Who Is the Modern CTE Student?

A DESCRIPTIVE PORTRAIT OF CAREER AND TECHNICAL EDUCATION STUDENTS IN TEXAS

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MARCH 2019

AMERICAN ENTERPRISE INSTITUTE

Executive Summary

Vocational education was once synonymous with tracking—the systematic funneling of low-income, underrepresented minority, limited English proficient, and low-achieving students into technical pathways with limited educational and economic benefit. But more recent research has found that students who concentrate in career and technical education (CTE) may actually be more likely to go to college than otherwise equivalent students who do not. Have CTE programs become more rigorous, or has the population of students who concentrate in CTE evolved? Who is the modern CTE student?

To address this question, this report uses statewide administrative data housed in Texas' Educational Research Center at the University of Texas at Austin. The data repository contains detailed information on students' demographic and academic backgrounds, including transcript data of every course they completed in high school. The cohort of high school graduates analyzed in this study includes more than 300,000 students.

I paint a descriptive portrait of CTE in Texas by examining the general patterns of CTE course taking and concentration, defined as students completing three or more credits in the same CTE subject, and I explore how these patterns vary across regional and district lines in Texas. Further, I assess the extent to which CTE course taking is related to students' demographic characteristics and investigate the academic achievement and other course-taking behaviors of CTE concentrators.

Critically, I examine these patterns separately by the subject of CTE concentration, allowing me to assess variation within CTE concentrators rather than simply comparing concentrators to non-concentrators. Given the growing emphasis on developing rigorous programs of study within specific career clusters aligned with industry needs, this look into the diversity within CTE is of paramount importance. Key findings of the study are:

- **CTE Course Taking Is Widespread.** Nearly all high school students complete at least one CTE course, and nearly three-quarters of students earn three or more CTE credits. The most common pattern is students earning three or more credits but not in the same subject, which I term "CTE explorers." Nearly 30 percent of students concentrate in at least one CTE subject.

- **CTE Is Highly Regional.** Across the 20 educational regions in Texas, the CTE concentration rate ranged from 21.9 percent to 47.9 percent. Rural regions generally had higher concentration rates, but metropolitan areas often had higher concentration rates in areas such as STEM.

- **There Is Limited Tracking into CTE.** Students from all racial and ethnic groups have roughly equivalent rates of CTE concentration, with white students having the highest concentration rate. Low-income students are only marginally more likely than non-low-income students to concentrate in CTE.

- **While There Is Limited Tracking into CTE, There Is Evidence of Tracking *Within* CTE.** Fields such as architecture and construction, manufacturing, and transportation continue to be dominated by male students, while female students are far more likely to concentrate in areas such as education, health science, and human services. These differences reflect historically gendered occupational roles. Hispanic students had the highest rates of concentration in architecture and construction, manufacturing,

and transportation, while Asian students had the highest concentration rates in finance, health science, and STEM. And while CTE concentrators as a whole have roughly equivalent academic achievement compared to non-concentrators, students appear to be sorted into areas of CTE concentration by their level of achievement.

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The Carl D. Perkins Act of 1984 (Perkins I) and subsequent reauthorizations of Perkins legislation directed the secretary of education to "conduct a national assessment of vocational education [NAVE] . . . through independent studies and analysis" and report the findings to Congress. In its 1994 report, the NAVE independent panel noted that vocational education was increasingly composed of less academically qualified students. The report stated:

> The inappropriate placement of students into vocational education is commonly called "dumping." It is not a new practice, but seems to be increasing—more so in area vocational schools than in others. A number of factors contribute to "dumping." For example, as vocational enrollments decline, schools that want to preserve vocational staff, funding, and programs must actively recruit students to vocational education. Special populations are often easier to recruit, in part because regular programs are more willing to let them go.[1]

Despite declines in overall vocational education participation between 1987 and 1991, the percentage of disabled, special needs, limited English proficient, and economically disadvantaged students enrolled in vocational education increased. Roughly half of school administrators who responded to a NAVE survey rated "placing problem students into vocational education programs, regardless of appropriateness" as a moderate to serious problem in their schools. Case studies included in the report revealed systematic patterns of funneling low-achieving students to vocational schools while academic high schools actively held onto higher-performing students.

The 1994 NAVE report was honest and prescient. It foreshadowed the coming decline in vocational education, both in terms of reputation and student enrollment. This decline was accelerated by a growing body of literature highlighting that students of color and low-income students were disproportionately "tracked" into vocational programs,[2] that vocational education diverted students away from four-year universities to two-year colleges,[3] and that it decreased the likelihood that students would go to college.[4] Given the growing emphasis on college attendence and perceptions that vocational programs were inferior to more academic courses, it is no wonder that enrollment in vocational education decreased precipitously.[5]

Beginning with Perkins II and the establishment of the Tech Prep program in 1990, which funded the establishment of local consortia of school districts and postsecondary institutions that codeveloped vocational programs, two major trends have marked vocational education. The first is an increasing emphasis on designing vocational programs that prepare students for postsecondary education, rather than just the transition into the labor market. The second is a broadening of the population of students served by vocational education.

These trends culminated with the passage of Perkins IV in 2006, which symbolically rebranded

vocational education to career and technical education (CTE). This rebrand was coupled with the development of the Career Clusters Framework (CCF), which helped design CTE programs of study in an even more diverse set of industry clusters and career pathways. Despite the somewhat tarnished legacy of vocational education, more recent studies of CTE suggest that, controlling for other relevant student characteristics, students who completed three or more credits in the same CTE subject (referred to as CTE concentrators) are more likely than their peers to attend postsecondary institutions today[6] and have higher odds of going to college than vocational education concentrators in the past did.[7]

Few would say that broadening the population of students served by CTE and strengthening its linkage with postsecondary education are undesirable outcomes. And yet, there is a certain irony in the reforms that have been made to CTE. Although concerns about vocational education becoming a "dumping ground" for disadvantaged students were legitimate, Perkins I was explicit about the program's primary intent to serve disadvantaged students, including the disabled, those with limited English proficiency, single parents, and the incarcerated, in addition to students entering occupations that do not require higher education in general. These *special populations* were still mentioned in Perkins IV, but with far less emphasis.

The Vocational Education Act of 1963 underscored the need to provide high-quality vocational education to rural students, yet rural students are scarcely mentioned in Perkins IV. Similarly, Perkins IV conceptualized CTE pathways to include connections to baccalaureate programs, whereas earlier iterations of Perkins were explicit about serving students who were less likely to attend universities. Overall, in an attempt to shed the legacy as a mechanism for perpetuating inequality, CTE policy and programs may have become less focused on promoting equity by serving the neediest students.

In the summer of 2018, more than a decade after Perkins IV passed, President Donald Trump signed into law the Strengthening Career and Technical Education for the 21st Century Act (Perkins V). Among a number of noteworthy changes to the law, Perkins V added a short but important clause clarifying that the purpose of the act is to increase "the employment opportunities for populations who are chronically unemployed or underemployed, including individuals with disabilities, individuals from economically disadvantaged families, out-of-workforce individuals, youth who are in, or have aged out of, the foster care system, and homeless individuals."[8] Perkins V also expanded the definition of special populations to include students from the populations described above and mandated that states report on the outcomes of students from special populations who concentrate in CTE, including any gaps in outcomes between these populations and non-disadvantaged populations. It remains to be seen how states, districts, and schools balance the renewed emphasis on recruiting and serving these special populations with the focus on maintaining rigorous CTE programs aligned with in-demand postsecondary education and career pathways.

Although the field needs stronger evidence of the relationship between new models of CTE and student outcomes, an even more basic gap exists in the literature—namely, a descriptive portrait of the modern CTE student. Indeed, Perkins V mandated that national research and evaluation activities overseen by the commissioner of education include studies of *changes in student enrollment patterns.*[9]

The goal of this report is to serve as a primer for those seeking a deeper understanding of CTE by addressing three basic questions.

