CTE in Central Texas, including Round Rock ISD, only five districts had more than five programs aligned to high-wage, in-demand career pathways, and seven districts had only one aligned program of study (map 1; table B4 in appendix B).

Map 1. The number of career and technical education programs of study offered in 2015/16 through 2017/18 that aligned with Central Texas high-wage, in-demand career pathways, by school district

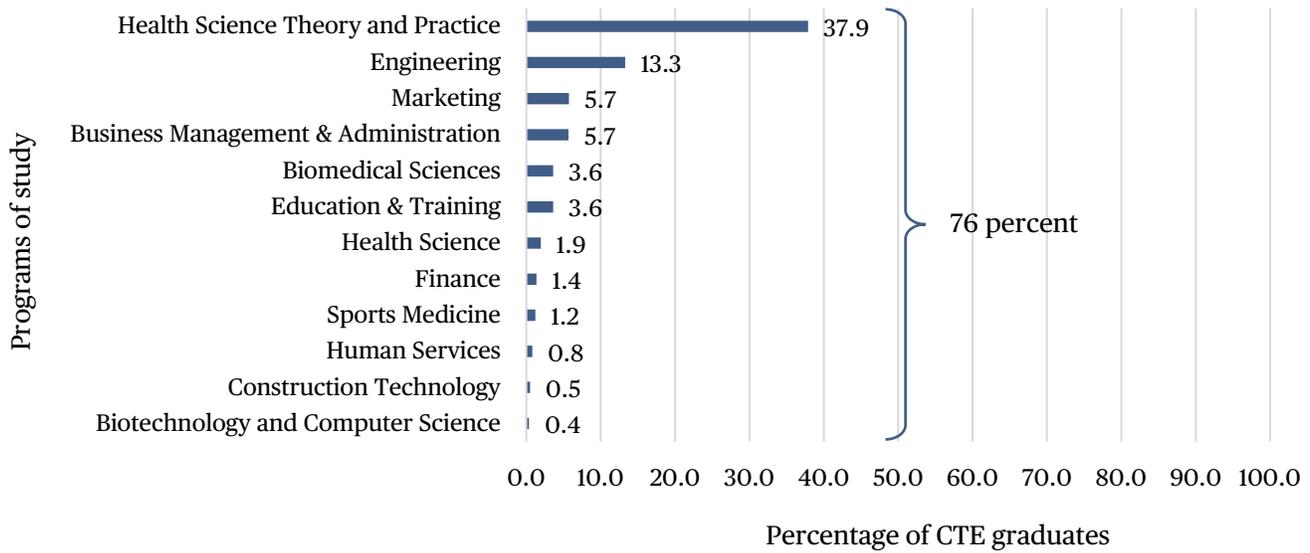


Note: Of the 15 districts shaded gray, 10 districts did not have career and technical education programs of study data on their website or in their course catalogs, and five districts were masked to protect confidentiality. Table B4 in appendix B contains a list of all districts in Central Texas. Source: Authors' analysis based on data described in appendix A.

Seventy-six percent of Round Rock Independent School District career and technical education graduates had completed programs of study aligned with high-wage, in-demand career pathways

Among three cohorts of CTE graduates (2015/16, 2016/17, and 2017/18), 76 percent completed at least one of the 13 programs of study aligned with high-wage, in-demand career pathways in the Central Texas labor market. The largest percentage of CTE graduates completing programs of study aligned with high-wage, in-demand career pathways was in the Health Science Theory and Practice program of study (figure 4). Table B5 in appendix B lists programs of study aligned with high-wage, in-demand career pathways and the percentages of CTE graduates for each program of study.

Figure 4. The percentage of career and technical education graduates from 2015/16, 2016/17, and 2017/18 completing programs of study in high-wage, in-demand career pathways varied across programs of study



CTE is career and technical education.

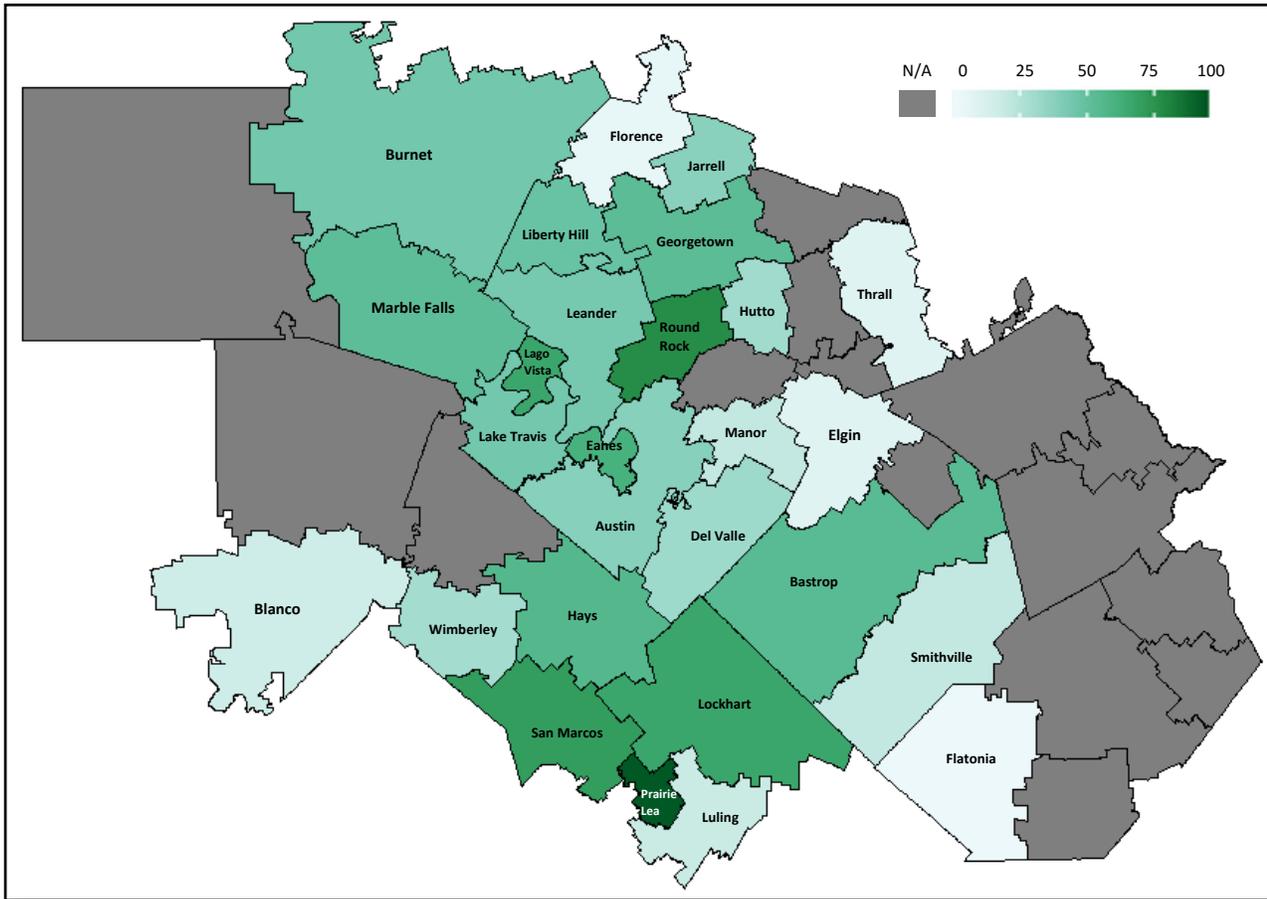
Note: CTE graduates completing Biotechnology and Computer Science programs of study were combined in the chart because of small sample sizes.

Source: Authors' analysis based on data described in appendix A.

The percentage of career and technical education graduates completing programs of study aligned with high-wage, in-demand career pathways varied across districts in Central Texas

The percentage of CTE graduates completing programs of study aligned with high-wage, in-demand career pathways in the Central Texas labor market varied across the 27 districts with available data (map 2). Ninety-three percent of CTE graduates from Prairie Lea ISD completed programs of study aligned with high-wage, in-demand career pathways—the highest percentage among the districts examined. More than 65 percent of CTE graduates from Round Rock ISD, San Marcos Consolidated ISD, Lockhart ISD, and Lago Vista ISD completed programs of study aligned with high-wage, in-demand career pathways (map 2; table B4 in appendix B).

Map 2. The percentage of 2015/16 through 2017/18 career and technical education graduates who completed programs of study aligned with Central Texas high-wage, in-demand career pathways, by school district

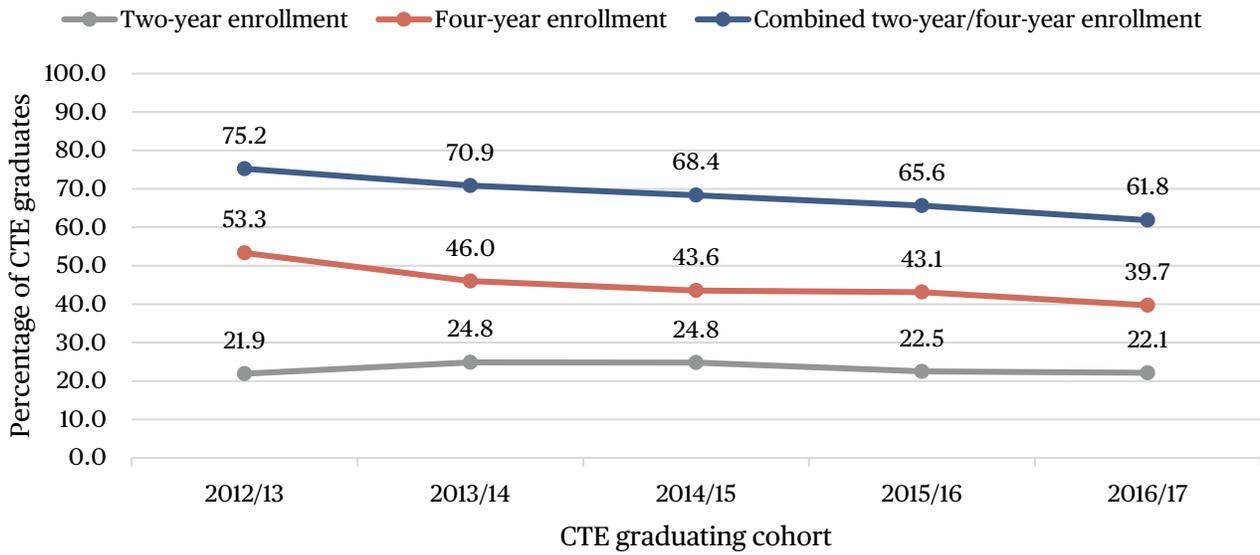


Note: Of the 15 districts shaded gray, 10 districts did not have career and technical education programs of study data on their website or in their course catalogs, and five districts were masked to protect confidentiality.
 Source: Authors' analysis based on data described in appendix A.

Four-year college enrollment rates decreased among Round Rock Independent School District career and technical education graduates while two-year college enrollment rates remained stable

Combined two- and four-year college enrollment rates within one year of graduation decreased from 75 percent for the 2012/13 cohort to 62 percent for the 2016/17 cohort of CTE graduates, although the number of CTE graduates in the earlier cohorts was small (figure 5; table B6 in appendix B). The two-year enrollment rate remained relatively stable, whereas the four-year enrollment rate decreased during the last five CTE graduating cohorts (figure 5). Combined two- and four-year college enrollment rates increased for each cohort the longer CTE graduates were followed postgraduation, with a more than 5 percentage point increase in enrollment rates for the first two cohorts five and four years after high school graduation, respectively (table B6 in appendix B).

Figure 5. Four-year college enrollment rates, within one year of high school graduation, decreased for the last five Round Rock Independent School District career and technical education graduating cohorts, whereas two-year enrollment remained relatively stable



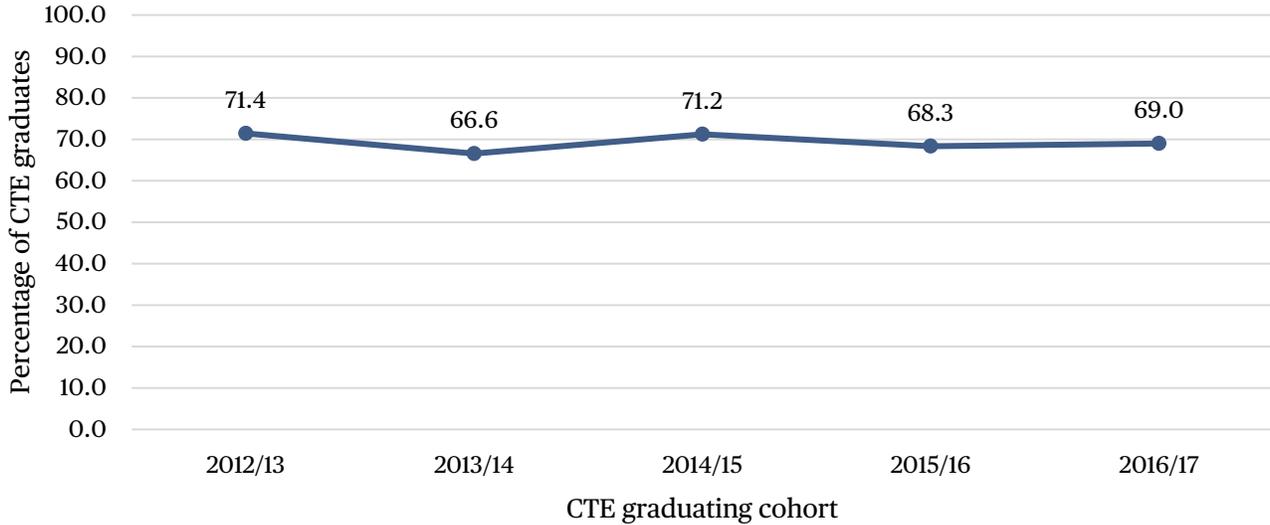
CTE is career and technical education.

Source: Authors' analysis based on data described in appendix A.

Employment rates within one year of high school graduation remained stable across Round Rock Independent School District career and technical education graduating cohorts

Employment among CTE graduates within one year of high school graduation ranged from 67 percent to 71 percent of CTE graduates across the years examined (figure 6). As expected, the longer CTE graduates were followed postgraduation, the higher the percentage of students employed across all cohorts (table B7 in appendix B).

Figure 6. Employment of Round Rock Independent School District career and technical education graduates within one year of high school graduation remained stable across the 2012/13 through 2016/17 cohorts



CTE is career and technical education.

Source: Authors’ analysis based on data described in appendix A.