- What are the current patterns of CTE participation across Texas?
- How does CTE participation vary across regions and districts?
- What are the demographic and academic characteristics of CTE participants, and to what extent do student characteristics vary across CTE subjects?

To address these questions, this report uses statewide longitudinal student data from Texas. Texas is an

ideal setting for this analysis for three reasons. First, Texas collects detailed course-taking data on all public school students, providing an opportunity to analyze CTE course-taking patterns for the entire state. Second, like many states, Texas moved from offering vocational education to CTE beginning in 2009 to now offering programs of study aligned with the CCF. Finally, Texas is extremely diverse, both in terms of its demographic composition and its tremendous regional variation. Texas boasts five of the 15 largest cities in the United States, but more than half of Texas' roughly 1,200 school districts enroll fewer than 1,000 students. These factors make this report's findings generalizable to many other parts of the country.

Historical Patterns of CTE Participation

Vocational education has a long and thorny history in American society.[10] The federal government has invested in vocational education for over a century, since the passage of the Smith-Hughes Act in 1917, to ensure that students not bound for college or the professions have the training they need to become productive members of the workforce. However, until the 1960s, federally supported vocational education occupied a minor place in the educational system, and the majority of vocational education provided to students was in agriculture and homemaking, particularly in smaller and more rural communities.[11] Beginning in the mid-1960s, the Vocational Education Act of 1963 and its three subsequent reauthorizations provided the policy framework and funding needed to significantly expand vocational education across the country, particularly in the skilled trades and industry.[12] This federal support resulted in enrollment in vocational education increasing considerably through the 1960s and 1970s.[13]

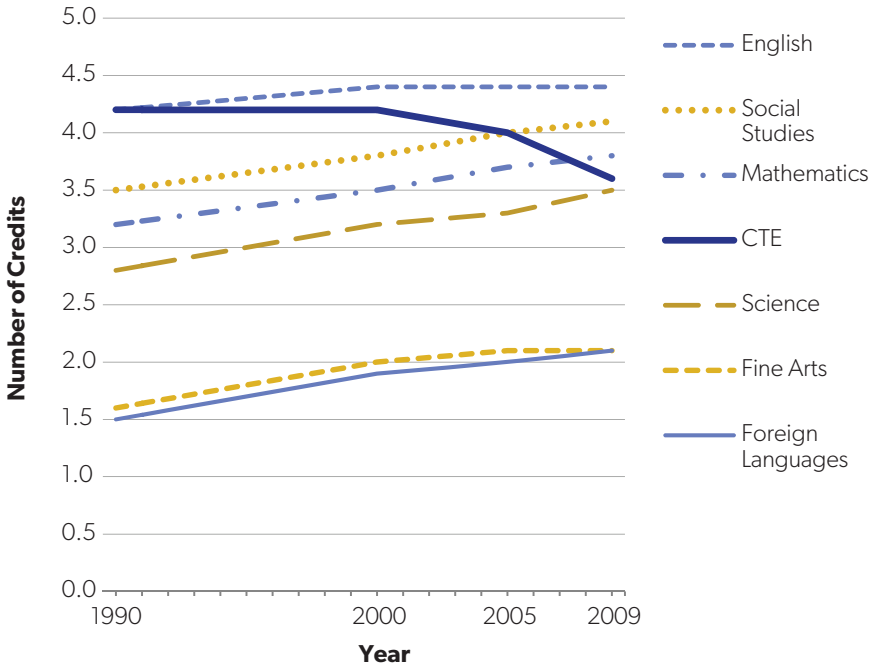
By 1982, the average American high school graduate completed 21.8 percent of his or her credits in vocational subjects, but this figure dropped to 17.8 percent by 1994 and 16.2 percent in 2000.[14] This proportional decline was driven primarily by an increase in the number of academic courses students completed rather than a decline in the number of vocational credits earned; in both 1990 and 2000, the average number of vocational credits students completed was 4.2 and was no less than 4.0 in any year.[15]

However, beginning in 2000 the average number of vocational credits completed by high school graduates did indeed begin to decline. As shown in Figure 1, students completed as many vocational credits as any other subject in 1990, but by 2009 vocational education had been surpassed by English, social studies, and mathematics. Indeed, credits earned in all other subjects have increased considerably over this two-decade time frame, with vocational courses the only subject experiencing a decline. These same trends are evident in terms of vocational concentrators. The percentage of students concentrating in a vocational area declined from 34 percent to 25 percent between 1982 and 1994,[16] and data from the most recent National Center for Education Statistics longitudinal survey on the graduating class of 2013 show only 16.1 percent of graduates concentrated.[17]

There are various causes for this decline in vocational education, including perceptions that vocational programs were not aligned to labor market needs, the college-for-all movement, and a resurgence of the long-held view among some educators that the purpose of education should not be to prepare students for the workforce.[18] But perhaps the most damning criticism was that vocational education had become a "dumping ground" for unmotivated, low-ability, and disabled students[19] and was being used as a tracking mechanism to stratify educational opportunity based on race and class.[20] This position was supported by research showing that vocational education either decreased the likelihood that students would attend college or, at a minimum, diverted students from four-year to two-year colleges.[21] Most scholars agree that the more egregious forms of tracking are no longer common in American schools.[22] Nevertheless, the perception that vocational education is inferior to academic coursework persists, along with the associated view that preparing for college is more valuable than preparing for employment.

Despite the decline in vocational education over time and the litany of criticisms levied against vocationalism, supporters of vocational education have

Figure 1. Trends in CTE Course Taking Between 1990 and 2009



Source: US Department of Education, National Center for Education Statistics, "NCES Data Point: Trends in CTE Coursetaking," November 2013, https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2014901.

some reason for optimism. Three recent developments are noteworthy. First, recognizing the need to increase the rigor of vocational education, the Carl D. Perkins acts have gradually strengthened the emphasis of vocational programs preparing students for postsecondary education. Indeed, Perkins IV redefined vocational education to CTE to distinguish it from the vocational education of the past and redefined CTE as a rigorous and legitimate pathway to college.

Accompanying the shift to CTE was the creation of the CCF by Advance CTE, formerly known as the National Association of State Directors of Career Technical Education Consortium, which supported the development of CTE programs of study in a variety of new fields. While most vocational education in the past was in fields such as home economics, agriculture, and trades, CTE pathways are now available in fields such as health science, information technology (IT), and STEM. Although the adoption of these new pathways is a work in progress, roughly two-thirds of districts report that most or all of their CTE programs are now offered to students as career pathways aligned with postsecondary programs,[23] in contrast to the finding that Tech Prep programs (Perkins II) were often not implemented as coherent sequences of courses stretching from secondary to postsecondary.[24]

The second reason for being optimistic about CTE is that, despite a body of literature suggesting that vocational education diverted students away from postsecondary education, and four-year colleges in particular,[25] more recent studies provide a more nuanced view. Research in Arkansas[26] and Texas[27] has found that vocational concentrators are more likely than their peers to enroll in college when controlling for a range of students' demographic and academic characteristics and may also be more likely to persist in college. Similarly, national data show that the gap in postsecondary enrollment between CTE concentrators and students who completed no CTE coursework declined from 22 percent to 11 percent between the 1992 and 2004 graduating cohorts and that the gap in postsecondary attainment declined from 26 percent to 14 percent. Preliminary data from NCES's most recent longitudinal study cohort (HSLS:09) show that CTE concentrators were only slightly less likely than non-concentrators to have earned a degree or still be enrolled in college three years after graduating high school (75.2 percent versus 76.7 percent).[28]

Perhaps most importantly, the third cause for optimism is that CTE and tracking are no longer synonymous.[29] Although gaps in academic achievement remain between CTE concentrators and non-concentrators, these gaps have narrowed

considerably over time. Between 1990 and 2000, CTE concentrators started to become much more likely to complete core academic courses and tripled their likelihood of completing a college-preparatory curriculum from 10.2 percent to 29.2 percent.[30] Trends in National Assessment of Education Progress scores also show academic achievement among CTE concentrators is increasing faster than for non-concentrators, resulting in a narrowing of this achievement gap.[31] Among the HSLS:09 cohort, 39.5 percent of concentrators scored in the top two quintiles on the standardized math assessment compared to 42.4 percent of non-concentrators, a gap of less than 3 percentage points.

The relationship between students' demographic backgrounds and their propensity to concentrate in CTE has also softened. Although students with disabilities continue to be overrepresented among concentrators, white students, among all racial and ethnic groups, are the most likely to concentrate, and the relationship between school poverty levels and CTE offerings is minimal.[32] Overall, in the present-day approach to CTE, there is limited evidence of overt tracking and stratification based on race, class, and student ability, in stark contrast to the historical patterns of vocational education.

Although these trends may be promising, they raise novel questions about CTE, both empirical and philosophical or political in nature. Empirically, it is unclear whether improvements in the academic achievement and postsecondary outcomes of CTE students have been driven by positive reforms to CTE programming or changes in the characteristics of students who participate in CTE. The answer may be both, but the extant literature does not provide strong evidence of the extent to which each phenomenon explains these changes.

Additionally, while research has found that overt forms of tracking are increasingly rare, providing students with more CTE options and giving them more autonomy in CTE course taking could still result in equity gaps in participation and outcomes.[33] This could be true if some CTE programs are perceived to be more rigorous and aligned with desirable postsecondary programs than others. It is therefore crucial to examine how students' demographic and academic backgrounds relate to the types of CTE programming they engage with in addition to whether they complete CTE coursework.

From a philosophical and political perspective, an unresolved question is: Who are CTE programs designed for? Indeed, the answer to this question appears to have been clearer in earlier iterations of federal legislation, particularly Perkins I's heavy emphasis on designing vocational programs that serve special populations and those not bound for university. The overrepresentation of disadvantaged groups in vocational education was troubling when these programs were found to divert students from higher education, but the emphasis on equity was laudable despite inequitable implementation. These questions will be revisited after reviewing the results.

Methods

The data for this study come from the Texas Education Research Center (TERC) at the University of Texas at Austin. TERC houses Texas' longitudinal student data system, which integrates K–12 data from the Texas Education Agency, postsecondary education data from the Texas Higher Education Coordinating Board, and workforce data from the Texas Workforce Commission. Each student who enrolls in an educational institution in Texas is assigned a unique identification number that is common across all three Texas data sources, allowing researchers to follow individual students from the time they enter prekindergarten through their postsecondary enrollment and into the workforce, provided the student remains in Texas.

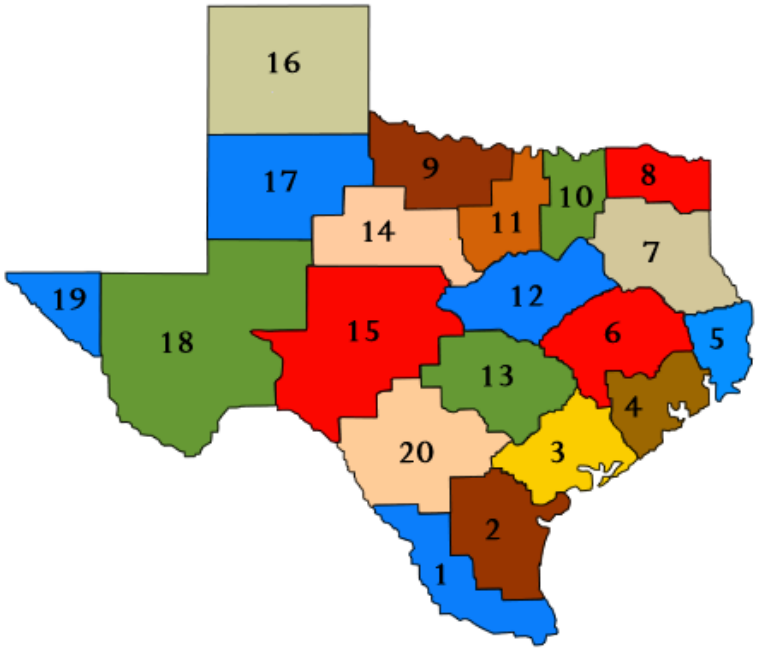
The TERC warehouse contains information on every course students attempted during high school, whether they passed the course, the number of credits they received, whether the course was categorized as advanced or dual credit, the broad subject area of the course, and the more refined subject of the course. All vocational education and CTE courses are categorized as the same subject area (called "career and technology education" in Texas), and the more refined subject variable indicates the specific subject

of the CTE course. Since approximately 2010, the CTE subjects offered in Texas have been aligned with the national CCF, which is composed of programs of study that fall within one of 16 clusters.[34]

Sample and Variables

A sample of students who graduated high school in 2016 and had demographic and course data available[35] (n = 323,037) was used in this study. The primary independent variables of interest relate to students' participation and concentration in CTE. Congruent with the federal government's approach,[36] CTE concentrators were defined as students who completed three or more credits in a single CTE subject during high school. Dichotomous variables were created indicating the specific concentration students completed and whether they completed any concentration.

Figure 2. Map of the 20 ESC Boundaries in Texas



Note: Each ESC provides resources and supports to districts in its region.
Source: Texas Education Agency, "Education Service Centers Map," https://tea.texas.gov/regional_services/esc/.

Additionally, a categorical variable was created to measure the extent of students' CTE participation. The four levels of this categorical variable are (1) fewer than three CTE credits earned ("CTE dabblers"); (2) greater than or equal to three CTE credits, no concentration ("CTE explorers"); (3) greater than or equal to three CTE credits earned in the same subject ("CTE concentrators"); and (4) concentration in more than one subject ("CTE multi-concentrators").

Texas is divided into 20 Educational Service Centers (ESCs) that each serve districts in their geographic region. Figure 2 shows these ESCs and their geographic boundaries. These ESCs represent the state's tremendous diversity, from geographically sprawling and highly rural regions with fewer than 50,000 students (ESC 9 and ESC 15) to the Houston metropolitan area with over one million students (ESC 4).

Students' educational and economic opportunities are highly influenced by the region in which they live. For example, the unemployment rates range from 2.2 percent to 6.2 percent, and mean annual earnings vary from $35,241 to $54,049 across the regions of the state.[37] Similarly, only 14.1 percent of high school graduates from ESC 7 enrolled in a four-year institution, compared to 29.1 percent of students from ESC 15. Because one of the primary intents of CTE programming is to facilitate students' transitions into college and career within their region, it was anticipated that CTE might look quite different across the state given this regional variation. A categorical variable representing the ESC from which students graduated high school was therefore used in the analyses.

To create a complex and detailed picture of CTE participation, the relationships between CTE participation and several student demographic and academic characteristics are explored. Demographic characteristics include race and ethnicity, gender, and economic status. Race and ethnicity are coded according to the US Census Bureau categories. The economic status variable includes four categories: students who are not disadvantaged, students who

qualify for reduced-price lunch, students who qualify for free lunch, and students who do not qualify for free or reduced-price lunch but have another form of economic disadvantage.[38]

Academic characteristics include the courses students completed in high school, their high school graduation plan (diploma), and their test scores on end-of-course (EOC) exams, the standardized assessments used in Texas' accountability system at this time. The course variables indicate the total number of high school credits students earned in advanced, dual-credit, and advanced technical credit (ATC) subjects. Advanced courses include Advanced Placement (AP) and International Baccalaureate courses. Dual-credit courses allow students to earn high school and college credit for the same course, primarily in academic areas such as English, math, and social studies. ATC courses provide students the opportunity to earn college credit, but, unlike dual-credit courses, they are the product of local articulation agreements between school districts and postsecondary institutions and relate to technical or CTE subjects. Further, the student must enroll in the partnering community or technical college within 15 months following high school graduation to claim the college credit.