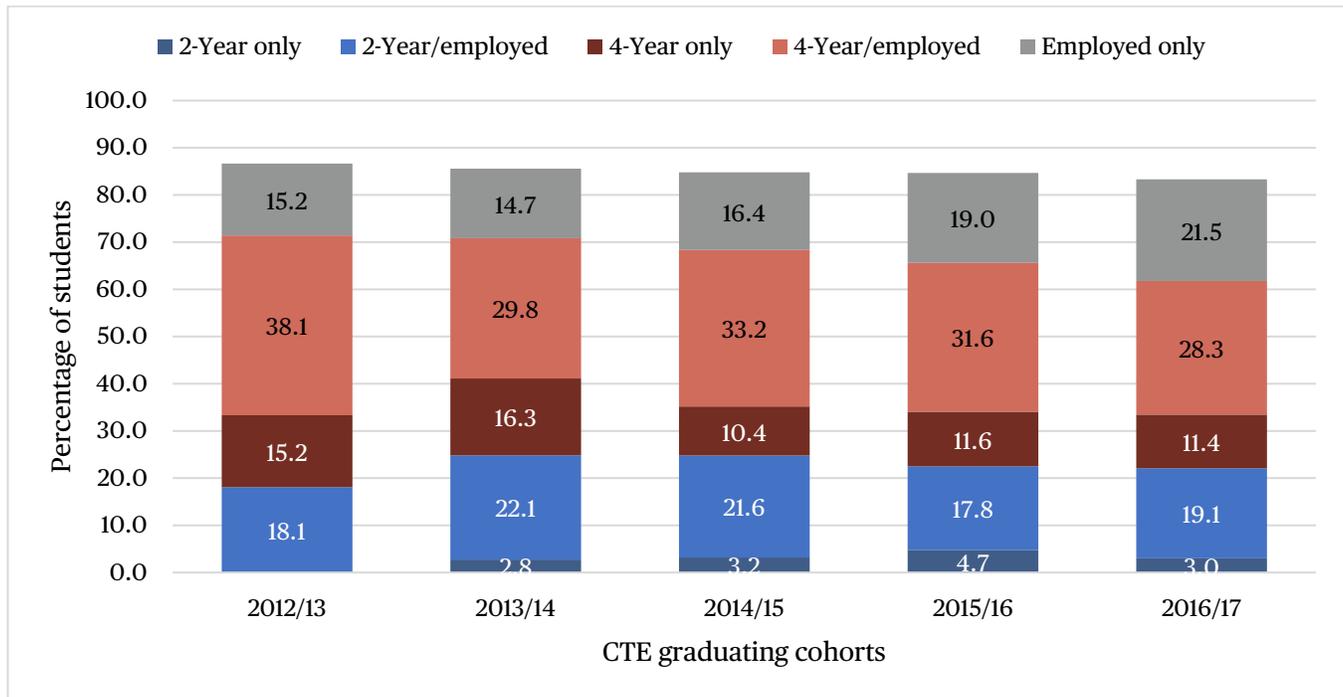
The percentage of Round Rock Independent School District career and technical education graduates directly entering the workforce—without also enrolling in college—increased for the last five cohorts

The percentage of CTE graduates who were employed without also enrolling in a two- or four-year college increased across the five cohorts examined (figure 7). The number of jobs that pay well without a bachelor’s degree increased 58 percent in Texas from 1991 to 2015, which could explain the increase in CTE graduates who were employed without also enrolling in a two- or four-year college (Carnevale, Strohl, & Ridley, 2017).¹ The annual unemployment rate in Texas also decreased during this period, from 6.3 percent in 2013 to 4.3 percent in 2017 (Texas Workforce Commission, 2020).

In 2018, Austin ranked as the strongest economy in the United States after experiencing consistent growth in the past 10 years (Policom Corporation, 2018).

¹ The Center on Education and the Workforce defines jobs that pay well without a bachelor’s degree as those with minimum earnings of \$35,000 for individuals younger than age 45.

Figure 7. The percentage of Round Rock Independent School District career and technical education graduates employed, without also enrolling in a two- or four-year college, within one year of high school graduation increased across the cohorts



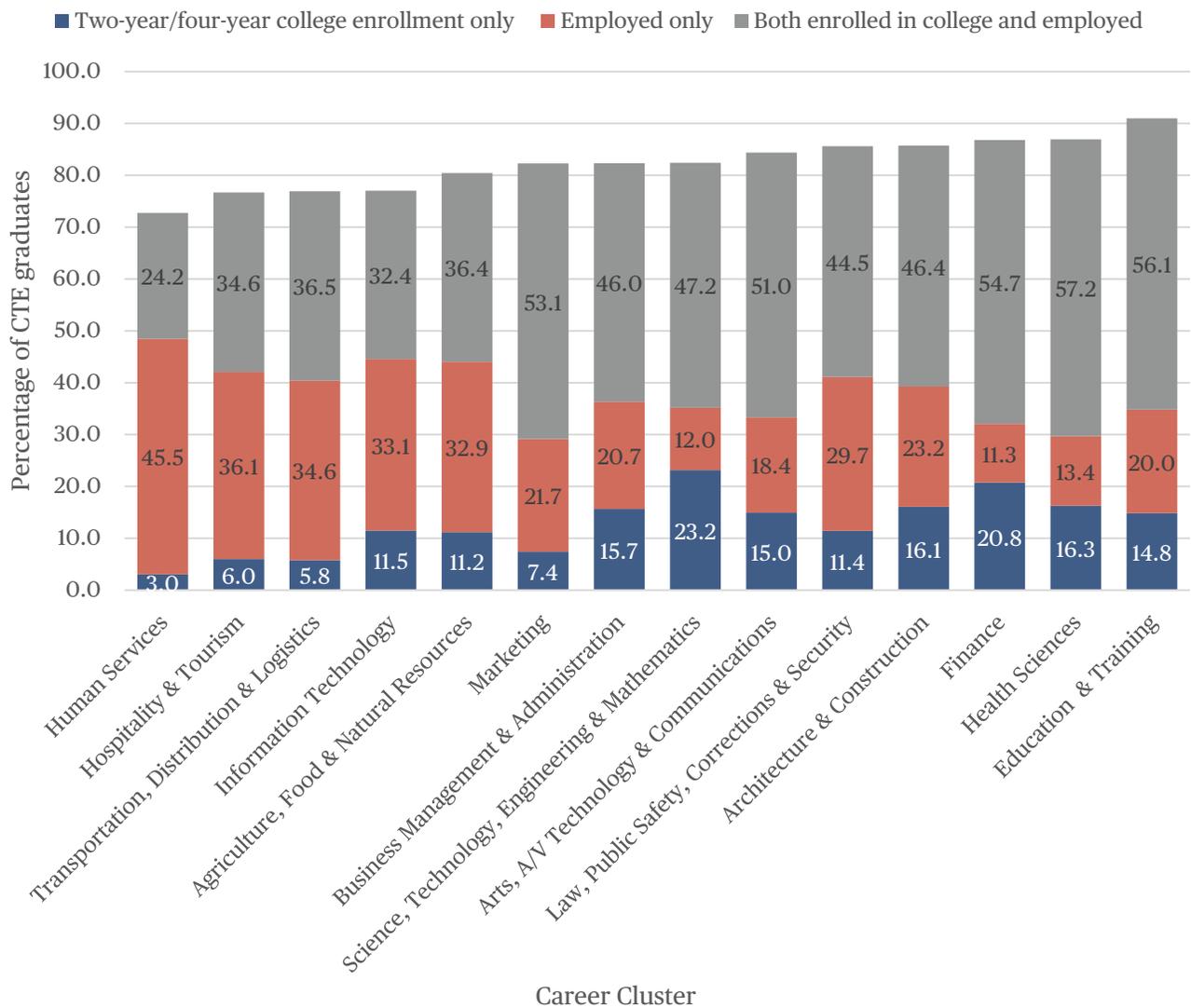
CTE is career and technical education.
 Source: Authors' analysis based on data described in appendix A.

The percentage of Round Rock Independent School District career and technical education graduates who were enrolled or employed within one year of high school graduation varied across career clusters

Of all CTE students who graduated during the past five years, the 4 percent of CTE students who graduated within the Education & Training career cluster had the highest percentage (91 percent) of graduates enrolled in two- or four-year colleges, employed, or both within one year of high school graduation. The Health Sciences career cluster, which represented 45 percent of CTE graduates, had the second highest percentage (86 percent) of CTE graduates enrolled in a two- or four-year college, employed, or both (figure 8).

The Human Services career cluster had the highest percentage of CTE graduates employed only (46 percent). Notably, the Human Services cluster in Round Rock ISD includes a program of study that aligns to a high-wage, in-demand career pathway in Central Texas. The Science, Technology, Engineering & Mathematics plus Finance career clusters had the highest percentages (23 percent and 21 percent, respectively) of CTE graduates enrolled in two- or four-year colleges only (figure 8).

Figure 8. The percentage of Round Rock Independent School District career and technical education graduates from 2012/13 to 2016/17 who were enrolled in a two- or four-year college, employed, or both enrolled and employed within one year of high school graduation varied across the career clusters



Note: Because of small sample sizes in some career clusters, career and technical education (CTE) graduates from all cohorts are combined for this analysis. Students enrolled in two- and four-year colleges out of state are included in the two-year/four-year college-only categories. Source: Authors' analysis based on data described in appendix A.

Few Round Rock Independent School District career and technical education graduates earned postsecondary degrees or certificates within the first three years of high school graduation

Less than 5 percent of CTE graduates in the 2012/13 through 2014/15 cohorts earned college degrees or certificates within the first three years after high school graduation (table B8 in appendix B). The percentage of CTE graduates earning degrees or certificates increased to 23 percent (2012/13 cohort) and 27 percent (2013/14 cohort) within four years of high school graduation and to 40 percent (2012/13

cohort) within five years of graduation (see table B8 in appendix B). A greater share of CTE graduates in 2012/13 through 2014/15 earned college degrees or certificates than high school graduates across Texas (table B9 in appendix B). Examining graduates within a three-year period following high school graduation provided the maximum number of cohorts that could be examined for a credential. The small percentage of CTE graduates earning degrees or certificates within three years was largely the result of relatively few graduates enrolling in a two-year college (see figure 5).

Implications

This study points to several implications for Round Rock ISD leaders to consider as they makes changes to their CTE programming.

Round Rock ISD leaders could use the information on the percentage of graduates and the demographic characteristics of graduates who completed CTE to encourage participation in CTE by all student groups. Almost half of 2017/18 Round Rock ISD graduates completed at least one CTE program of study, demonstrating the popularity of CTE to district students and the necessity of improving CTE programming for future career success. An exploration of potential barriers that prevent students from disadvantaged subgroups, including African American and Hispanic students, students in special education and students who are economically disadvantaged, from participating in CTE programs may inform efforts to recruit additional students from historically disadvantaged groups into CTE. Although the sample sizes by student groups were too small to examine CTE program of study completion and postsecondary outcomes in Round Rock ISD, it is important to examine these differences in future statewide research on CTE. All students should have the opportunity to access pathways that offer a family-sustaining wage at the outset of students' careers and opportunities for flexibility and growth in a changing labor market.

Round Rock ISD leaders could use the results regarding CTE programs of study completed by graduates during the past six years and the alignment of those programs to high-wage, in-demand career pathways in Central Texas to refine the CTE programs of study they offer. Seven programs of study had 10 or fewer students graduating within a program of study in the past six years. District leaders may consider these results when examining programs of study that were less popular and not in high-wage, in-demand career pathways (for example, Fashion Design, Floral Design, and Print Shop) to improve efficiencies and repurpose resources to more popular CTE programs, especially those aligned with high-wage, in-demand career pathways. District leaders also could use the results to identify aligned programs of study that were less popular (for example, Human Service, Construction Technology, Biotechnology, and Computer Science) and launch a campaign to expand enrollment in those least populated programs of study. District leaders also may consider promoting programs of study aligned with high-wage, in-demand career pathways to expose families and students to new pathways they might not have been aware of and partnering with local organizations to open up work-based learning opportunities for students in high-wage, in-demand career pathways.

Although stable during the study period, the low two-year enrollment rates and the increase in the percentage of students employed only suggests that Round Rock ISD leaders consider activities to encourage postsecondary enrollment and completion. District leaders could demonstrate for students

and families which colleges and universities in the region have credentials in high-wage, in-demand programs of study. Round Rock ISD could also work with Austin Community College (ACC) to align more of the high-wage, in-demand programs to its ACCTech Articulated Credit programs to assist students in making a smooth transition from high school to postsecondary or have ACC create more dual-credit CTE courses.² Obtaining college credits in high school could allow students to complete their postsecondary education sooner and enter the job market with advanced skills and a credential. For students who want to enter the labor market right after high school, district leaders could highlight the occupations that do not require a bachelor's degree from high-wage, in-demand programs of study. District leaders also could promote to students and families the benefits of earning an industry-based certification, which can further support students in transitioning to the workforce.

Finally, findings from the study provide information to inform Round Rock ISD leaders as they consider opening a CTE high school. Round Rock ISD leaders could gauge student interest in programs of study that are not currently offered but are aligned to high-wage, in-demand career pathways. For example, district leaders could offer Maintenance/Operations within the Architecture & Construction career cluster or Professional Support Services in the Education & Training career cluster if there was sufficient demand. The Health Science plus the Science, Technology, Engineering & Mathematics career clusters represent the largest number of CTE graduates and are offered in each Round Rock ISD high school. These two programs of study also aligned to high-wage, in-demand career pathways, and more than 85 percent of Health Sciences graduates enrolled in two- or four-year college and/or were employed within one year of graduation. Science, Technology, Engineering & Mathematics also represented the highest percentage of CTE graduates enrolled in two- or four-year colleges. Opening a CTE high school could allow Round Rock ISD to offer specialty Health Science courses and programs not currently offered.

Opening a CTE high school could help Round Rock ISD leaders promote relationships with other resources available in Austin. In 2016, The University of Texas at Austin opened Dell Medical School, which increased the possibility that Central Texas could become a biotech hub (Williams, 2016). The medical school and recent expansion of health facilities and companies in Central Texas could further expand opportunities for students graduating from a Health Science CTE high school and improve access to and training of CTE educators (Thompson, 2020). Therefore, expanding CTE through an additional high school may expand opportunities for students to enroll in postsecondary education and engage in occupations related to science, technology, engineering, and mathematics, which is one of the key initiatives the Texas Education Agency highlighted when developing the statewide Perkins V programs of study.

² See <https://sites.austincc.edu/acctech/> for more information about articulated courses at ACCTech.

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Appendix A. Data and methods

This appendix describes the data sources, population, and analysis methods.

Data sources

The study used deidentified student-level administrative data from Texas, which were available through the data repository at the Texas Education Research Center at the University of Texas, and supplemental publicly available data (table A1). Data stored at the Texas Education Research Center include public education information from preK-12 schools collected by the Texas Education Agency (TEA), information from both public and private higher education institutions collected by the Texas Higher Education Coordinating Board and the National Student Clearinghouse, and students' employment and earnings data (if employed within Texas) collected by the Texas Workforce Commission. In addition to these data, TEA's career and technical education (CTE) website, district websites, and the Texas labor market information website provided supplemental information to address the study's research questions.

Table A1. Data sources and key variables used in this study

Agency	Data source	Years	Key variables	Research question
TEA	Student enrollment	2009/10-2014/15	Gender, race/ethnicity, English learner status, economically disadvantaged status, special education status, and CTE program enrollment indicator	All
TEA	Graduation	2012/13-2017/18	Four-year graduation plan, CTE program completion indicator, and graduation date	All
TEA	Student demographics	2012/13-2017/18	Gender, race/ethnicity, English learner status, economically disadvantaged status, and special education status	All
TEA	Student course enrollment	2009/10-2017/18	CTE course enrollment, course completion, earned credit, and earned certificates; includes information that links student to their teachers	All
TEA	Course completion	2009/10-2017/18	CTE course enrollment, course completion, earned credit, and earned certificates during fall and spring semesters	All
TEA Career and Technical Education website	Public website	2019/20	CTE career clusters, CTE programs of study, and TEA-approved industry-based certifications (first collected by TEA in 2016/17)	All
District websites	CTE programs of study and courses	2019/20	Course catalogs describing CTE programs of study and courses needed for completion	2
Texas labor market information website	Public website	2016-2026	Existing occupations, projected occupations, projected percentage increase of occupations, and average annual wage	2

Agency	Data source	Years	Key variables	Research question
TWC	UI (year and quarter)	2013/14-2017/18	Quarterly reported employed occupation and wage amount	3
THECB	Public two-year, four-year, and independent four-year college enrollment	2013/14-2017/18	Two-year and four-year college enrollment within Texas	3
THECB	Public two-year, four-year, and independent four-year college credentials	2013/14-2017/18	Two- and four-year credential records, including certifications and degrees obtained within Texas	4
NSC	National student college enrollment and credentials	2013/14-2017/18	Two- and four-year college enrollment and two- and four-year credential records, including certifications and degrees obtained outside Texas	3, 4

CTE is career and technical education. NSC is the National Student Clearinghouse. TEA is the Texas Education Agency. TWC is the Texas Workforce Commission. THECB is the Texas Higher Education Coordinating Board. UI is Unemployment Insurance.