The diploma variable consists of four categories, corresponding to the four possible levels of high school diplomas that students were potentially eligible to earn: (1) individualized education plan (or IEP, primarily for special education students), (2) minimum, (3) recommended, and (4) distinguished. Both the recommended and distinguished plans granted students eligibility for automatic admission to any public college or university in the state if students graduated with a high school GPA in the top 10 percent of their graduating class, but students who completed an IEP or the minimum diploma were not eligible for automatic admission regardless of their GPA. The EOC variables include assessment scores in algebra, biology, and English.

Table 1. Rates of CTE Course Taking and Concentration, 2016 High School Graduates

	Frequency	Percentage
None	11,674	3.6
Dabblers (< 3 CTE Credits)	74,048	22.9
Explorers (≥ 3, No Concentration)	145,017	44.9
Concentrators (Single Concentration)	84,912	26.3
Multi-Concentrators	7,386	2.3
Total	323,037	100.0

Source: Author's calculations.

Patterns of CTE Participation in Texas

Table 1 provides the rates of CTE course taking and concentration for the study cohort. As shown in the table, slightly more than a quarter (28.6 percent) of students concentrated in at least one CTE area, with 2.3 percent concentrating in multiple areas. Although a minority of students concentrate in CTE, concentrators outnumbered CTE dabblers, who earned fewer than three total CTE credits across subjects (26.5 percent). Only 3.6 percent of students earned zero CTE credits (not shown in the table). The most common pattern was CTE explorers, or students taking three or more CTE credits but not earning three credits in a specific CTE subject (44.9 percent).

Table 2 provides the counts and percentages of CTE concentrators by their specific area of concentration. The two most popular areas of CTE concentration were agriculture (6.0 percent) and health science (5.5 percent), with more than 37,000 students combined concentrating in one of these two areas. On the other end of the spectrum, less than 1 percent of the cohort concentrated in nine of the 16 CTE cluster areas. Between 1 percent and 3 percent of high school graduates concentrated in the remaining five CTE areas.

Although CTE concentration was defined as students earning three or more credits in the same CTE subject, the actual number of credits earned by CTE concentrators could potentially be far greater than the three-credit minimum. Table 3 presents the mean number of CTE credits students earned by their area

Table 2. Counts and Percentages of CTE Concentration by CTE Cluster, 2016 High School Graduates

	Frequency	Percentage
None	230,739	71.4
Agriculture	19,277	6.0
Architecture	1,933	0.6
Arts	9,613	3.0
Business	5,275	1.6
Education	1,089	0.3
Finance	721	0.2
Government	119	0.0
Health Science	17,916	5.5
Hospitality	2,447	0.8
Human Services	9,411	2.9
IT	2,504	0.8
Law	5,346	1.7
Manufacturing	909	0.3
Marketing	742	0.2
STEM	5,634	1.7
Transportation	1,975	0.6
Multiple	7,387	2.3
Total	323,037	100.0

Source: Author's calculations.

Table 3. Mean CTE Credits Earned, by Subject of CTE Concentration

	N	Mean	Standard Deviation
None	230,739	3.51	2.11
Agriculture	19,277	7.61	2.24
Architecture	1,933	6.33	2.05
Arts	9,613	6.21	1.95
Business	5,275	6.93	2.05
Education	1,089	6.25	1.67
Finance	721	7.00	1.99
Government	119	5.39	1.63
Health Science	17,916	6.63	2.02
Hospitality	2,447	6.54	1.91
Human Services	9,411	6.93	2.04
IT	2,504	6.27	2.12
Law	5,346	6.61	1.89
Manufacturing	909	6.93	1.97
Marketing	742	7.01	2.13
STEM	5,634	6.01	1.90
Transportation	1,975	6.33	2.05
Multiple	7,386	10.25	2.27
Total	323,037	4.53	2.70

Source: Author's calculations.

of CTE concentration. As shown in this table, CTE concentrators in all subjects apart from government (M = 5.39) averaged six or more CTE credits. Students concentrating in agriculture averaged the highest number of CTE credits (7.61) among students concentrating in a single area, although students with multiple concentrations averaged 10.25 CTE credits. Even non-concentrators averaged 3.51 CTE credits throughout high school, despite not concentrating in a single CTE area.

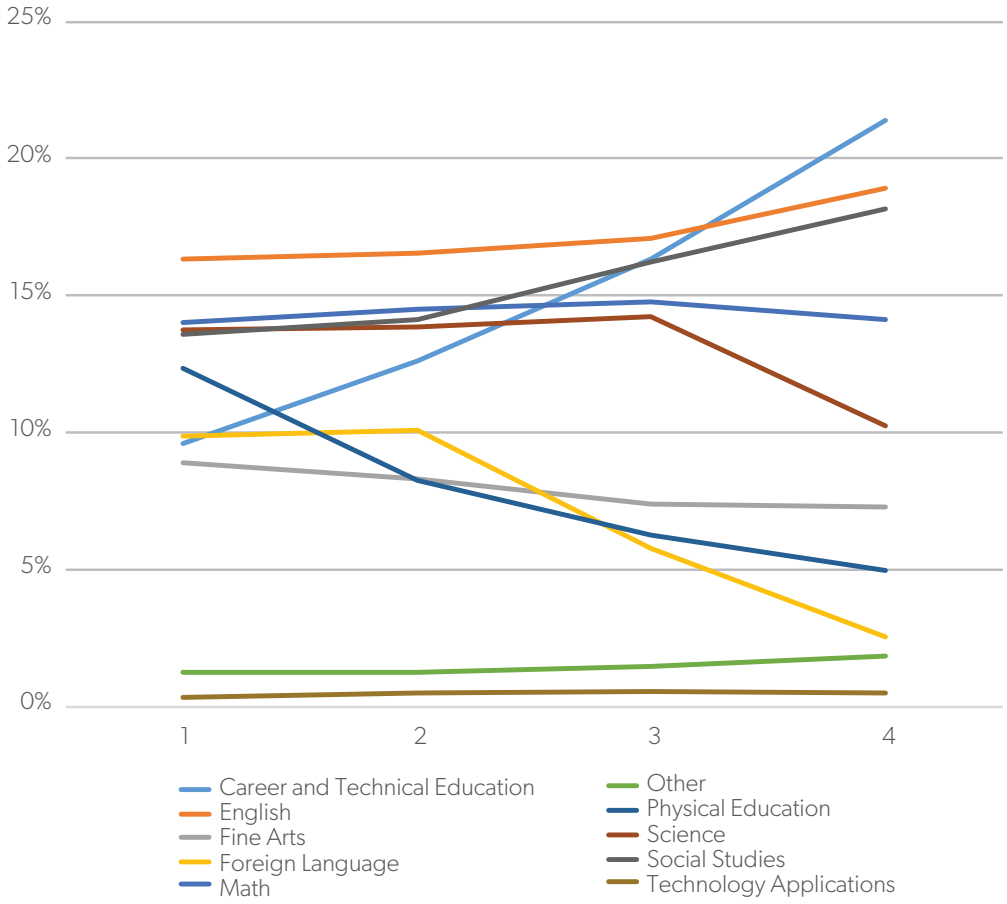
Although the 16 CTE subjects used in Texas are the same areas in the national CCF used by many other states, the specific courses in different CTE areas available in Texas may differ from what is offered in other states. To provide a fuller understanding of the specific courses students are completing in different CTE areas in Texas, Table 4 highlights the three courses with the greatest number of student enrollments for each CTE area. In contrast to traditional forms of vocational education, CTE courses appear to have much greater alignment with postsecondary programs. For example, students participating in health science CTE courses take anatomy and physiology, principles of health science, and health science as their three top courses. Although an analysis of the educational standards aligned with each course would be needed for a deeper understanding of precisely what students are learning in these courses, the subjects of CTE courses students are enrolled in today appear far more rigorous and relevant than the vocational education courses of the past.

Table 4. Top Three Most Popular Courses in Each CTE Subject

CTE Cluster	Top Course	Second Course	Third Course
Agriculture	Principles of Agriculture, Food, and Natural Resources	Principles and Elements of Floral Design	Agricultural Mechanics and Metal Technology
Architecture	Principles of Architecture and Construction	Construction Technology	Interior Design
Arts	Professional Communications	Graphic Design and Illustration	Principles Arts/Audio Video Technology and Communication
Business	Business Information Management I	Principles of Business, Marketing, and Finances	Business Information Management II
Education	Human Growth and Development	Principles of Education and Training	Instructional Practice in Education and Training
Finance	Money Matters	Accounting I	Statistics and Risk Management
Government	Principles of Government and Public Administration	Political Science I	National Security
Health	Anatomy and Physiology	Principles of Health Science	Health Science
Hospitality	Culinary Arts	Food Science	Principles of Hospitality and Tourism
Human Services	Lifetime Nutrition and Wellness	Child Development	Principles of Human Services
IT	Digital and Interactive Media	Principles of IT	Web Technologies
Law	Forensic Science	Law Enforcement I	Principles of Law, Public Safety, Corrections, and Security
Manufacturing	Welding	Principles of Manufacturing	Advanced Welding
Marketing	Sports and Entertainment Marketing	Entrepreneurship	Fashion Marketing
STEM	Concepts of Engineering and Technology	Introduction to Engineering Design	Principles of Technology
Transportation	Automotive Technology	Energy, Power, and Transportation Systems	Principles of Transportation, Distribution, and Logistics

Source: Author's calculations.

Figure 3. Share of High School Courses Completed in Subjects, by Year of High School



Note: This figure shows the percentage of credits earned in different subjects by year of high school for students who graduated high school in 2016.
Source: Author's calculations.

Because prior literature suggested that overt forms of tracking have been replaced with the model in which CTE courses are electives, I investigated how CTE course taking varies across years in high school given that students likely have more opportunity for CTE course taking once they complete the academic courses in the required curriculum, particularly as they enter their junior and senior year. Figure 3 investigates this possibility by analyzing the percentage of credits students earn in different subjects by their year in high school. As expected, freshmen completed a larger share of credits in all the academic subjects, as well as foreign language and physical education credits, compared to the percentage of CTE credits they completed. Less than 10 percent of all the credits earned in students' freshman year are in CTE. However, by students' senior year, CTE courses account for 21.4 percent of all credits earned and are the most popular subject. In contrast, courses in fine arts, foreign language, and science all decline in popularity as students get further in high school.

District and Regional Variation in CTE Course Taking

As mentioned above, Texas is broken into 20 ESCs serving districts in a specific geographic region. Table 5

Table 5. High School Graduate Cohort Size and CTE Concentration Rate, by ESC Region

ESC	High School Graduates	CTE Concentration Rate
01 (Edinburgh)	26,282	38.2%
02 (Corpus Christi)	6,713	27.9%
03 (Victoria)	3,420	35.6%
04 (Houston)	69,942	21.9%
05 (Beaumont)	4,950	29.4%
06 (Huntsville)	11,555	35.1%
07 (Kilgore)	10,561	44.3%
08 (Mount Pleasant)	3,829	47.9%
09 (Wichita Falls)	2,422	38.9%
10 (Dallas)	50,315	28.0%
11 (Fort Worth)	37,400	26.5%
12 (Waco)	10,133	33.4%
13 (Austin)	25,982	27.4%
14 (Abilene)	2,894	37.3%
15 (San Angelo)	3,063	39.0%
16 (Amarillo)	5,317	32.1%
17 (Lubbock)	4,910	34.5%
18 (Midland)	4,536	23.0%
19 (El Paso)	12,042	23.6%
20 (San Antonio)	27,201	25.1%
Statewide	323,467	28.5%

Source: Author's calculations.

presents the number of students in the study cohort and the percentage of students who concentrated in CTE for each of the ESCs. Both the size of the ESCs and their CTE concentration rate varied appreciably. The largest region (ESC 4) had roughly 30 times the enrollment of the smallest region (ESC 9), and the CTE concentration rate ranged from a low of 21.9 percent to a high of 47.9 percent.

Overall, there is an inverse relationship between the size of the region in terms of student enrollment and the percentage of students who concentrate in CTE (r = –0.505). Put differently, the results suggest more rural regions have higher CTE concentration rates. However, of the 10 regions with fewer than 10,000 graduates, the CTE concentration rate ranged from 23.0 percent to 47.9 percent, suggesting that even smaller and more rural districts likely approach CTE quite differently.

There is also significant variability in CTE concentration across the state when examining the specific area CTE students concentrate in. Table 6 highlights this variation for the eight CTE areas that had the highest rates of concentration across the state. The most extreme example in regional variation in CTE concentration is for agriculture, with a low of 1.1 percent (ESC 19) to a high of 21.5 percent (ESC 3). But variation exists in the other CTE areas as well. When comparing STEM concentration for these same two regions, ESC 19 has the highest concentration rate at 4.2 percent, compared to ESC 3 with the second lowest rate at 0.4 percent. Thus, whereas ESC 3 had an agriculture concentration rate 20 times higher than ESC 19, students in ESC 19 were approximately 10 times as likely as ESC 3 students to concentrate in STEM.

Although there is significant variation in CTE concentration by region, the variation at the district level is even greater. For the 1,069 school districts included in the sample (all districts with at least one high school graduate in 2016), 38 districts had zero students concentrate in CTE, whereas nine districts had 100 percent of their students concentrate. However, many of these districts had a relatively small number of graduates, making it difficult to draw firm conclusions on the scope of CTE in the district. If we restrict the sample to districts with at least 25 graduates (n = 841), we eliminate all the districts with a CTE concentration rate of 100 percent and most of those with a concentration rate of 0 percent.

Figure 4 shows the distribution of districts' CTE concentration rates by ventile, or 20 groups each with an equal number of districts (roughly 42). Approximately 6 percent of students in the lowest ventile of districts concentrated in CTE, compared to nearly three-fourths of students in the ventile with the highest concentration rate. In nearly 30 percent of districts, more than half of the 2016 high school graduates concentrated in CTE. Once again, we find an

Table 6. Concentration Rate in Specific CTE Clusters, by Region

ESC	Agriculture	Arts	Business	Health Science	Human Services	IT	Law	STEM
01 (Edinburgh)	2.8%	2.9%	4.3%	10.3%	1.1%	1.4%	5.3%	1.8%
02 (Corpus Christi)	7.1%	2.1%	1.7%	4.6%	4.2%	0.5%	0.7%	1.8%
03 (Victoria)	21.5%	1.9%	0.6%	2.3%	4.0%	0.1%	0.2%	0.4%
04 (Houston)	4.0%	2.1%	1.5%	5.0%	1.9%	0.6%	1.2%	1.9%
05 (Beaumont)	8.6%	2.1%	2.0%	3.6%	5.4%	0.5%	0.7%	0.6%
06 (Huntsville)	12.4%	2.9%	1.8%	4.7%	3.9%	0.7%	1.6%	0.7%
07 (Kilgore)	16.4%	4.2%	1.5%	7.7%	2.6%	0.7%	0.5%	0.8%
08 (Mount Pleasant)	17.1%	4.3%	1.0%	7.2%	5.0%	0.6%	1.1%	0.8%
09 (Wichita Falls)	18.7%	2.7%	0.5%	0.9%	8.6%	0.6%	0.0%	0.3%
10 (Dallas)	3.7%	3.6%	2.0%	4.6%	3.9%	1.0%	1.0%	2.1%
11 (Fort Worth)	4.3%	3.7%	1.6%	5.0%	3.3%	0.6%	1.1%	1.6%
12 (Waco)	13.1%	3.3%	0.6%	4.7%	3.1%	0.6%	1.2%	1.4%
13 (Austin)	6.1%	3.4%	1.2%	6.7%	1.9%	0.7%	1.5%	2.3%
14 (Abilene)	17.3%	1.3%	0.5%	5.1%	3.8%	1.7%	0.8%	1.7%
15 (San Angelo)	12.4%	2.5%	1.5%	6.6%	4.8%	0.5%	1.8%	1.4%
16 (Amarillo)	10.1%	1.8%	0.4%	4.6%	4.7%	0.9%	1.3%	1.2%
17 (Lubbock)	11.8%	3.5%	1.0%	4.4%	6.2%	0.4%	1.1%	0.5%
18 (Midland)	3.9%	3.4%	1.0%	4.3%	3.9%	0.4%	0.3%	1.1%
19 (El Paso)	1.1%	2.7%	0.7%	4.4%	1.4%	0.9%	5.4%	4.2%
20 (San Antonio)	4.3%	2.8%	0.7%	5.6%	3.1%	0.7%	1.8%	1.3%
Statewide	6.0%	3.0%	1.6%	5.5%	2.9%	0.8%	1.7%	1.7%

Source: Author's calculations.