Note: Race/ethnicity subpopulations included White, Hispanic, Black, Asian, American Indian/Alaska Native, and Hawaiian Native/Pacific Islander students. These groups account for more than 95 percent of the high school student population. An “Other” category captures other races and ethnicities and students who have two or more races.

Source: Authors’ compilation.

High school data

Texas Education Agency data from the Education Research Center. TEA’s Public Education Information Management System database contains student-level records that capture data on multiple dimensions of public education in Texas, including student enrollment, demographics, graduation, retention, and departure from Texas public schools.³ For all four research questions, this study used the following data for the six cohorts of high school graduates examined: student demographic characteristics (gender, race/ethnicity, English learner status, economically disadvantaged status, and special education status) and student CTE records, including whether students participated in a CTE program of study as part of their four-year high school graduation plans, CTE courses completed, and any industry-based certifications earned.

Texas Education Agency publicly available data. Data from TEA’s [CTE website](#) provided supplemental CTE program information, including the list of TEA’s approved industry-based certifications used in public school accountability. TEA began collecting industry-based certifications earned by graduates beginning with the 2016/17 annual graduating cohort.

Publicly available district data. Before Perkins V, TEA did not publish a list of all possible CTE pathways and associated courses. Districts constructed their own pathways to meet the criteria for CTE programs of study. To identify the CTE program of study for each CTE graduate, the research team associated each course completed with the districts’ CTE program of study using district course

³ All districts in Texas must submit Public Education Information Management System (PEIMS) data. Districts submit PEIMS data files in accordance with the PEIMS Data Standards, which provide instructions for submitting PEIMS data and ensure the quality and completion of data input.

catalogs, which are available on district websites. The course catalogs typically contained information on the programs of study offered in the district and the list of courses required for completing each program of study. Ten districts had no information about their CTE programs of study or had information limited to the career cluster. The current 2019/20 CTE course catalog was applied to all graduating cohorts because districts only posted their most recent catalog; using the 2019/20 catalog standardized the programs of study across the six cohorts within each district.

Workforce data

Texas Workforce Commission data from the Education Research Center. The research team used unemployment insurance data on employment and wages, available from the Texas Workforce Commission, to answer research question 3. These data track employment information for people who are paid wages within Texas, including quarterly data on total pretax wages, occupational classifications, the number of employers, and employment locations.

Publicly available data from Texas Workforce Commission labor market statistics. The research team used data on projected Central Texas labor market statistics from the [Texas labor market information website](#) to answer research question 2. This website stores Texas labor force and employment data at both the regional and the state levels for the 10-year window from 2016 to 2026. This website provides workforce statistics, including current employment in base year 2016, the projected employment in 2026, the projected percentage change in employment from 2016 to 2026, average annual job openings, and the annual wage (as of 2017) for each occupational category for all 28 regions in Texas (see <https://texaswages.com/Projections>).

Publicly available data from O*NET. To classify occupations by career clusters and career pathways, the research team used the Standard Occupational Classification taxonomy created by [O*NET OnLine](#). Standard Occupational Classification is a statistical standard that federal agencies use to classify workers into occupational categories. Federal agencies created 867 detailed occupations from which they created 459 broad occupations, 98 minor groups, and 23 major groups, based on required job skills, education, and/or training. O*NET crosswalks all Standard Occupational Classifications to career clusters and career pathways.⁴ The research team used the O*NET taxonomy as occupation identifiers to link CTE programs of study and the career pathways in Texas (table A2).

Table A2. O*NET Standard Occupational Classification codes mapped to career and technical education career clusters and career pathways

Career cluster	Career pathway	Number of SOC/occupation categories	SOC/occupation category
Agriculture, Food & Natural Resources	Agribusiness Systems	6	11-9013.03, 13-1021.00, 11-9013.02, 13-1074.00, 11-9013.00, 11-9013.01
	Animal Systems	4	45-2021.00, 19-1011.00, 45-2093.00, 39-2021.00
	Environmental Service Systems	8	17-3025.00, 17-2081.00, 19-4091.00, 47-4041.00, 37-2021.00, 53-7081.00, 51-8031.00, 17-2081.01

⁴ The last revision to the taxonomy occurred in 2010.

Career cluster	Career pathway	Number of SOC/occupation categories	SOC/occupation category
	Food Products and Processing Systems	10	19-4011.00, 19-4011.01, 45-1011.07, 45-1011.08, 45-1011.06, 45-1011.00, 45-1011.05, 19-4011.02, 19-1012.00, 45-2041.00
	Natural Resources Systems	16	11-9121.01, 45-4021.00, 45-3011.00, 19-4093.00, 45-4011.00, 19-1032.00, 19-4041.00, 19-4041.02, 19-4041.01, 45-3021.00, 45-4023.00, 45-4022.00, 45-4029.00, 11-9121.00, 11-9121.02, 19-1023.00
	Plant Systems	8	45-2099.00, 19-4021.00, 45-2092.02, 45-2092.00, 45-2092.01, 37-3012.00, 19-1013.00, 37-3013.00
	Power, Structural & Technical Systems	3	17-2021.00, 45-2091.00, 49-3041.00
Architecture & Construction	Construction	67	47-2021.00, 47-2031.00, 47-2041.00, 47-2051.00, 47-2031.01, 47-2061.00, 11-9021.00, 47-5041.00, 53-7011.00, 53-7021.00, 47-5011.00, 53-7031.00, 47-2081.00, 47-5021.00, 47-2111.00, 53-7032.00, 47-5031.00, 47-5099.00, 47-4031.00, 47-1011.00, 47-2042.00, 47-2043.00, 47-2121.00, 47-3019.00, 47-3011.00, 47-3012.00, 47-3013.00, 47-5081.00, 47-3014.00, 47-3015.00, 47-3016.00, 53-7041.00, 47-2131.00, 47-2132.00, 53-7033.00, 49-9095.00, 47-5042.00, 47-5049.00, 47-2073.00, 47-2141.00, 47-2142.00, 47-2071.00, 47-2072.00, 47-2152.01, 47-2151.00, 47-2161.00, 47-2152.02, 47-2152.00, 47-2171.00, 49-9096.00, 47-5051.00, 47-5061.00, 47-2181.00, 47-5012.00, 47-2031.02, 47-5071.00, 47-4091.00, 47-5013.00, 47-2211.00, 47-1011.03, 47-2231.00, 47-2022.00, 47-2221.00, 51-2041.00, 47-2082.00, 47-2053.00, 47-2044.00
	Design/Pre-Construction	15	17-1011.00, 17-3011.00, 17-3011.01, 17-3011.02, 17-3022.00, 17-2051.00, 13-1051.00, 17-1022.01, 27-1025.00, 17-1012.00, 17-3031.02, 17-3031.00, 17-3031.01, 17-1022.00, 17-2051.01
	Maintenance/Operations	21	47-2011.00, 49-9092.00, 47-4099.00, 49-9012.00, 49-9051.00, 47-4021.00, 37-1012.00, 37-3019.00, 49-9021.01, 49-9021.00, 49-9098.00, 47-4051.00, 37-3011.00, 49-9011.00, 49-9044.00, 49-9045.00, 49-9021.02, 47-4071.00, 47-4099.02, 51-8021.00, 47-4099.03
Arts, A/V Technology & Communications	Journalism and Broadcasting	17	27-4011.00, 27-3021.00, 27-4012.00, 27-4031.00, 27-3043.04, 27-3041.00, 27-4032.00, 27-4099.00, 27-3099.00, 27-4021.00, 27-3043.05, 27-3011.00, 27-4013.00, 27-3022.00, 27-4014.00, 27-3042.00, 27-3043.00
	Performing Arts	20	27-2011.00, 13-1011.00, 27-2032.00, 39-3092.00, 27-2031.00, 27-2012.02, 27-2099.00, 39-5091.00, 27-2041.04, 27-2041.01, 27-2041.00, 27-2042.00, 27-2042.02, 27-2012.01, 27-2012.00, 27-2012.03, 27-3012.00, 27-2042.01, 27-2012.04, 27-2012.05
	Printing Technology	5	43-9031.00, 51-5111.00, 51-5113.00, 51-5112.00, 43-9081.00
	Telecommunications	2	49-2022.00, 49-9052.00

Career cluster	Career pathway	Number of SOC/occupation categories	SOC/occupation category
	Visual Arts	11	27-1011.00, 27-1019.00, 27-1021.00, 27-1012.00, 27-1029.00, 27-1022.00, 27-1013.00, 27-1023.00, 27-1024.00, 27-1014.00, 27-1027.00
Business Management & Administration	Administrative Support	37	43-3031.00, 43-2099.00, 43-9011.00, 43-4021.00, 43-4051.00, 43-9021.00, 43-6011.00, 43-4071.00, 43-1011.00, 43-4161.00, 43-4199.00, 43-4111.00, 43-4121.00, 43-9051.00, 43-5081.02, 43-5041.00, 43-4141.00, 43-9199.00, 43-9061.00, 43-9071.00, 43-4151.00, 43-5081.04, 43-4051.03, 43-3051.00, 43-5051.00, 43-5052.00, 43-5053.00, 43-3061.00, 43-4171.00, 43-6014.00, 43-5071.00, 43-5081.00, 43-5081.01, 43-5081.03, 43-2011.00, 43-2021.00, 43-9022.00
	Business Information Management	1	11-3021.00
	General Management	13	11-9199.11, 11-1011.00, 11-1011.03, 11-9199.02, 11-1021.00, 11-9199.03, 11-9199.08, 11-9199.00, 11-9199.01, 11-9199.07, 11-9199.04, 11-9199.09, 11-9199.10
	Human Resources Management	7	11-3111.00, 13-1141.00, 11-3121.00, 13-1071.00, 13-1075.00, 11-3131.00, 13-1151.00
	Operations Management	20	11-3011.00, 11-3051.03, 11-3051.04, 13-1199.04, 13-1199.00, 13-1199.03, 13-1199.01, 13-1131.00, 11-3051.02, 11-3051.06, 11-3051.00, 13-1111.00, 13-1121.00, 11-3051.05, 13-1199.06, 15-2031.00, 11-3061.00, 11-3051.01, 13-1199.02, 13-1199.05
Education & Training	Administration and Administrative Support	6	11-9039.01, 11-9039.00, 11-9032.00, 11-9033.00, 11-9031.00, 11-9039.02
	Professional Support Services	10	25-4011.00, 25-9011.00, 25-4012.00, 21-1012.00, 25-9031.00, 25-9031.01, 27-3091.00, 25-4021.00, 25-4031.00, 25-4013.00
	Teaching/Training	59	25-2059.01, 25-3011.00, 25-1041.00, 25-1061.00, 25-1031.00, 25-1062.00, 25-1121.00, 25-1051.00, 25-1042.00, 25-1011.00, 25-2023.00, 25-2032.00, 25-1052.00, 27-2022.00, 25-1122.00, 25-1021.00, 25-1111.00, 25-1063.00, 25-1081.00, 25-9099.00, 25-2021.00, 25-1032.00, 25-1123.00, 25-1053.00, 25-9021.00, 25-1124.00, 25-1043.00, 25-1064.00, 25-1191.00, 25-1071.00, 25-1125.00, 25-1192.00, 25-2012.00, 25-1112.00, 25-1082.00, 25-1022.00, 25-2022.00, 25-1072.00, 25-1126.00, 25-1054.00, 25-1065.00, 25-1199.00, 25-2011.00, 25-1066.00, 25-1193.00, 25-2031.00, 25-3021.00, 25-1069.00, 25-1113.00, 25-1067.00, 25-2059.00, 25-2052.00, 25-2053.00, 25-2051.00, 25-2054.00, 25-9041.00, 25-3099.00, 25-3099.02, 25-1194.00
Finance	Accounting	3	13-2011.01, 13-2011.00, 13-2011.02
	Banking Services	9	43-3011.00, 13-2041.00, 43-4041.01, 43-4041.00, 43-4041.02, 43-3099.00, 43-4131.00, 13-2072.00, 43-3071.00

Career cluster	Career pathway	Number of SOC/occupation categories	SOC/occupation category
	Business Finance	6	13-2031.00, 13-2051.00, 11-3031.00, 11-3031.02, 13-2082.00, 11-3031.01
	Insurance	10	15-2011.00, 13-1031.00, 13-1031.01, 13-1031.02, 13-1032.00, 43-9041.00, 43-9041.01, 43-9041.02, 41-3021.00, 13-2053.00
	Securities & Investments	11	43-4011.00, 13-2099.01, 13-2099.00, 13-2099.04, 13-2099.03, 13-2052.00, 13-2099.02, 41-3031.02, 41-3031.01, 41-3031.03, 41-3031.00
Government & Public Administration	Governance	13	53-6051.01, 13-1041.00, 13-1041.06, 13-1041.01, 13-1041.03, 13-2061.00, 53-6051.08, 13-1041.04, 11-1031.00, 13-1041.02, 13-1041.07, 53-6051.00, 53-6051.07
	National Security	21	55-3011.00, 55-1011.00, 55-1012.00, 55-3012.00, 55-3013.00, 55-1013.00, 55-3014.00, 55-1014.00, 55-1015.00, 55-3015.00, 55-2011.00, 55-2013.00, 55-2012.00, 55-3016.00, 55-1016.00, 55-3019.00, 55-1019.00, 55-3017.00, 55-3018.00, 55-1017.00, 33-9093.00
	Planning	3	43-9111.01, 43-9111.00, 19-3051.00
	Public Management and Administration	7	43-4031.01, 43-4031.00, 43-4061.00, 11-9161.00, 43-4031.03, 43-4031.02, 11-9131.00
	Regulation	4	45-2011.00, 47-4011.00, 29-9011.00, 29-9012.00
	Revenue and Taxation	4	13-2021.00, 13-2021.02, 13-2021.01, 13-2081.00
Health Science	Biotechnology Research and Development	2	17-2031.00, 19-1042.00
	Diagnostic Services	17	29-2031.00, 29-2011.01, 29-2011.02, 29-2032.00, 19-1041.00, 29-2099.00, 29-2011.03, 29-2035.00, 29-2012.00, 29-2011.00, 29-2099.01, 29-2033.00, 29-2099.05, 29-2099.06, 29-2034.00, 29-2099.07, 29-2056.00
	Health Informatics	3	29-2071.00, 43-6013.00, 31-9094.00
	Support Services	9	31-9099.02, 31-9099.00, 11-9111.00, 31-9093.00, 31-1015.00, 31-9095.00, 31-9097.00, 31-9099.01, 31-9096.00
	Therapeutic Services	81	29-1199.01, 29-1141.01, 29-1141.02, 29-1069.01, 29-1071.01, 29-1061.00, 29-1125.01, 29-9091.00, 29-1181.00, 29-1011.00, 29-1141.04, 29-1141.03, 31-9091.00, 29-2021.00, 29-1029.00, 29-1021.00, 29-1069.02, 29-2051.00, 29-1031.00, 29-1128.00, 29-1062.00, 29-9092.00, 29-1199.00, 29-9099.00, 29-2092.00, 31-1011.00, 29-1069.03, 29-1063.00, 29-2061.00, 29-1122.01, 31-9092.00, 29-9099.01, 29-1125.02, 29-1199.04, 29-1069.04, 29-1069.05, 29-1151.00, 29-1161.00, 29-1171.00, 31-1014.00, 29-1064.00, 29-1122.00, 31-2012.00, 31-2011.00, 29-2057.00, 29-1069.06, 29-2081.00, 29-1041.00, 29-1022.00,