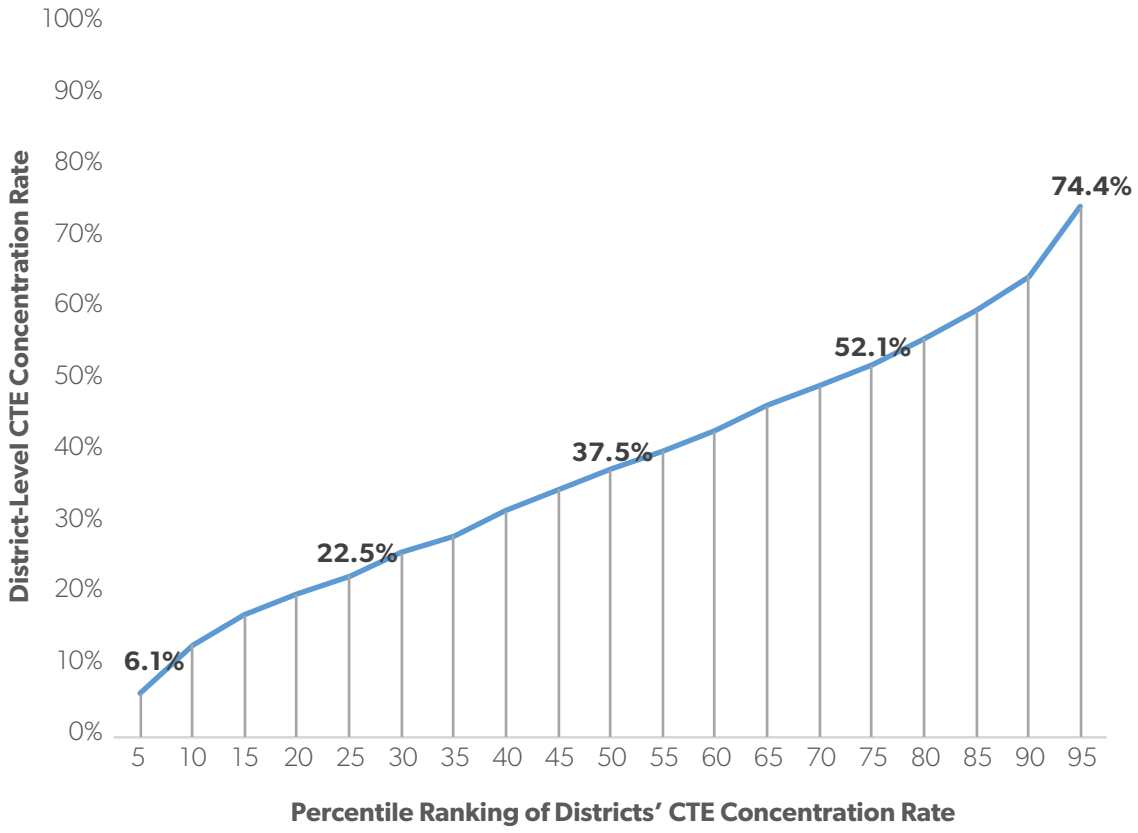
inverse relationship between the size of the student population in the district and the percentage of students who concentrate ($r = -0.213$), suggesting CTE is more prominent in smaller districts, which also tend to be found in rural areas of the state.

Student Characteristics and CTE Participation

The previous section began painting the picture of what CTE participation in Texas looks like. However, to fully understand CTE, we need to understand both who participates and aggregate patterns of participation. This is particularly crucial given that students from historically disadvantaged groups, such as low-income students, students of color, and immigrant students, were often disproportionately more likely to pursue vocational pathways even when controlling for students' abilities and interests.

CTE concentration rates by students' demographic characteristics are found in Table 7. Although there is some variation in CTE concentration by students' demographic backgrounds, the differences

Figure 4. Percentage of High School Graduates in Texas Districts Who Concentrated in CTE, by Districts' CTE Concentration Rate



Note: Figure 4 shows the distribution of Texas school districts' CTE concentration rates, defined as the number of CTE concentrators who graduated from that school district divided by the total number of high school graduates in that district. Districts are broken into 20 equal groups (ventiles) based on their CTE concentration rate, with each ventile containing roughly 42 districts.
Source: Author's calculations.

are generally modest. Roughly 1.5 percent more female than male students concentrated in CTE, and 1.1 percent more economically disadvantaged students than non-disadvantaged students concentrated in CTE. Apart from Native Hawaiian or Pacific Islander students, who had a CTE concentration rate of 19.3 percent but constituted less than 0.1 percent of the sample, between 23.5 percent and 30.5 percent of all other racial or ethnic groups concentrated in CTE. Asian and black students had the lowest rates of concentration, whereas white and Hispanic students had the highest rates.

Although the demographic differences in CTE concentration overall are quite modest, differences among groups in specific CTE subjects are often far more pronounced. For example, while male and female students have similar rates of any CTE concentration, their areas of concentration differ dramatically. Table 8 shows the rates of concentration in specific CTE subjects by gender. The table includes the difference in the CTE concentration rates between male and female students and female–male and male–female ratios to better capture the magnitude of the disparities.

In half of the 16 career clusters, one gender group is at least three times more likely than the other gender group to concentrate in a subject. Female students are at least three times more likely than male students to concentrate in education and training, health science, and human services, whereas male students are

Table 7. CTE Concentration Rate by Demographic Characteristics

	Mean	Standard Deviation
Sex		
Female	0.294	0.456
Male	0.279	0.448
Race		
Asian	0.235	0.424
Black	0.244	0.429
Hispanic	0.291	0.454
Native American	0.274	0.446
Native Hawaiian or Pacific Islander	0.193	0.395
White	0.305	0.460
Multiracial	0.254	0.435
Economic Status		
Not Economically Disadvantaged	0.281	0.449
Economically Disadvantaged	0.292	0.455
Total	0.286	0.452

Source: Author's calculations.

at least three times more likely than female students to concentrate in architecture and construction, IT, manufacturing, STEM, and transportation. These disparities correspond to occupational patterns, such as the underrepresentation of men in education and the health sciences and the underrepresentation of women in STEM and IT.

The differences in areas of CTE concentration by economic status are not as pronounced as the gender differences are. For example, the only CTE area in which one economic group is more than twice as likely as the other economic group to concentrate is government, in which disadvantaged students are 2.49 times more likely than non-disadvantaged students to concentrate (Table 9). This result could be spurious, though, as government is the CTE area with the fewest concentrators (n = 119). However, disadvantaged students are more likely than non-disadvantaged students to concentrate in architecture and construction (0.90 percent versus 0.55 percent), manufacturing (0.44 percent versus 0.33 percent), and transportation (0.95 percent versus 0.48 percent), pathways traditionally associated with preparing students for the labor market rather than postsecondary education.

Regarding race, the patterns of CTE concentration are quite nuanced. As shown in Table 7, white students are the most likely to concentrate in any CTE area. However, as shown in Table 10, this is driven overwhelmingly by the rates at which white students concentrate in agriculture. Roughly 13.2 percent of all white high school graduates concentrated in agriculture, compared to 4.1 percent of Hispanic students, 3.1 percent of black students, and 0.9 percent of Asian students. This is the only CTE area in which white students are the most likely to concentrate.