Career cluster	Career pathway	Number of SOC/occupation categories	SOC/occupation category
			29-1023.00, 29-1199.05, 29-2091.00, 29-1069.07, 29-1065.00, 29-1051.00, 29-2052.00, 29-1069.08, 31-2022.00, 31-2021.00, 29-1123.00, 29-1071.00, 29-1069.00, 29-1081.00, 29-1069.09, 29-1024.00, 31-1013.00, 29-2053.00, 29-1066.00, 29-1124.00, 29-1069.10, 29-1125.00, 29-1141.00, 29-1126.00, 29-2054.00, 29-1127.00, 29-1069.11, 29-1067.00, 29-2055.00, 29-1129.00, 29-1069.12, 29-1131.00
Hospitality & Tourism	Lodging	8	39-6011.00, 37-2019.00, 39-6012.00, 37-1011.00, 43-4081.00, 37-2011.00, 11-9081.00, 37-2012.00
	Recreation, Amusements & Attractions	16	39-3091.00, 39-2011.00, 27-2021.00, 39-3099.00, 39-3012.00, 43-3041.00, 41-2012.00, 39-3011.00, 11-9071.00, 39-3019.00, 39-1011.00, 39-3021.00, 39-9032.00, 39-1012.00, 27-2023.00, 39-3031.00
	Restaurants and Food/Beverage Services	21	51-3011.00, 35-3022.01, 35-3011.00, 35-1011.00, 35-3021.00, 35-2019.00, 35-2011.00, 35-2012.00, 35-2013.00, 35-2014.00, 35-2015.00, 35-3022.00, 35-9011.00, 35-9021.00, 35-1012.00, 35-9099.00, 35-2021.00, 35-3041.00, 11-9051.00, 35-9031.00, 35-3031.00
	Travel & Tourism	4	43-4181.00, 39-7011.00, 41-3041.00, 39-7012.00
Human Services	Consumer Services	2	13-2071.00, 13-2071.01
	Counseling & Mental Health Services	13	19-3031.02, 19-3031.00, 19-3031.03, 21-1019.00, 19-3032.00, 21-1013.00, 21-1023.00, 21-1014.00, 19-3039.01, 19-3039.00, 21-1015.00, 19-3031.01, 21-1011.00
	Early Childhood Development & Services	2	39-9011.00, 39-9011.01
	Family & Community Services	11	21-1021.00, 21-2011.00, 21-1099.00, 21-1094.00, 21-2021.00, 21-1091.00, 21-1022.00, 21-2099.00, 11-9151.00, 21-1093.00, 21-1029.00
	Personal Care Services	20	39-5011.00, 39-4011.00, 39-1021.00, 39-9031.00, 39-4021.00, 11-9061.00, 39-5012.00, 51-6011.00, 39-3093.00, 39-5092.00, 31-9011.00, 39-4031.00, 39-9021.00, 39-9099.00, 51-6021.00, 39-9041.00, 39-5093.00, 39-5094.00, 39-1021.01, 51-6052.00
Information Technology	Information Support and Services	14	15-1199.08, 15-1199.00, 15-1199.02, 15-1151.00, 15-1199.07, 15-1199.06, 15-1199.12, 15-1199.05, 15-1199.04, 15-1199.09, 15-1199.10, 15-1199.01, 15-1199.11, 15-1199.03
	Network Systems	6	15-1143.00, 15-1152.00, 15-1141.00, 15-1122.00, 15-1142.00, 15-1143.01
	Programming and Software Development	5	15-1131.00, 15-1121.00, 15-1121.01, 15-1132.00, 15-1133.00
	Web and Digital Communications	1	15-1134.00
Law, Public	Correction Services	3	33-3012.00, 33-1011.00, 21-1092.00

Career cluster	Career pathway	Number of SOC/occupation categories	SOC/occupation category
Safety, Corrections & Security	Emergency and Fire Management Services	12	29-2041.00, 33-2021.01, 33-2021.00, 33-2021.02, 33-2011.00, 33-1021.00, 33-1021.02, 33-2022.00, 33-2011.02, 33-1021.01, 33-2011.01, 43-5031.00
	Law Enforcement Services	16	33-9011.00, 33-3021.03, 33-3021.00, 33-1012.00, 33-3031.00, 19-4092.00, 33-3021.05, 33-3021.06, 33-3041.00, 33-3051.00, 33-3021.01, 33-3021.02, 33-3051.01, 33-9021.00, 33-3051.03, 33-3052.00
	Legal Services	10	23-1021.00, 23-1022.00, 23-2091.00, 23-1023.00, 23-1012.00, 23-1011.00, 43-6012.00, 23-2099.00, 23-2011.00, 23-2093.00
	Security & Protective Services	8	33-3011.00, 33-9091.00, 33-1099.00, 33-9031.00, 33-9092.00, 33-9099.00, 33-9099.02, 33-9032.00
Manufacturing	Maintenance, Installation & Repair	26	49-9061.00, 49-9091.00, 49-2011.00, 49-2092.00, 49-2094.00, 49-2095.00, 49-2097.00, 49-9093.00, 49-1011.00, 49-9099.01, 49-9031.00, 49-9041.00, 49-9099.00, 49-9094.00, 49-9071.00, 49-9043.00, 51-9082.00, 49-9062.00, 49-9063.00, 49-3053.00, 49-9069.00, 49-2021.01, 49-2021.00, 49-2098.00, 49-9064.00, 49-9081.00
	Manufacturing Production Process Development	32	17-3021.00, 17-3027.01, 19-4031.00, 17-3019.00, 17-3023.00, 17-3012.00, 17-3012.02, 17-3023.03, 17-3029.02, 17-3024.00, 17-3029.03, 17-3012.01, 17-3023.01, 17-3029.04, 17-3029.00, 17-3029.10, 17-3026.00, 17-3029.05, 17-3029.06, 17-3029.09, 17-3013.00, 17-3027.00, 17-3029.07, 17-3029.12, 17-3029.11, 17-3029.01, 19-4051.01, 19-4051.02, 19-4051.00, 17-3029.08, 13-1023.00, 17-3024.01
	Production	111	51-9191.00, 51-2011.00, 51-2099.00, 51-8099.01, 51-8099.03, 51-3021.00, 51-7011.00, 51-9011.00, 51-8091.00, 51-9192.00, 51-9121.00, 51-2021.00, 51-4012.00, 51-4011.00, 51-9193.00, 51-9021.00, 51-9031.00, 51-9032.00, 51-4031.00, 51-9081.00, 51-4032.00, 51-2022.00, 51-2023.00, 51-2031.00, 51-9194.00, 51-4021.00, 51-6091.00, 51-9041.00, 51-6092.00, 51-2091.00, 51-1011.00, 51-3091.00, 51-3092.00, 51-3093.00, 51-3099.00, 51-4022.00, 51-4071.00, 51-9051.00, 51-7021.00, 51-8092.00, 51-9071.06, 51-9195.04, 51-9022.00, 51-4033.00, 51-4191.00, 51-9198.00, 51-8099.04, 51-9071.01, 51-9071.00, 51-4034.00, 51-4192.00, 53-7063.00, 51-4041.00, 51-3022.00, 51-4199.00, 51-4051.00, 51-8099.02, 51-4035.00, 51-9023.00, 51-4061.00, 51-7031.00, 51-9195.00, 51-9195.07, 51-4072.00, 51-4081.00, 51-8011.00, 51-9083.00, 51-9111.00, 51-9122.00, 51-9123.00, 51-9196.00, 51-4062.00, 51-7032.00, 51-8093.00, 51-9151.00, 51-8099.00, 51-4193.00, 51-9195.05, 51-4052.00, 51-8012.00, 51-8013.00, 51-9071.07, 51-9199.00, 51-9199.01, 51-4023.00, 51-7041.00, 51-9141.00, 51-9012.00, 51-6051.00, 51-6031.00, 51-6041.00, 51-6042.00, 51-3023.00, 51-4121.07, 51-9195.03, 51-2092.00,

Career cluster	Career pathway	Number of SOC/occupation categories	SOC/occupation category
			51-6061.00, 51-6062.00, 51-6063.00, 51-6064.00, 51-6099.00, 51-2093.00, 51-9197.00, 51-4111.00, 51-4194.00, 51-6093.00, 51-4121.06, 51-4121.00, 51-4122.00, 51-7099.00, 51-7042.00
	Quality Assurance	3	51-9061.00, 43-5061.00, 43-5111.00
Marketing	Marketing Communications	1	27-3031.00
	Marketing Management	6	11-2011.00, 11-2011.01, 11-2021.00, 11-9141.00, 11-2031.00, 11-2022.00
	Marketing Research	1	13-1161.00
	Merchandising	3	27-1026.00, 41-9012.00, 13-1022.00
	Professional Sales	20	41-3011.00, 41-2011.00, 41-2021.00, 41-9011.00, 41-9091.00, 53-3031.00, 41-3099.01, 41-1012.00, 41-1011.00, 41-2022.00, 41-9021.00, 41-9022.00, 41-2031.00, 41-9099.00, 41-9031.00, 41-3099.00, 41-4012.00, 41-4011.00, 41-4011.07, 41-9041.00
Science, Technology, Engineering & Mathematics	Engineering and Technology	36	17-2011.00, 11-9041.00, 17-2141.02, 17-2199.01, 11-9041.01, 17-2041.00, 17-2061.00, 17-2071.00, 17-2072.00, 17-2199.03, 17-2199.00, 17-2111.02, 17-2141.01, 17-2111.00, 17-2112.01, 17-2112.00, 17-2111.01, 17-2199.04, 17-2121.02, 17-2121.01, 17-2121.00, 17-2131.00, 17-2141.00, 17-2199.05, 17-2199.06, 17-2151.00, 17-2199.09, 17-2161.00, 17-2171.00, 17-2199.07, 17-2111.03, 17-2072.01, 17-2199.08, 17-2199.11, 17-2199.02, 17-2199.10
	Science and Mathematics	50	19-3091.01, 19-3091.00, 19-3091.02, 19-2011.00, 19-2021.00, 19-1021.00, 19-1029.01, 19-1029.00, 15-2041.01, 17-1021.00, 19-2031.00, 19-4061.01, 19-2041.01, 15-2041.02, 15-1111.00, 19-1031.00, 19-3011.00, 19-3011.01, 19-2041.02, 19-2041.00, 19-1029.03, 19-3092.00, 19-2042.00, 19-3093.00, 19-2043.00, 19-2041.03, 19-1099.00, 19-4099.00, 19-2032.00, 15-2099.00, 15-2091.00, 15-2021.00, 19-1022.00, 19-1029.02, 19-1031.03, 19-2099.00, 19-2012.00, 19-3094.00, 19-4099.02, 19-4099.01, 19-1031.02, 19-2099.01, 19-4099.03, 19-4061.00, 19-3099.00, 19-3041.00, 19-1031.01, 15-2041.00, 19-3022.00, 19-3099.01
Transportation, Distribution & Logistics	Facility and Mobile Equipment Maintenance	21	49-3011.00, 53-6031.00, 49-3021.00, 49-3022.00, 49-3023.01, 49-3023.00, 49-3023.02, 49-2091.00, 49-3091.00, 49-3031.00, 53-7061.00, 49-2093.00, 49-2096.00, 49-3042.00, 49-3051.00, 49-3052.00, 49-3043.00, 47-4061.00, 49-3092.00, 49-9097.00, 49-3093.00
	Logistics Planning and Management Services	8	43-5032.00, 13-1081.00, 13-1081.02, 13-1081.01, 11-3071.03, 11-3071.02, 11-3071.01, 11-3071.00
	Sales and Service	6	43-3021.00, 43-3021.02, 43-5011.00, 43-5011.01, 53-6021.00, 43-3021.01
	Transportation	41	53-1011.00, 53-2011.00, 53-3011.00, 53-6011.00,

Career cluster	Career pathway	Number of SOC/occupation categories	SOC/occupation category
	Operations		53-3022.00, 53-3021.00, 53-5021.00, 53-2012.00, 43-5021.00, 53-1021.00, 53-1031.00, 53-2031.00, 53-7071.00, 53-3032.00, 53-7051.00, 53-7062.00, 53-3033.00, 53-4011.00, 53-4012.00, 53-7199.00, 53-5021.02, 53-7111.00, 53-3099.00, 53-5022.00, 53-7064.00, 53-5021.03, 53-7072.00, 53-4099.00, 53-4013.00, 53-4021.00, 53-4031.00, 53-1021.01, 53-5011.00, 53-5021.01, 53-5031.00, 53-4041.00, 53-7121.00, 53-3041.00, 53-6061.00, 53-6099.00, 53-7073.00
	Transportation Systems/ Infrastructure Planning, Management and Regulation	3	53-2021.00, 53-2022.00, 53-6041.00

SOC is Standard Occupational Classification.

Note: This taxonomy was last revised with the 2010 SOC codes. In this version, the following six career pathways were not mapped against SOC codes: A/V Technology & Film; Foreign Service; Health, Safety & Environmental Assurance; Health, Safety & Environmental Management; Logistics & Inventory Control; and Warehousing & Distribution Center Operations.

Source: Mapping of SOC codes to career clusters and pathways is available at [O*NET OnLine](#).

Postsecondary education data

Texas Higher Education Coordinating Board and National Student Clearinghouse data from the Education Research Center. The Texas Higher Education Coordinating Board and the National Student Clearinghouse datasets contain records of students' college enrollment, degree, and certificate attainment. Texas Higher Education Coordinating Board data include student-level postsecondary records (that is, student enrollment status, degree and certification attainment) for approximately 90 percent of Texas high school graduates who enroll in a Texas college (Texas Higher Education Coordinating Board, 2017a). This database was the main source of information for tracking Round Rock Independent School District (ISD) graduates' postsecondary education outcomes. The National Student Clearinghouse is a national dataset that holds higher education enrollment and degree attainment information for 98 percent of students enrolled in both public and private postsecondary institutions across the nation. This database functioned as a supplemental source of information to track Round Rock ISD graduates who enrolled in out-of-state institutions.⁵ The research team used these postsecondary datasets to answer research questions 3 and 4.

⁵ The Texas Higher Education Coordinating Board and National Student Clearinghouse databases are not mutually exclusive. The research team cross-matched overlapping students to ensure consistent data. When data were inconsistent, the team prioritized the Texas Higher Education Coordinating Board data, as suggested by the data documentation from the Education Research Center (Texas Higher Education Coordinating Board, 2017b).

Study population

The study used all annual graduates from six cohorts of Round Rock ISD high school graduates (2012/13-2017/18) who were followed for as many as five postsecondary years (table A3). For research question 2, the study also included three cohorts of CTE graduates who graduated in 2015/16-2017/18 from 41 other Central Texas school districts. For research questions 3 and 4, the study included cohorts 1-5 with available postsecondary data.

Table A3. Cohort, school year, and grade for the six cohorts of Round Rock Independent School District career and technical education graduates included in the study

Cohort	Year								
	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
1	G - 3	G - 2	G - 1	G	Y + 1	Y + 2	Y + 3	Y + 4	Y + 5
2	na	G - 3	G - 2	G - 1	G	Y + 1	Y + 2	Y + 3	Y + 4
3	na	na	G - 3	G - 2	G - 1	G	Y + 1	Y + 2	Y + 3
4	na	na	na	G - 3	G - 2	G - 1	G	Y + 1	Y + 2
5	na	na	na	na	G - 3	G - 2	G - 1	G	Y + 1
6	na	na	na	na	na	G - 3	G - 2	G - 1	G

na is not applicable.

Note: G refers to the graduation year; Y refers to years following high school graduation.

Source: Authors' compilation.

The population included 5,147 Round Rock ISD CTE graduates from 2012/13 through 2017/18 (table A4).

Table A4. Number of Round Rock Independent School District career and technical education graduates and demographic characteristics by cohort

Demographic variable	CTE graduating cohort					
	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
All graduates	2,912	3,007	3,050	3,231	3,283	3,421
CTE graduates	105	326	905	1,037	1,162	1,612
Percentage of all graduates	3.6	10.8	29.7	32.1	35.4	47.1
Gender percentage						
Male	31.4	43.9	49.6	48.4	46.5	49.4
Race/ethnicity percentages						
African American	12.4	9.2	8.7	9.3	8.6	8.6
Asian	8.6	11.3	14.4	14.4	14.8	14.2
Hispanic	32.4	26.7	28.3	29.1	32.9	30.5
White	41.0	47.9	43.8	41.9	39.3	42.4
Other	5.7	4.9	4.9	5.3	4.4	4.3

Demographic variable	CTE graduating cohort					
	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Student group percentages						
Special education	a	3.4	3.0	3.8	4.1	4.2
Economically disadvantaged	25.7	18.7	20.1	22.7	21.9	22.1
English learner students	a	a	2.4	2.3	1.8	1.6

CTE is career and technical education.

a. Represents data masked to protect confidentiality.

Source: Authors' analysis based on data described in appendix A.

Analysis

To answer the study's research questions, the research team had to first identify CTE graduates across the study cohorts. The team created a retrospective longitudinal dataset that compiled each student's high school course-taking history for the years prior to high school graduation. They retained students' demographic characteristics collected in their graduating year for this analysis, even if data had changed from previous years.

During the summer, the TEA collects a CTE indicator code for every student in grades 7-12. This code indicates whether the student completed a state-approved CTE course as an elective or as a participant in a district's coherent sequence of CTE courses, which consists of earning three or more CTE credits in a program of study.⁶ Such students are called CTE completers. The courses are categorized by career clusters. Using the indicator code from the students' graduation year of high school and associated CTE course, the research team calculated the total number of CTE credits completed during the four-year period. To identify the CTE program of study for each CTE graduate, the research team associated each course completed with each district's CTE programs of study using each district's course catalog.

Research question 1

To address research question 1, the research team used descriptive statistics to examine the numbers and percentages of CTE graduates in Round Rock ISD. The percentage calculation equation is as follows:

$$P_{RRISD} = \frac{n_{CTEG-RRISD}}{N_{G-RRISD}}$$

where P_{RRISD} is the percentage of Round Rock ISD CTE graduates, $n_{CTEG-RRISD}$ is the number of Round Rock ISD CTE graduates, and the $N_{G-RRISD}$ is the total number of Round Rock ISD high school graduates.

To address research question 1a, the research team applied the formula for the student subgroups of interest (gender, race/ethnicity, English learner status, economically disadvantaged status, special education status). To examine graduation by CTE career clusters for research question 1b, the formula

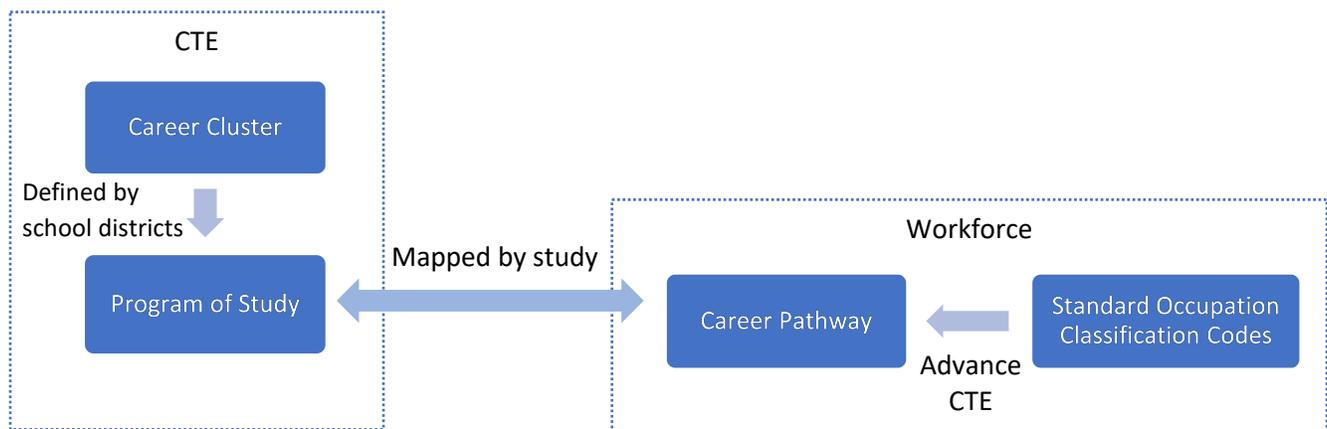
⁶ In 2012/13 and 2013/14, the TEA collected an indicator for students who intended to complete the federal Tech Prep program. (See <https://www2.ed.gov/about/offices/list/ovae/pi/cte/techprep.html> for more information.) This program was dissolved at the federal level, and TEA removed the indicator. Students completing the Tech Prep program were not included in the sample of CTE completers.

was modified by using the number of CTE graduates in a career cluster in the numerator and the number of all CTE graduates in the denominator. For research question 1c, the team used descriptive statistics to examine the percentages of CTE graduates with an industry-based certification, by CTE career cluster and student subgroup status.

Research question 2

To address research question 2, the research team conducted three primary analytic steps. First, they determined the nationally recognized career pathways that met the criteria for high-wage, in-demand occupations in Central Texas. Next, they aligned high-wage, in-demand career pathways with CTE programs of study offered by districts in Central Texas. Third, they calculated the percentages of high school graduates from Central Texas districts who completed a program of study aligned to a high-wage, in-demand career pathway. This analysis used data on CTE graduates in cohorts 4-6 from Round Rock ISD and 31 other Central Texas districts, publicly available programs of study downloaded from district websites, and publicly available data from the Texas Workforce Commission on labor market statistics. To calculate the high-wage, in-demand career pathways in Central Texas, the research team used the Texas Workforce labor market statistics for each occupation in Texas mapped to the taxonomy downloaded from O*NET OnLine. The O*NET taxonomy crosswalks Department of Labor occupation codes to career clusters and pathways developed by Advance CTE (Kotamraju & Steuernagel, 2012).⁷ To connect workforce career pathways to district CTE programs of study, the research team mapped programs of study downloaded from district websites to career pathways (figure A1).

Figure A1. Flowchart shows the mapping of district career and technical education programs of study to career pathways and workforce occupations



CTE is career and technical education.

Source: Authors' analysis based on data described in appendix A.

Step 1. Determining high-wage, in-demand career pathways in Central Texas. The research team estimated each of the following Texas labor market statistics by career pathway:

⁷ O*NET guidance is available at <https://www.onetonline.org/>.

Current occupations in 2016 within each career pathway (N_C): N_C is the sum of current employment in 2016 across all occupations within a career pathway. Current employment in 2016 represents the number of current part-time and full-time employees in 2016 for each occupation.

Projected occupations in 2026 within each career pathway (N_P): N_P is the sum of projected employment in 2026 across all occupation categories within a career pathway. Projected employment in 2026 indicates the number of projected part-time and full-time job openings needed in 2026 for an occupation, resulting from both employment growth and the need to replace workers who leave their occupations during 2016-26.

Projected percentage increase in occupations during 2016-26 within each career pathway (I_P): I_P information is not directly reported on the Texas labor market website. The research team calculated I_P using the function defined by the Texas labor market website:

$$\frac{N_P - N_C}{N_C} * 100\%$$

Average annual regional openings within each career pathway (O): O is calculated as the sum of annual job openings across all occupation categories within a career pathway divided by the total number of occupation categories within a career pathway. It indicates the average number of annual job openings per occupation category for a given career pathway.

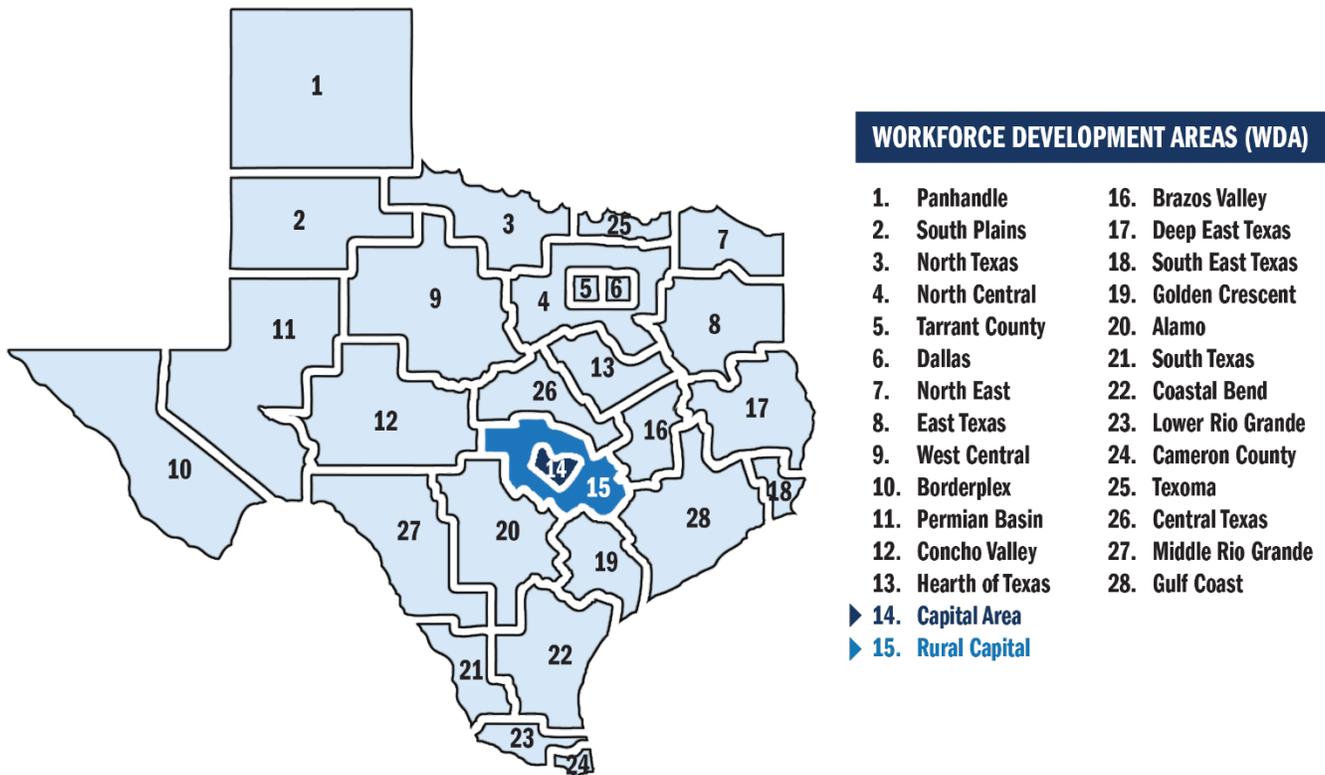
Average annual median wages in 2017 (the earliest data available through the Texas Workforce Commission) within each career pathway (W): The research team estimated W as the sum of occupational median annual wages in 2017 across all occupations within a career pathway divided by the number of occupations that make up the career pathway. Annual median occupational wages for 2017 indicate the median annual wage earned by all entry-level and experienced workers in an occupation category.

Following the definition of high-wage, in-demand occupations TEA used to develop the statewide programs of study, the research team identified high-wage, in-demand career pathways in the Central Texas labor market (TEA, 2019). The research team identified pathways within the Capital Areas and Rural Capital Workforce Development Areas that met the following criteria (map A1):⁸

- Average median annual salary in 2017 greater than \$35,339 ($W \geq \$35,339$).
- Projected percentage growth during 2016-26 greater than 17 percent ($I_P \geq 17$ percent).
- Average annual regional (that is, Central Texas) number of job openings larger than 723 ($O \geq 723$).

⁸ A workforce development board is a group of community leaders appointed by local elected officials and charged with planning and oversight responsibilities for workforce programs and services in their area. Texas has 28 boards that represent the state, and all market labor information is reported by the 28 Workforce Development Areas.

Map A1. Texas Workforce Development Areas



Note: Areas 14 and 15 represent the area surrounding Austin and designated as Central Texas in this report.

Source: Authors' compilation using Texas Workforce Commission data.

Step 2. Aligning district CTE programs of study to high-wage, in-demand career pathways.

Before Perkins V, programs of study were defined and assigned a sequence of courses by local education agencies. To estimate the percentage of district CTE programs of study aligned with high-wage, in-demand career pathways, the research team first crosswalked the districts' programs of study to the 79 career clusters and pathways using a three-step process:

1. Programs of study with the same career cluster and exact career pathway name were mapped together.
2. Programs of study with the same career cluster name but no exact match to a career pathway were matched to the closest sounding career pathway name within the career cluster. For example, some districts listed Animal Science as a program of study; however, the closest match to Animal Science within the Agriculture, Food & Natural Resource career cluster was Animal Systems.
3. All but 10 programs of study mapped to a career pathway using steps 1 or 2. For the 10 programs without a clear match, the research team searched O*NET OnLine for job titles in the program of study and assigned the program of study that mapped to the O*NET Standard Occupations Classification. (Table D1 in appendix D maps district programs of study to career clusters and career pathways.)

The research team then estimated the number and percentage of CTE programs of study aligned with the regional high-wage, in-demand career pathways across the three cohorts. The percentage value for a given district S ($P_{POS_{G-S}}$) was calculated using the following equation:

$$P_{POS_{G-S}} = \frac{n_{POS_{G-S},IDHW}}{N_{POS_{G-S}}}$$

where $N_{POS_{G-S}}$ is the total number of CTE programs of study completed by CTE graduates in district S and $n_{POS_{G-S},IDHW}$ is a subset of $N_{POS_{G-S}}$ that represents the number of CTE programs of study completed by CTE graduates in school district S that aligned with regional high-wage, in-demand career pathways.⁹

Step 3. Calculating CTE graduates from regional high-wage, in-demand CTE career pathways.

Using the following formula, the research team estimated the number and percentage of CTE graduates from programs of study aligned with regional high-wage, in-demand career pathways across the three cohorts.