Indeed, if we remove agriculture from our definition of CTE concentration, white students have the lowest concentration rate of all racial and ethnic groups. And while the overall concentration rates between racial and ethnic groups do not vary significantly, there are key differences in the most popular areas of concentration for different groups. For example, Asian students were the most likely to concentrate in finance, health science, and STEM, three areas with greater alignment to postsecondary programs, whereas Hispanic students were the most likely to concentrate in architecture and construction, manufacturing, and transportation. Thus, although race does not appear to significantly affect whether students will concentrate in CTE, there are still discrepancies between racial and ethnic groups in the areas in which students concentrate.

The final set of analyses investigates the extent to which CTE concentration is associated with academic performance. One way to examine this is to compare how CTE concentrators and non-concentrators perform on standardized assessments (Table 11). Using data from Texas' EOC assessments in three subjects (algebra, reading, and biology), concentrators scored roughly 0.05–0.07 standard deviations (SD) lower on these assessments than did non-concentrators. Although these differences are statistically significant

Table 8. CTE Subject Concentration Rates by Gender

	Female Students	Male Students	Total	Raw Difference	Female–Male Ratio	Male–Female Ratio
Any	29.4%	27.9%	28.6%	1.5%	1.06	0.95
Agriculture	5.8%	7.8%	6.8%	–1.9%	0.75	1.33
Architecture	0.2%	1.2%	0.7%	–1.0%	0.16	6.15
Arts	3.0%	4.1%	3.6%	–1.0%	0.75	1.34
Business	2.1%	2.5%	2.3%	–0.4%	0.83	1.20
Education	0.7%	0.1%	0.4%	0.5%	6.07	0.16
Finance	0.3%	0.4%	0.3%	–0.1%	0.69	1.45
Government	0.0%	0.0%	0.0%	0.0%	1.59	0.63
Health Science	9.4%	3.0%	6.2%	6.4%	3.11	0.32
Hospitality	1.2%	0.7%	0.9%	0.5%	1.81	0.55
Human Services	5.8%	1.4%	3.6%	4.4%	4.28	0.23
IT	0.5%	1.5%	1.0%	–1.0%	0.33	3.01
Law	1.7%	2.2%	1.9%	–0.5%	0.78	1.28
Manufacturing	0.0%	0.7%	0.4%	–0.7%	0.05	19.84
Marketing	0.3%	0.4%	0.3%	–0.1%	0.75	1.34
STEM	0.8%	3.1%	1.9%	–2.3%	0.26	3.92
Transportation	0.1%	1.3%	0.7%	–1.2%	0.07	14.19

Source: Author's calculations.

Table 9. CTE Subject Concentration Rates by Economic Status

	Non-Disadvantaged	Disadvantaged	Total	Raw Difference	Non-Disadvantaged/Disadvantaged Ratio	Disadvantaged/Non-Disadvantaged Ratio
Any	28.1%	29.2%	28.6%	–1.1%	0.96	1.04
Agriculture	8.4%	5.2%	6.8%	3.2%	1.60	0.62
Architecture	0.5%	0.9%	0.7%	–0.4%	0.61	1.65
Arts	3.5%	3.6%	3.6%	0.0%	0.99	1.01
Business	2.0%	2.6%	2.3%	–0.6%	0.76	1.31
Education	0.3%	0.5%	0.4%	–0.2%	0.67	1.49
Finance	0.4%	0.3%	0.3%	0.0%	1.16	0.86
Government	0.0%	0.1%	0.0%	0.0%	0.40	2.49
Health Science	6.1%	6.3%	6.2%	–0.2%	0.97	1.03
Hospitality	0.7%	1.2%	0.9%	–0.5%	0.56	1.80
Human Services	3.1%	4.1%	3.6%	–1.0%	0.76	1.32
IT	0.8%	1.2%	1.0%	–0.4%	0.65	1.54
Law	1.3%	2.5%	1.9%	–1.2%	0.52	1.94
Manufacturing	0.3%	0.4%	0.4%	–0.1%	0.75	1.33
Marketing	0.3%	0.3%	0.3%	0.1%	1.18	0.85
STEM	2.1%	1.8%	1.9%	0.3%	1.16	0.86
Transportation	0.5%	0.9%	0.7%	–0.5%	0.50	1.99

Source: Author's calculations.

Table 10. CTE Subject Concentration Rates by Race

	Asian	Black	Hispanic	White
Any	23.5%	24.4%	29.1%	30.5%
Agriculture	0.9%	3.1%	4.1%	13.2%
Architecture	0.2%	0.4%	1.0%	0.5%
Arts	2.3%	3.9%	3.6%	3.6%
Business	1.7%	2.6%	2.8%	1.6%
Education	0.1%	0.3%	0.5%	0.3%
Finance	0.5%	0.3%	0.3%	0.3%
Government	0.0%	0.1%	0.1%	0.0%
Health Science	12.1%	5.4%	6.9%	4.7%
Hospitality	0.3%	1.3%	1.1%	0.6%
Human Services	1.4%	4.7%	3.6%	3.4%
IT	0.9%	0.6%	1.1%	0.9%
Law	0.4%	1.3%	2.9%	1.0%
Manufacturing	0.1%	0.1%	0.5%	0.4%
Marketing	0.4%	0.6%	0.3%	0.3%
STEM	3.1%	1.4%	2.1%	1.8%
Transportation	0.2%	0.4%	1.0%	0.5%

Note: The racial and ethnic group with the highest concentration rate in that CTE subject is highlighted. American Indian and Native Hawaiian or Pacific Islander students were excluded from this table given their small sample sizes, as fewer than five students from these groups concentrating in certain CTE areas.
Source: Author's calculations.

given the large sample size ($p < 0.000$), the test score gaps on the same assessments between economically disadvantaged and non-disadvantaged students were 0.48–0.58 SD, meaning the economic gap was nearly 10 times as great as the gap based on whether students concentrated in CTE.

However, there were more sizable gaps based on the specific area of CTE concentration. For example, students who concentrated in health science scored 0.29–0.30 SD higher than did students who did not concentrate in this area, and students who concentrated in STEM scored 0.29–0.58 SD higher than non-concentrators did. In contrast, students who concentrated in manufacturing and transportation scored between 0.38 and 0.49 SD lower on state exams than did non-concentrators. These results suggest that academic ability is not strongly associated with CTE concentration overall but is associated with whether students concentrate in specific CTE areas.

A similar pattern emerges when assessing the relationship between the type of high school diploma students completed and their CTE concentrations (Table 12). Of the four types of diplomas Texas students can earn (distinguished, recommended, minimum, and IEP), students completing the distinguished plan had the highest rates of CTE concentration (31.5 percent), whereas students completing the minimum diploma had the lowest rates (21.4 percent). Additionally, students completing the distinguished plan were more than 10 times as likely as students completing the minimum plan to concentrate in health science (10.2 percent versus 0.9 percent) and were also the most likely to complete concentrations in STEM, business, and IT.

In contrast, students completing either the minimum diploma or an IEP were the most likely to concentrate in architecture and construction, hospitality and tourism, manufacturing, and transportation. Overall, the rigor of the high school curriculum students complete is only modestly related to whether they will concentrate in CTE. It has a far greater relationship with the area that CTE students tend to concentrate in.

Given that students have a limited amount of space in their schedules, the decision to complete additional CTE credits could potentially come at the expense of other types of college-preparatory coursework, such as dual-credit and advanced courses. To explore this possibility, Table 13 compares the average number of college credit courses students completed by their area of CTE concentration. Non-concentrators completed an average of 0.75 ATC courses,[39] 2.90 advanced courses (AP or International Baccalaureate), and 0.66 dual-credit courses. Even non-concentrators

Table 11. Mean Test Scores on Standardized EOC Exams by CTE Concentration

	Algebra	Biology	Reading
None	0.02	0.02	0.02
Agriculture	–0.17	–0.14	–0.15
Architecture	–0.14	–0.17	–0.31
Arts	–0.06	0.00	–0.03
Business	–0.04	–0.10	–0.10
Education	–0.02	–0.13	–0.01
Finance	0.32	0.25	0.16
Government	0.40	0.34	0.65
Health Science	0.30	0.29	0.30
Hospitality	–0.28	–0.31	–0.28
Human Services	–0.38	–0.42	–0.27
IT	0.15	0.15	–0.02
Law	–0.19	–0.24	–0.19
Manufacturing	–0.39	–0.39	–0.46
Marketing	–0.07	–0.02	0.04
STEM	0.54	0.58	0.29
Transportation	–0.38	–0.40	–0.49
Multiple	–0.21	–0.21	–0.19
Total	0.00	0.00	0.00

Source: Author's calculations.

completed more ATC courses than dual-credit courses on average, despite dual credit often figuring more prominently in research and policy.