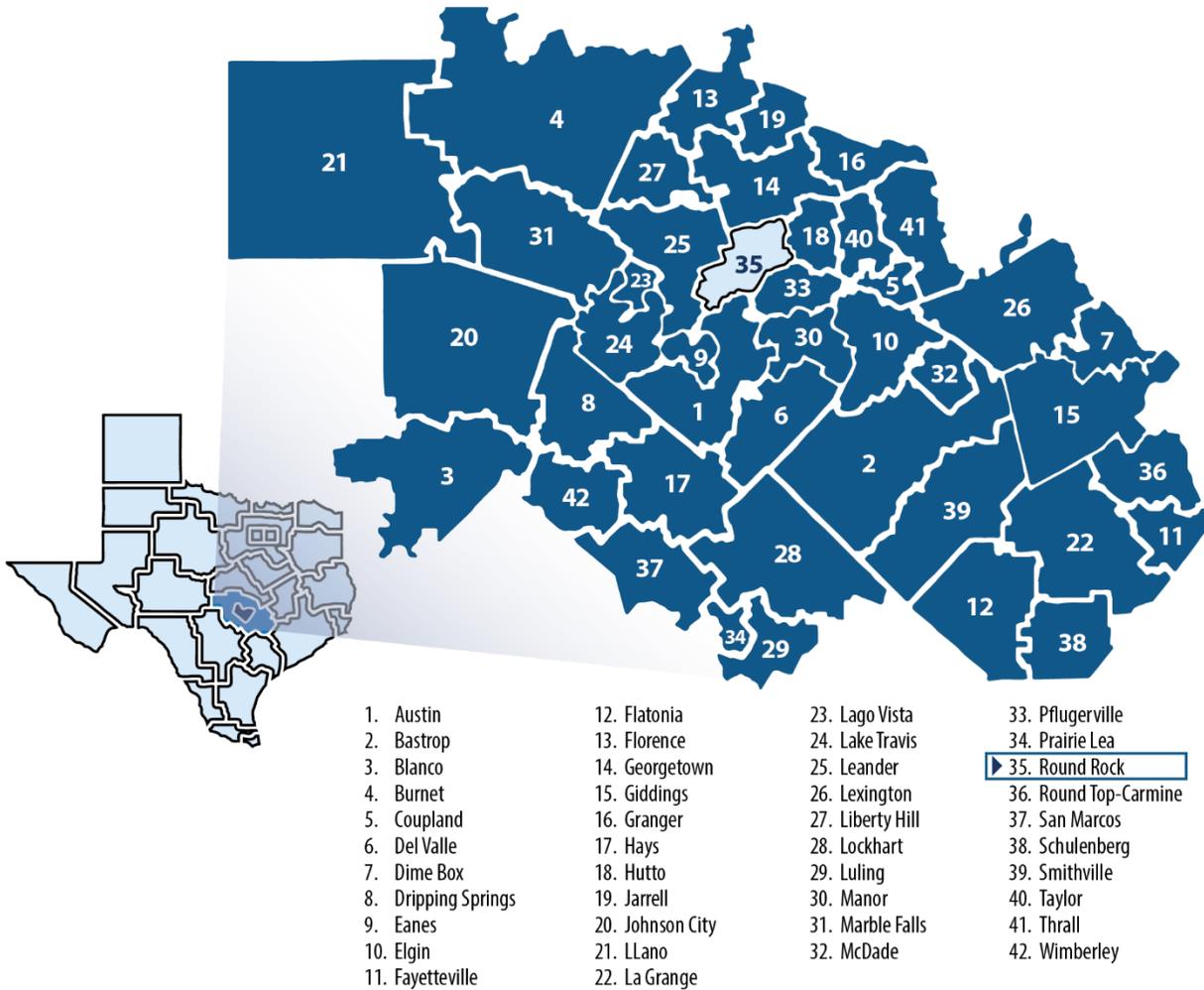
$$P_{CTE_{G-S}} = \frac{n_{CTE_{G-S}}}{N_{CTE_{G-S}}}$$

where $P_{CTE_{G-S}}$ is the percentage of CTE graduates in district S , $N_{CTE_{G-S}}$ is the total number of CTE graduates in district S , and $n_{CTE_{G-S}}$ is a subset of $N_{CTE_{G-S}}$ which represents the number of CTE graduates in district S who graduated in regional high-wage, in-demand career pathways.

The alignment of high-wage, in-demand CTE programs of study to Central Texas career pathways and the percentage of CTE graduates completing programs of study in those high-wage, in-demand career pathways was applied to all 42 districts (including Round Rock ISD) in the Central Texas Workforce Development Areas (map A2).

⁹ The alignment of programs of study to high-wage, in-demand career pathways was conducted for programs of study that had CTE graduates.

Map A2. Overlay of the 42 public school districts represented in Workforce Development Areas 14 and 15



Source: Authors' compilation using Texas Education Agency mapping data.

Research questions 3 and 4

The research team created a longitudinal dataset that tracked each cohort of CTE graduates up to as many as five years into postsecondary education (two-year and four-year colleges) and/or employment. The percentage of CTE graduates who could not be located in a postsecondary data source within one year after high school ranged from 13 percent for the 2012/13 cohort to 17 percent for the 2016/17 cohort.

For enrollment in two- or four-year colleges within or outside Texas, completion of postsecondary certificates or degrees, and employment and wages within Texas, the research team followed each CTE graduate from each cohort for as many as five years, as allowed by the timeline and data availability.

For employment status within one year of high school graduation, the research team classified CTE graduates into the following three categories, using the information from the Texas Workforce Commission and data files from the Texas Higher Education Coordinating Board and the National Student Clearinghouse:

- CTE graduates who had at least one wage record in the Texas Workforce Commission data and were not listed in the higher education datasets were classified as employed only.
- CTE graduates enrolled in a two-year college and had at least one wage record during the same year were classified as employed and enrolled in a two-year college.
- CTE graduates enrolled in a four-year college and had at least one wage record during the same year were classified as employed and enrolled in a four-year college.

In the Texas Workforce Commission data, employees working at multiple jobs during a given quarter have multiple quarterly wage records for that quarter. For an employee with multiple quarterly wage records, the research team summed the number of quarterly wages for this employee to indicate his or her total quarterly wages during this given quarter. The average quarterly wage per CTE graduate was calculated by averaging all quarterly wages earned within a year.

The research team then used descriptive statistics to examine, by cohort, the number and percentage of CTE graduates who enrolled in a two-year or four-year college, received a certificate or degree from a higher education institution, and/or were employed in Texas. The research team calculated the percentage of CTE graduates who attained any of these outcomes.

To address research question 3a, the research team disaggregated the results for research question 3 by CTE career cluster and student demographics, including gender, race/ethnicity, English learner status, economically disadvantaged status, and special education status. (Figures C1 and C2 in appendix C present postsecondary outcomes by student demographics.) In addition, the team used descriptive statistics to examine, by cohort, the average number of quarters employed and the mean and standard deviation of average quarterly wages for CTE graduates employed within one, two, three, four, and five years of high school graduation in Texas (tables C2 and C3 in appendix C).

Limitations

The study has several limitations. First, the programs of study for each cohort were defined by the districts' 2019/20 catalogs of pathways and courses. Although using the current catalogs allowed for comparisons across the CTE graduating cohorts, those catalogs may not reflect the policy requirements for CTE completion for earlier cohorts. Therefore, CTE completers as defined by earlier policies might have been inadvertently dropped from the analyses and underreport the percentages of CTE graduates in those cohorts.

Second, the research team conducted the mapping of Standard Occupational Classification codes to CTE career clusters and career pathways with the 2010 classification codes. New occupations available in the 2018 classification codes were not included in the career pathways. Including these occupations may have changed the high-wage, in-demand classification of a career pathway.

Third, the crosswalk of districts' programs of study to career pathways was conducted by the research team. Before Perkins V, the TEA did not define programs of study. Although the research team defined a systematic process, the team made some subjective decisions to place a program of study into a particular career pathway. Although a very small probability, as programs of study are aligned by

career clusters, a different subjective decision might have changed the alignment of the program of study with high-wage, in-demand career pathways.

Fourth, the required education level, job openings, and wages of occupations within career pathways are not all the same. Aggregating the measures to the career pathway level might mask these occupational differences and does not indicate that all occupations under these pathways are high-wage, in-demand occupations.

Fifth, TEA established the thresholds for defining high-wage, in-demand occupations by using statewide market labor information. However, these thresholds may not reflect high-wage, in-demand occupations across different regions of Texas. Also, the definition of in-demand does not ensure a position for every CTE graduate.

Sixth, the analysis excludes students who pursued out-of-state employment or did not pursue the postsecondary outcomes examined in this study, such as military service, and may underestimate the number of CTE graduates employed after high school.

Seventh, the employment status categories are not precise ways to classify employees when analyzing wages. Ideally, a full-time equivalent employment category would better clarify whether CTE graduates were working full time or part time and whether their quarterly wages represent one or multiple jobs. However, full-time equivalent information is not available in the datasets on Texas unemployment insurance wages.

Finally, the economic impact brought on by the COVID-19 pandemic may alter labor market statistics presented in this study.

Appendix B. Supporting analyses

This appendix provides supporting analyses for the findings in the report. Table B1 is a supplement to figure 1 in the main report. The table shows the demographic characteristics of the most recent (2017/18) Round Rock Independent School District (ISD) career and technical education (CTE) graduates by demographic characteristics.

Table B1. Percentage of 2017/18 Round Rock Independent School District students who graduated from career and technical education programs, by student demographics

Demographic variable	2017/18 CTE graduates (1,612)
Gender	
Female	48.2
Male	46.0
Race/ethnicity	
African American	42.3
Asian	52.4
Hispanic	45.6
White	47.7
Other	46.9
Student group	
Special education	33.2
Non-special education	48.7
Economically disadvantaged	41.1
Non-economically disadvantaged	49.2
English learner students	23.2
Non-English learner students	48.6

CTE is career and technical education.

Note: Round Rock Independent School District graduates included 1,612 CTE graduates and 3,429 total graduates.

Source: Authors' analysis based on data described in appendix A and the [2018/19 Texas Academic Performance Report for Round Rock Independent School District](#).

Table B2 is a supplement to figure 2 in the main report and presents the list of all programs of study completed by all six graduating cohorts combined and the percentage of CTE graduates completing each program of study.

Table B2. The number and percentage of all Round Rock Independent School District career and technical education graduates from 2012/13 through 2017/18, by career cluster and program of study

Career cluster	Program of study	CTE graduates	
		Number	Percentage
Agriculture, Food & Natural Resources	Agriculture Mechanics & Metal Technologies	42	0.8
	Animal Science	131	2.6
	Floral Design	9	0.2
	Veterinary Science	59	1.2
Architecture & Construction	Architectural Design	63	1.2
	Construction Technology	22	0.4
	Interior Design	a	a
Arts, A/V Technology & Communications	3D Animation and Game Design	37	0.7
	Animation	29	0.6
	Graphic Design	42	0.8
	Graphic Design and Illustration	87	1.7
	Video Production	78	1.5
	Print Shop	a	a
Business Management & Administration	Business Management & Administration	293	5.7
Education & Training	Education & Training	204	4.0
Finance	Finance	69	1.3
Health Science	Biomedical Sciences	138	2.7
	Health Science	83	1.6
	Health Science Theory and Practice	2,033	39.5
	Sports Medicine	68	1.3
Hospitality & Tourism	Culinary Arts	171	3.3
	Hospitality Services	10	0.2
Human Services	Human Services	45	0.9
Information Technology	Computer Maintenance	16	0.3
	Digital Media	195	3.8
Law, Public Safety, Corrections & Security	Law Enforcement	328	6.4
	Law and The Legal System	10	5.4
Marketing, Sales & Service	Marketing	277	5.4
	Fashion Design	a	a
Science, Technology, Engineering & Mathematics	Biotechnology	14	0.3
	Computer Science	7	0.1
	Engineering	646	12.6
Transportation, Distribution & Logistics	Automotive Technology	68	1.3

CTE is career and technical education.

a. Represents data masked to protect confidentiality.

Note: The total number of CTE graduates across all six graduating cohorts is 5,147. CTE graduates may have completed more than one CTE program of study.

Source: Authors' analysis based on data described in appendix A.

Figure B1 is a supplement to map 1 in the main report and presents the 73 career pathways within the high-wage, in-demand thresholds.

Figure B1. Thirteen career pathways were identified as high-wage, in-demand career pathways in Central Texas



Note: The figure shows the 73 career pathways that were crosswalked to Texas occupations, using Standard Occupational Classification codes. The career pathways noted in bold, in the center of the figure, represent the 13 high-wage, in-demand pathways in Central Texas. The thresholds include average median annual salary greater than or equal to \$35,339, projected job growth greater than or equal to 17 percent, and median annual regional job openings greater than or equal to 723. These thresholds were based on current labor market projections in Texas as of 2019.

Source: Authors' compilation using data described in appendix A.

Table B3 is a supplement to figure B1 and presents the projected growth, average median annual salary, and median annual regional job opening values for the 13 Central Texas high-wage, in-demand occupations.

Table B3. High-wage, in-demand career pathways in the Central Texas labor market, sorted by projected 10-year growth

Career cluster	Career pathway	Projected 10-year growth percentage	Average annual median salary	Median annual regional job openings
Marketing	Marketing Research	32.6	\$73,444	812
Health Science	Health Informatics	24.8	\$35,443	1,339
Health Science	Therapeutic Services	24.5	\$65,799	5,471
Architecture & Construction	Maintenance/ Operations	23.1	\$39,844	2,499
Education & Training	Teaching/Training	22.3	\$70,626	7,207
Architecture & Construction	Construction	21.3	\$36,607	6,947
Education & Training	Professional Support Services	20.3	\$56,035	789
Business Management & Administration	Operations Management	19.9	\$84,893	2,199
Finance	Business Finance	19.7	\$78,400	729
Marketing	Marketing Management	18.9	\$104,446	746
Human Services	Family & Community Services	18.1	\$48,648	1,124
Science, Technology, Engineering & Mathematics	Engineering and Technology	17.3	\$109,454	962
Finance	Accounting	17.1	\$67,138	1,391

Note: Projected 10-year growth, average annual median salary, and median annual regional job openings were used to identify the high-wage, in-demand career pathways in Central Texas.

Source: Authors' analysis based on data described in appendix A.

Table B4 is a supplement to map 1 in the main report and presents the number of CTE programs of study completed by district CTE graduates; the number of those programs of study that were aligned to high-wage, in-demand career pathways in the Central Texas labor market; and the percentage of CTE graduates completing programs of study aligned to high-wage, in-demand career pathways for all districts in Central Texas.

Table B4. Number of career and technical education programs of study offered in Central Texas districts that aligned with regional high-wage, in-demand career pathways and the percentage of career and technical education graduates from 2015/16, 2016/17, and 2017/18 in those programs, ordered by number of programs of study aligned to high-wage, in-demand career pathways

School district	Community type	Total CTE programs of study completed by CTE graduates	Number of CTE programs of study aligned to high-wage, in-demand career pathways in Central Texas	Total CTE graduates	Percentage of CTE graduates aligned to high-wage, in-demand career pathways in Central Texas
Round Rock	Major suburban	32	13	3,811	76.0
Leander	Major suburban	28	9	1,736	44.6
Austin	Major urban	27	7	3,309	38.4
Del Valle	Major suburban	22	6	1,271	30.6
Hays Consolidated	Major suburban	12	5	281	55.2
Bastrop	Independent town	15	4	472	53.0
Eanes	Major suburban	8	4	150	60.0
Jarrell	Other central city suburban	16	4	212	37.3
Lockhart	Other central city suburban	9	4	322	65.5
Manor	Major suburban	18	4	652	20.1
Marble Falls	Independent town	12	4	459	50.5
San Marcos Consolidated	Other central city	11	4	376	69.9
Burnet Consolidated	Other central city suburban	9	3	350	44.0
Hutto	Other central city suburban	11	3	308	29.9
Luling	Independent town	6	3	71	18.3
Elgin	Nonmetropolitan stable	13	2	289	8.3
Lago Vista	Nonmetropolitan stable	6	2	88	65.9
Lake Travis	Major suburban	5	2	392	43.6
Liberty Hill	Other central city suburban	7	2	144	46.5
Wimberley	Other central city suburban	6	2	92	29.3
Blanco	Non-metropolitan stable	3	1	45	15.6
Flatonia	Rural	4	1	^a	2.2
Florence	Nonmetropolitan stable	2	1	^a	5.2

School district	Community type	Total CTE programs of study completed by CTE graduates	Number of CTE programs of study aligned to high-wage, in-demand career pathways in Central Texas	Total CTE graduates	Percentage of CTE graduates aligned to high-wage, in-demand career pathways in Central Texas
Georgetown	Other central city	3	1	316	52.2
Prairie Lea	Rural	2	1	a	93.3
Smithville	Nonmetropolitan stable	7	1	79	20.3
Thrall	Rural	8	1	a	7.7
Johnson City	Rural	2	a	a	a
La Grange	Independent town	1	a	5	a
Lexington	Nonmetropolitan stable	1	a	21	a
Pflugerville	Major suburban	6	a	a	a
Schulenburg	Rural	2	a	a	a
Coupland	Rural	–	–	–	–
Dime Box	Rural	–	–	–	–
Dripping Springs	Major suburban	–	–	–	–
Fayetteville	Rural	–	–	–	–
Giddings	Nonmetropolitan stable	–	–	–	–
Granger	Rural	–	–	–	–
Llano	Nonmetropolitan stable	–	–	–	–
McDade	Nonmetropolitan fast growing	–	–	–	–
Round Top-Carmine	Rural	–	–	–	–
Taylor	Other central city suburban	–	–	–	–

CTE is career and technical education. – is not available.

a. Represents data masked to protect confidentiality.

Note: The table is sorted by the number of CTE programs of study aligned to high-wage, in-demand career pathways.

Source: Authors' analysis based on data described in appendix A.

Table B5 is a supplement to figure 4 in the main report and shows the alignment of the 13 Round Rock ISD programs of study to the 13 high-wage, in-demand career pathways in Central Texas.

Table B5. Round Rock Independent School District programs of study aligned with high-wage, in-demand career pathways in Central Texas and the number and percentage of Round Rock ISD career and technical education graduates from 2015/16 through 2017/18 completing the program of study

Career cluster	Central Texas high-wage, in-demand career pathway	Round Rock ISD programs of study aligned to high-wage, in-demand career pathway	Number of Round Rock ISD CTE graduates (n = 3,811)	Percentage of Round Rock ISD CTE graduates
Architecture & Construction	Construction	Construction Technology	19	0.5
	Maintenance/Operations	na	na	na
Business Management & Administration	Operations Management	Business Management & Administration	216	5.7
Education & Training	Professional Support Services	na	na	na
	Teaching/Training	Education & Training	138	3.6
Finance	Accounting	na	na	na
	Business Finance	Finance	52	1.4
Health Sciences	Health Informatics	Biomedical Sciences	138	3.6
		Health Science	74	1.9
		Health Science Theory and Practice	1,444	37.9
	Therapeutic Services	Sports Medicine	46	1.2
Human Services	Family & Community Services	Human Services	31	0.8
Marketing	Marketing Management	Marketing	218	5.7
	Marketing Research	na	na	na
Science, Technology, Engineering & Mathematics	Engineering & Technology	Biotechnology	a	a
		Engineering	506	13.3
		Computer Science	a	a
Total	13	13	2,896	75.9

CTE is career and technical education. ISD is independent school district. na is not applicable.

a. Represents data masked to protect confidentiality.

Source: Authors' analysis based on data described in appendix A.

Table B6 is a supplement to figure 5 in the main report and shows the results of CTE graduates' college enrollment rates up to five years after high school graduation.

Table B6. Percentage of Round Rock Independent School District career and technical education graduates who enrolled in a college, by graduating cohort and number of years after high school graduation

CTE graduating cohort	College type	Number of years after high school graduation				
		Within 1 year	Within 2 years	Within 3 years	Within 4 years	Within 5 years
2012/13 (n = 105)	Two-year	21.9	30.5	30.5	31.4	32.4
	Four-year	53.3	48.6	50.5	49.6	48.6
	Combined	75.2	79.1	81.0	81.0	81.0
2013/14 (n = 326)	Two-year	24.9	27.3	22.7	23.0	–
	Four-year	46.0	47.0	52.5	52.8	–
	Combined	70.9	74.3	75.2	75.8	–
2014/15 (n = 907)	Two-year	24.8	27.2	26.4	–	–
	Four-year	43.6	44.4	46.5	–	–
	Combined	68.4	71.6	72.9	–	–
2015/16 (n = 1,036)	Two-year	22.5	25.6	–	–	–
	Four-year	43.2	43.4	–	–	–
	Combined	65.7	69.0	–	–	–
2016/17 (n = 1,162)	Two-year	22.1	–	–	–	–
	Four-year	39.7	–	–	–	–
	Combined	61.8	–	–	–	–

CTE is career and technical education. – is not available.

Source: Authors' analysis based on data described in appendix A.

Table B7 is a supplement to figure 6 in the main report and shows the results of CTE graduates' employment rates up to five years after high school graduation.

Table B7. Percentage of Round Rock Independent School District career and technical education graduates employed, by graduating cohort and number of years after high school graduation

CTE graduating cohort	Number of years after high school graduation				
	Within 1 year	Within 2 years	Within 3 years	Within 4 years	Within 5 years
2012/13 (n = 105)	71.4	81.9	82.9	84.7	87.6
2013/14 (n = 326)	66.6	75.2	77.6	80.4	–
2014/15 (n = 907)	71.2	78.5	81.7	–	–
2015/16 (n = 1,036)	68.3	75.6	–	–	–
2016/17 (n = 1,162)	69.0	–	–	–	–

– is not available.

Source: Authors' analysis based on data described in appendix A.

Table B8 shows the actual percentage of Round Rock ISD CTE graduating cohorts who earned a postsecondary credential up to five years after high school graduation.

Table B8. Percentage of Round Rock Independent School District career and technical education graduates with postsecondary credentials, by graduating cohort, type of credential, and number of years after high school graduation

CTE graduating cohort	Postsecondary credential	Number of years after high school graduation				
		Within 1 year	Within 2 years	Within 3 years	Within 4 years	Within 5 years
2012/13	Certificate	a	a	a	a	a
	Associate's degree	a	a	a	a	4.7
	Bachelor's degree	a	a	a	18.1	31.4
2013/14	Certificate	a	1.5	1.5	1.8	–
	Associate's degree	a	a	1.5	2.5	–
	Bachelor's degree	a	a	1.5	22.4	–
2014/15	Certificate	a	a	0.8	–	–
	Associate's degree	a	a	1.5	–	–
	Bachelor's degree	a	a	1.2	–	–
2015/16	Certificate	a	a	–	–	–
	Associate's degree	a	0.9	–	–	–
	Bachelor's degree	a	a	–	–	–
2016/17	Certificate	a	–	–	–	–
	Associate's degree	a	–	–	–	–
	Bachelor's degree	a	–	–	–	–

CTE is career and technical education. – is not available.

a. Represents data masked to protect confidentiality.

Source: Authors' analysis based on data described in appendix A.

Table B9 compares the percentage of Round Rock ISD and Texas graduates who earned a postsecondary credential up to six years after high school graduation.

Table B9. Percentage of Round Rock Independent School District and Texas graduates with postsecondary credentials, by graduating cohort and number of years after high school graduation

Graduating year	Cohort	Total number of graduates	Number of years after high school graduation		
			Within 1-2 years	Within 3-4 years	Within 5-6 years
2012/13	Round Rock ISD CTE Graduates	105	1	23	40
	All high school graduates in Texas	301,418	0.5	15	23
2013/14	Round Rock ISD CTE Graduates	326	2	27	–
	All high school graduates in Texas	303,109	4	16	–
2014/15	Round Rock ISD CTE Graduates	905	1	–	–
	All high school graduates in Texas	313,397	2	–	–

ISD is independent school district. CTE is career and technical education. – is not available.

Source: Authors' analysis based on data described in appendix A and information compiled from [Graduation from Texas Public Two-Year or Four-Year Colleges](#).

Appendix C. Supplemental analyses

This appendix presents additional findings about Round Rock Independent School District (ISD) career and technical education (CTE) graduates.

Table C1 shows the percentage of 2017/18 CTE graduates who earned industry-based certifications by student demographics.

Table C1. Percentage of 2017/18 Round Rock Independent School District career and technical education graduates who earned industry-based certifications, by student demographics

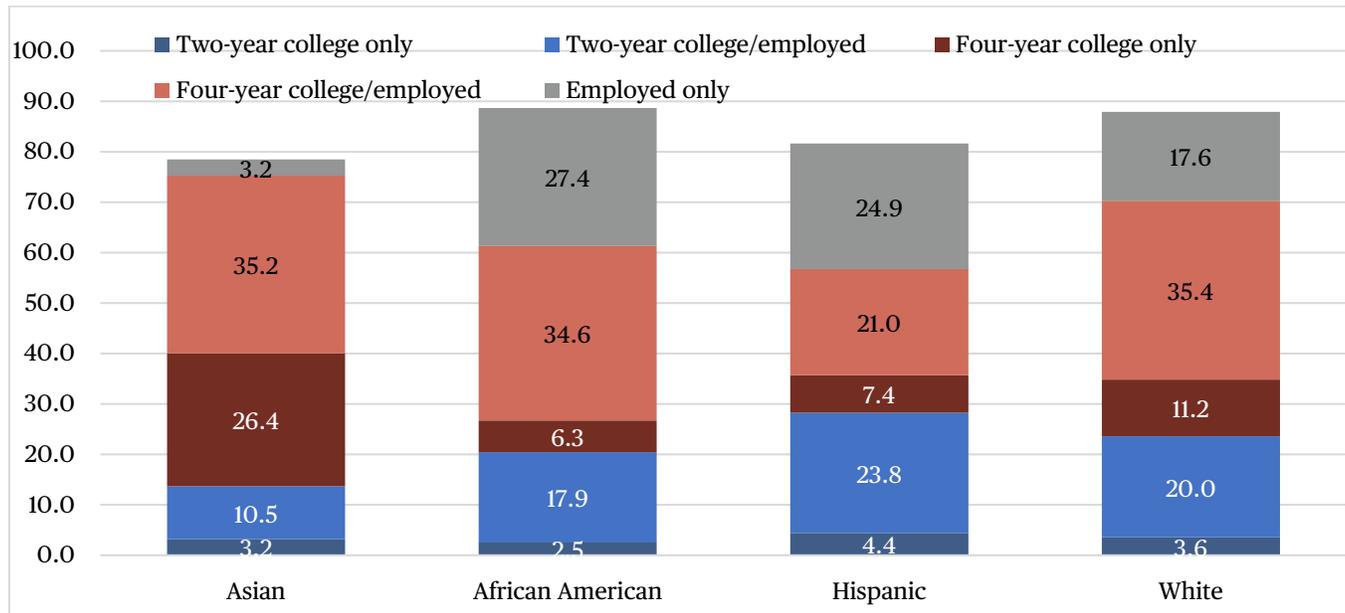
Demographic variable	Total CTE graduates	Percentage earning IBCs
Gender		
Female	815	24.3
Male	797	11.7
Race/ethnicity		
African American	138	11.6
Asian	229	31.4
Hispanic	492	14.0
White	684	17.8
Other	69	17.4
Student group		
Special education	67	3.0
Non-special education	1,545	18.7
Economically disadvantaged	357	14.6
Non-economically disadvantaged	1,255	19.0
English learner students	26	< 1
Non-English learner students	1,586	18.3

CTE is career and technical education. IBC is industry-based certifications.

Source: Authors' analysis based on data described in appendix A.

Figures C1 and C2 compare the postsecondary enrollment and employment of 2012/13 to 2016/17 Round Rock ISD CTE graduates, by student demographics, one year after high school graduation. These results provide additional information for district leaders to understand how CTE graduates perform on postsecondary outcomes.

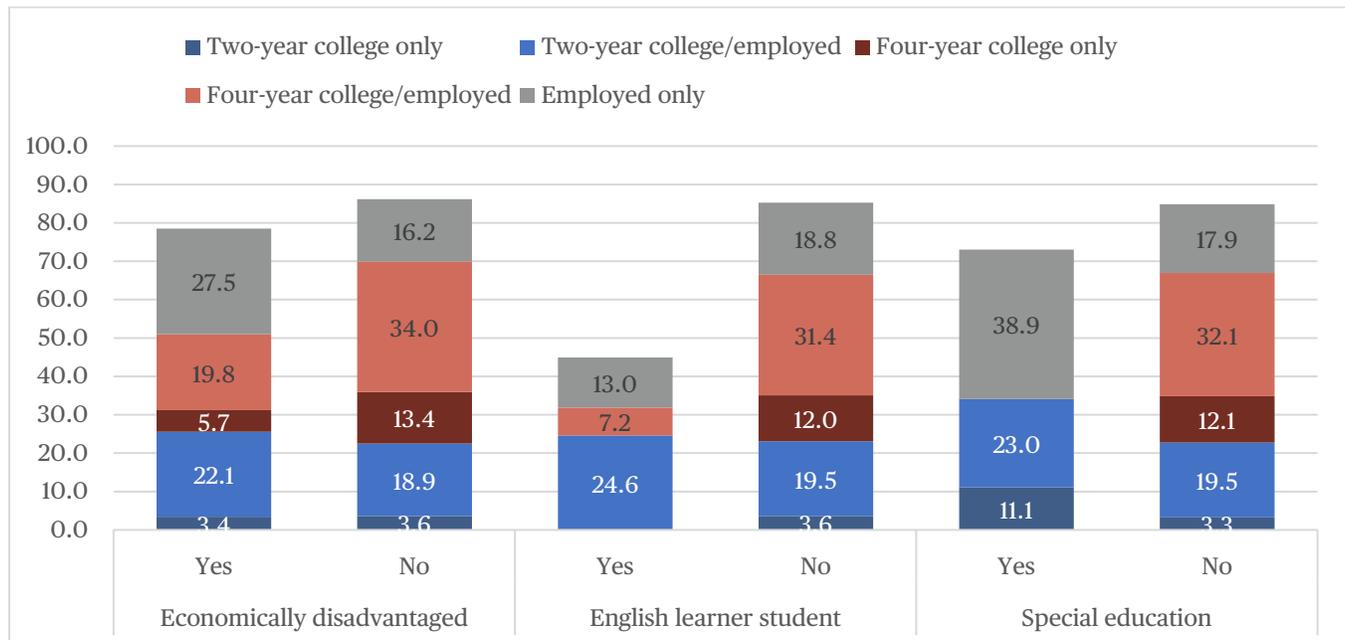
Figure C1. Percentage of 2012/13 through 2016/17 Round Rock Independent School District career and technical education graduates enrolled in college, employed, or both within one year of high school graduation, by ethnicity



Note: Students enrolled in two- and four-year colleges/universities out of state are included in the two-year and four-year college-only categories.

Source: Authors' analysis based on data described in appendix A.

Figure C2. Percentage of 2012/13 through 2016/17 Round Rock Independent School District career and technical education graduates enrolled in college, employed, or both within one year of high school graduation by student group

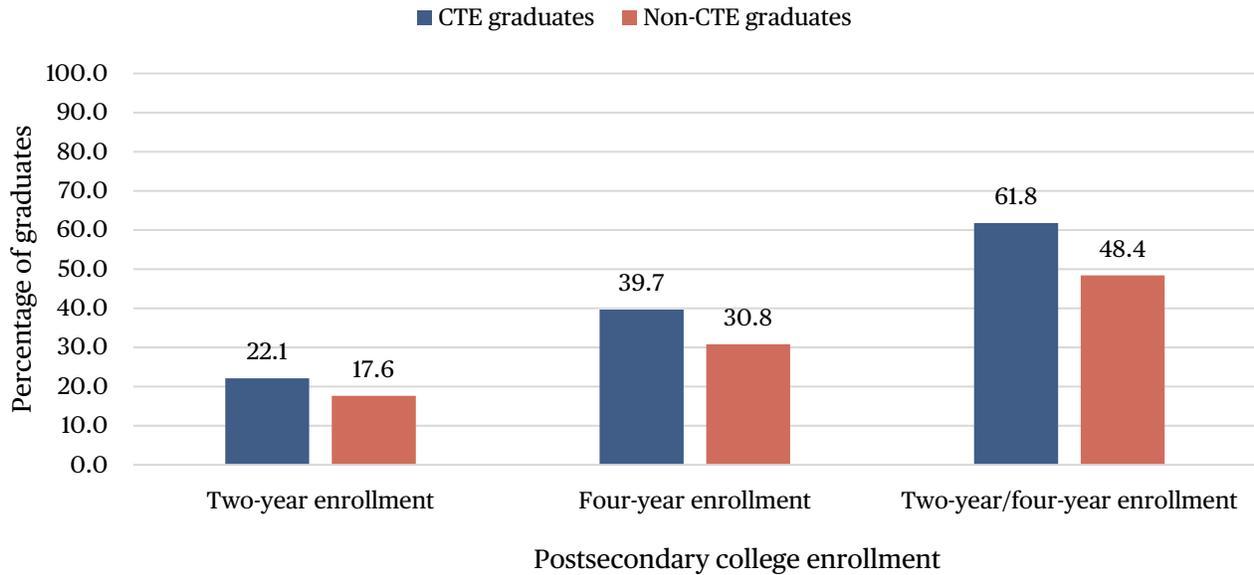


Note: Students enrolled in two- and four-year colleges/universities out of state are included in the two-year and four-year college-only categories. Two-year and four-year enrollment for English learner students was masked because of small sample sizes. Four-year enrollment and four-year/employed for students in special education were masked because of small sample sizes.

Source: Authors' analysis based on data described in appendix A.

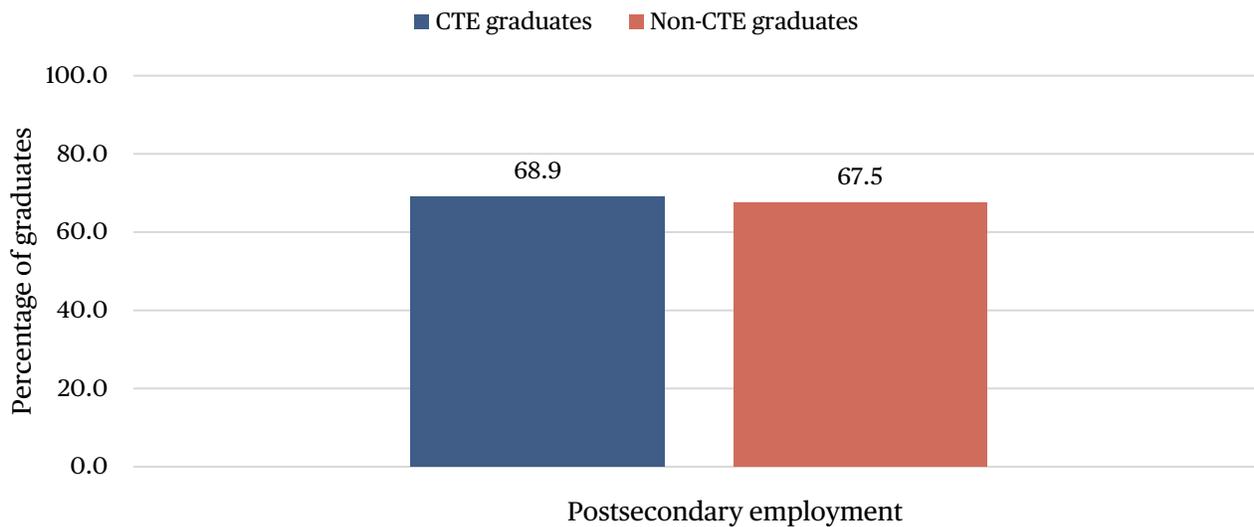
Figures C3 and C4 compare the postsecondary enrollment and employment of 2016/17 Round Rock ISD CTE graduates and non-CTE graduates one year after high school graduation. These results provide context for Round Rock ISD to understand how its CTE graduates compare with its non-CTE graduates on postsecondary outcomes.

Figure C3. Percentage of 2016/17 Round Rock Independent School District career and technical education graduates and non-career and technical education graduates enrolled in college within one year of high school graduation



CTE is career and technical education.
 Source: Authors' analysis based on data described in appendix A.

Figure C4. Percentage of 2016/17 Round Rock Independent School District career and technical education and non-career and technical education graduates employed within one year of high school graduation



CTE is career and technical education.
 Source: Authors' analysis based on data described in appendix A.

Tables C2 and C3 present additional results on the quarterly employment and wages of Round Rock ISD CTE graduates.

Table C2. Average number of quarters employed by Round Rock Independent School District career and technical education graduating cohorts and number of years after high school graduation

CTE graduating cohort	Number of years after high school graduation				
	Within 1 year	Within 2 years	Within 3 years	Within 4 years	Within 5 years
2012/13	2.8	5.3	8.0	10.6	13.3
2013/14	2.8	5.1	7.6	9.9	–
2014/15	2.8	5.2	7.7	–	–
2015/16	2.8	5.3	–	–	–
2016/17	2.8	–	–	–	–

CTE is career and technical education. – is not available.

Source: Authors' analysis based on data described in appendix A.

Table C3. Means and standard deviations of average quarterly wages earned by Round Rock Independent School District career and technical education graduating cohorts, by cohort and number of years after high school graduation

CTE graduating cohort	Average quarterly wages	Number of years after high school graduation				
		Within 1 year	Within 2 years	Within 3 years	Within 4 years	Within 5 years
2012/13	Mean	\$1,615	\$2,297	\$2,987	\$4,023	\$5,789
	Standard deviation	(\$1,175)	(\$1,498)	(\$1,998)	(\$2,550)	(\$3,514)
2013/14	Mean	\$1,736	\$2,558	\$3,310	\$4,178	–
	Standard deviation	(\$1,327)	(\$1,877)	(\$2,519)	(\$3,161)	–
2014/15	Mean	\$1,793	\$2,642	\$3,268	–	–
	Standard deviation	(\$1,424)	(\$2,008)	(\$2,498)	–	–
2015/16	Mean	\$2,029	\$2,705	–	–	–
	Standard deviation	(\$1,603)	(\$2,059)	–	–	–
2016/17	Mean	\$2,227	–	–	–	–
	Standard deviation	(\$3,211)	–	–	–	–

CTE is career and technical education. – is not available.

Source: Authors' analysis based on data described in appendix A.

Appendix D. Central Texas district career and technical education programs of study mapped to career clusters and pathways

Table D1 provides a crosswalk of Central Texas districts' career and technical education programs of study mapped to career clusters and pathways.

Table D1. Central Texas district programs of study mapped to career and technical education career clusters and career pathways

Career cluster	Career pathway	District program of study
Agriculture, Food & Natural Resources	Agribusiness Systems	Agribusiness, Agribusiness Systems, Leadership
	Animal Systems	Animal Systems, Animal Health, Animal Production, Animal Science, Certified Veterinary Assistant, Sustainable Agriculture Entrepreneurship (Animal Science), Veterinary & Agriculture Science, Veterinary & Animal Science, Veterinary Medicine, Veterinary Science
	Environmental Service Systems	Environmental and Natural Resources, Horticulture, Sustainable Agriculture Entrepreneurship (Horticulture)
	Food Products and Processing Systems	Agricultural Mechanics & Metal Technologies
	Natural Resources Systems	Agriculture General, Food & Natural Resources, Natural Resource Systems, Wildlife and Resource Management, Wood
	Plant Systems	Floral & Landscape Design, Plant, Plant Science, Plant Systems
	Power, Structural & Technical Systems	Agricultural Mechanics, Applied Agricultural Engineering, Agricultural Mechanics/Welding, Certified Welding Technician, Power Structures & Tech Welding, Power, Structural & Technical Systems, Welding: Power, Structural & Technical Systems
Architecture & Construction	Construction	Architecture & Construction, Carpentry, Construction and Management, Construction, Construction Technology
	Design/Pre-Construction	Architectural Design, Architecture, Interior Design
	Maintenance/Operations	Electrical, Electrical Technology
Arts, A/V Technology & Communications	Journalism and Broadcasting	A/V Production and Film, A/V Technology & Film, Arts, A/V Tech, & Comm, Audio & Video Technology, Audio and Video Technology & Video Production, Audio Video Technology & Communications, Audio/Video Production, Audio/Video Technology, Audio/Visual Production, Broadcast Technician, Digital Communications, Film & Video Production, Video Production
	Performing Arts	^a
	Printing Technology	Print & Imaging (Yearbook), Printing Technology (Yearbook)
	Telecommunications	^a
	Visual Arts	3D Animation and Game Design, Animation, Audio/Visual, Design and Multimedia Arts, Fashion Design, Fine arts, Floral Design, Graphic Design, Graphic Design & Animation, Graphic Design & Illustration, Graphic Design (Newspaper), Graphic Design and Animation, Graphic Design and Illustration, Graphic Design and Multimedia Arts, Graphic Design/Multimedia, Visual Arts

Career cluster	Career pathway	District program of study
Business Management & Administration	Administrative Support	Administration Services, Administrative and Information Support, Business Administration (DECA)
	Business Information Management	Business Information Management, Marketing Information and Management
	General Management	Business, Business & Industry, Business Management, Business Marketing and Finance, Business, Finance, and Management, Business, Marketing, Finance General, Entrepreneurship, Management
	Human Resources Management	Business Leadership
	Operations Management	Business Management and Administration, Business Technology Applications
Education & Training	Administration and Administrative Support	^a
	Professional Support Services	^a
	Teaching/Training	Business Education, Education & Training, Teaching and Training
Finance	Accounting	Accounting, Accounting and Financial Services
	Banking Services	Banking & Related Services
	Business Finance	Business Finance, Business Management & Finance, Finance, Marketing and Finance
	Insurance	Insurance
	Securities & Investments	^a
Government & Public Administration	Governance	Government & Public Administration
	National Security	^a
	Planning	^a
	Public Management and Administration	^a
	Regulation	^a
	Revenue and Taxation	^a
Health Science	Biotechnology Research and Development	Biomedical Sciences, Biotechnology
	Diagnostic Services	Diagnostic Services, Health Science - Clinical, Healthcare Diagnostics
	Health Informatics	Health, Health Informatics, Health Science, Health Science - Pre-professional, Health Science Theory and Practice, Non-Clinical
	Support Services	Patient Care Technician, Phlebotomy Technician, Public Services, Support Services
	Therapeutic Services	Advanced Health Sciences, Advanced Science & Medicine, Certified Clinical Medical Assistant, Healthcare Sciences, Healthcare Therapeutic, Healthcare Therapeutic Services, Medical Assistant, Medical Sciences, Medical Therapy, Nursing Medical, Nursing Science, Patient Care, Pharmacology, Pharmacy Technician, Sports Medicine, Therapeutic Services-clinical, Therapeutic Services-vet

Career cluster	Career pathway	District program of study
Hospitality & Tourism	Lodging	Hospitality, Lodging and Resort Management
	Recreation, Amusements & Attractions	^a
	Restaurants and Food/Beverage Services	Culinary, Culinary Arts, Pastry Arts
	Travel & Tourism	Hospitality and Tourism, Hospitality Services
Human Services	Consumer Services	^a
	Counseling & Mental Health Services	Health and Wellness, Mental Health & Wellness
	Early Childhood Development & Services	Early Childhood Development
	Family & Community Services	Family and Community Services, Human Services, Human Services General, Public Service
	Personal Care Services	Cosmetology
Information Technology	Information Support and Services	Computer Information Technology, Computer Maintenance, Computer Technician, Cybersecurity, Information Technology, Information Technology Support and Services, IT (ACC)
	Network Systems	Networking Systems, Technology Applications
	Programming and Software Development	Computer Programming, Programming & Software Development, Programming and Software Development, Web Development
	Web and Digital Communications	Digital Media, Digital Communications
Law, Public Safety, Corrections & Security	Correction Services	^a
	Emergency and Fire Management Services	Emergency Medical Technician, Emergency Services, Health Science: EMT
	Law Enforcement Services	Criminal Justice, Law and Public Safety, Law Enforcement, Law, Public Safety, Corrections & Security, Law, Public Safety, Corrections, and Security, Law, Public Safety, Corrections & Safety
	Legal Services	Law and the Legal System, Legal Studies
	Security & Protective Services	^a
Manufacturing	Maintenance, Installation & Repair	^a
	Manufacturing Production Process Development	Advanced Manufacturing and Machinery Mechanics, Manufacturing
	Production	Welding
	Quality Assurance	^a
Marketing	Marketing Communications	Marketing Communications
	Marketing Management	Entrepreneurship, Marketing
	Marketing Research	^a

Career cluster	Career pathway	District program of study
	Merchandising	a
	Professional Sales	a
Science, Technology, Engineering & Mathematics	Engineering and Technology	Engineering - Aerospace, Engineering & Technology - Civil, Computer Science, Computer Science (TEALS), Computer Science PLTW, Cybersecurity, Engineering, Engineering & Technology - Aerospace, Engineering & Technology - Digital Electronics, Engineering PLTW, PLTW Engineering, Pre-Engineering, Software Engineering, Biotechnology
	Science and Mathematics	Science, Technology, Engineering and Math, STEM
Transportation, Distribution & Logistics	Facility and Mobile Equipment Maintenance	Automotive, Automotive Collision Repair & Refinishing, Automotive Service, Automotive Technician, Automotive Technology, Collision & Repair, Collision Repair
	Logistics Planning and Management Services	a
	Sales and Service	Sales and Service
	Transportation Operations	a
	Transportation Systems/ Infrastructure Planning, Management and Regulation	a

a. Indicates no district program of study available in the career cluster and pathway. PLTW is Project Lead the Way.

Note: Ten districts did not have CTE programs of study data on their website or in their course catalogs.

Source: Authors' compilation using data described in appendix A.

REL 2021-050

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