Overall, students who concentrated in a CTE area averaged fewer advanced courses and more ATC credits than non-concentrators did. The relationship was more mixed for dual-credit courses, with concentrators in nine of the 16 areas averaging more dual-credit courses than non-concentrators did and concentrators in the remaining seven areas averaging fewer dual-credit courses than non-concentrators did. In CTE areas such as STEM and health science, concentrators average a greater number of ATC, advanced, and dual-credit courses than non-concentrators do. Overall, while concentrators in most CTE areas averaged fewer advanced courses than non-concentrators did, concentrating in CTE does not preclude students from earning college credit through more academic courses.

Discussion

Although negative stereotypes about CTE programs and the students who enroll in them surely persist in many educators' and policymakers' minds, CTE has come a long way since the days it was viewed as a "dumping ground" for unmotivated and academically disinclined students. The most notable evolution has been a growing emphasis on creating programs of study that are rigorous and aligned with in-demand postsecondary education programs and career pathways. While CTE was found to detrimentally affect students' postsecondary education outcomes in the past,[40] more recent studies have found that CTE concentrators often have higher odds of college enrollment than do observably equivalent non-concentrators.[41]

There are two possible reasons why the relationship between CTE concentration and college enrollment appears to have strengthened. The first is that CTE programs now more effectively prepare students for postsecondary education. Some researchers have reached this conclusion after finding that the relationship between CTE concentration and college attendance is more positive in more recent cohorts.[42]

However, an alternative hypothesis is that the population of students who tend to pursue CTE opportunities has changed. CTE policy in the past was explicit about serving students experiencing various forms of disadvantage, and studies showed that underprivileged students were disproportionately more likely to be enrolled in CTE.[43] The justifiable criticisms of this type of tracking led to a softening of the emphasis on serving students from special populations in later iterations of the Perkins legislation through Perkins IV. This may have resulted in broadening the populations of students served by CTE. Indeed, these two hypotheses are not mutually exclusive; improving the quality of CTE programs may have helped attract a more diverse set of students, and diversifying CTE students

Table 12. CTE Concentration by High School Diploma Type

	IEP	Minimum	Recommended/ Foundation	Distinguished	All High School Graduates
Any	27.8%	21.4%	29.1%	31.5%	28.5%
Agriculture	7.2%	7.0%	6.1%	4.4%	6.0%
Architecture	1.0%	0.5%	0.7%	0.3%	0.6%
Arts	2.6%	2.1%	3.3%	2.2%	3.0%
Business	1.8%	1.2%	1.5%	2.9%	1.6%
Education	0.1%	0.1%	0.4%	0.2%	0.3%
Health Science	0.6%	0.9%	5.5%	10.2%	5.5%
Hospitality	1.1%	0.7%	0.8%	0.3%	0.8%
Human Services	5.2%	4.1%	3.0%	1.3%	2.9%
IT	0.5%	0.4%	0.8%	0.9%	0.8%
Law	1.0%	0.7%	1.8%	1.6%	1.7%
Manufacturing	0.4%	0.3%	0.3%	0.1%	0.3%
Marketing	0.6%	0.1%	0.2%	0.2%	0.2%
STEM	0.1%	0.3%	1.7%	3.2%	1.7%
Transportation	1.1%	0.9%	0.6%	0.2%	0.6%
Multiple	4.4%	2.1%	2.0%	3.4%	2.3%

Source: Author's calculations.

may have put added pressure on schools and districts to ensure CTE programs are high quality. Nevertheless, reducing the historic emphasis on CTE programs serving disadvantaged students leads to two key questions: Who participates in CTE, and who should?

The purpose of this report was to more deeply investigate the characteristics of students who participate in CTE in Texas to paint a more complex picture of the modern CTE student. Many of the results of this report echo earlier findings. CTE course taking is widespread in Texas, but only a quarter of high school graduates concentrate in a CTE area. Economically disadvantaged students are modestly more likely than non-disadvantaged students to concentrate in CTE, but the findings strengthen the evidence base, suggesting that more egregious forms of tracking are no longer prevalent.[44] CTE concentration rates are generally much higher in rural than urban areas. The availability of CTE courses appears heavily influenced by district contexts. The district-level CTE concentration rate ranges from 6.1 percent to 74.4 percent for districts in the bottom and top ventiles of CTE concentration, respectively.

However, while CTE concentrators overall are quite similar to non-concentrators on demographic and academic characteristics, there appear to be clear disparities *within* CTE. Students who concentrate in areas such as human services, manufacturing, and transportation generally have lower test scores and complete less rigorous high school curricula than non-concentrators do. These are the same CTE areas in which low-income students and students of color are more likely than non-disadvantaged and white students, respectively, to concentrate in CTE.

In contrast, students who concentrate in fields such as finance, health science, and STEM are much higher achieving. These are the only three CTE areas in which Asian students have the highest concentration rate out of any racial and ethnic subgroup.

Table 13. Mean College Credits Earned, by CTE Concentration

	ATC	Advanced	Dual Credit
None	0.75	2.90	0.66
Agriculture	0.74	1.46	0.82
Architecture	1.06	1.93	0.43
Arts	1.17	2.53	0.56
Business	2.68	2.64	0.94
Education	0.84	2.81	0.68
Finance	1.07	3.65	0.91
Government	0.60	8.32	0.83
Health Science	1.95	3.92	1.16
Hospitality	0.91	1.83	0.34
Human Services	1.10	1.34	0.47
IT	1.66	3.37	1.07
Law	2.43	2.22	0.52
Manufacturing	1.12	1.11	0.98
Marketing	1.13	2.57	0.50
STEM	1.49	4.80	1.19
Transportation	1.29	1.32	0.37
Multiple	2.95	2.03	0.90
Total	0.98	2.79	0.70

Source: Author's calculations.

Further, non-disadvantaged students are more likely than disadvantaged students to concentrate in finance and STEM (though not health science). These patterns suggest that the population of students served by CTE has broadened, but this has not necessarily translated into greater equity in CTE participation or student outcomes.

Since the 1980s, researchers and policymakers have expressed concern that CTE may serve as a stratifying mechanism by funneling fewer academically qualified students into pathways with limited educational and economic benefits. The increased rigor of today's CTE programs, including the stronger alignment with postsecondary education, and the broadening of the population of students served by CTE are two notable and positive developments. However, the Perkins Act cannot fulfill its goal of improving the opportunities of many of our nation's most disadvantaged youth if the most rewarding CTE pathways continue to be unavailable to them.

While the manner in which educators implemented vocational education may have led to tracking and "dumping" into CTE in the past, providing rigorous CTE programs of study aligned with in-demand college and career pathways and being intentional about serving students from disadvantaged backgrounds need not be mutually exclusive endeavors. While it remains to be seen how states and educators respond to Perkins V, the legislation provides a compelling opportunity for educators to demonstrate that creating rigorous CTE programs and serving disadvantaged students are necessary, practicable, and mutually reinforcing goals.

About the Author

Matt S. Giani is the director of research and data science for the Office of Strategy and Policy at the University of Texas at Austin.

Notes

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35. Approximately 0.1 percent of the high school graduate sample did not have either course data or demographic data available.

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37. These figures were calculated using Texas' 28 Workforce Development Areas to define the regions, which are aligned with but not identical to the 20 ESCs.

38. Students are considered to have another form of economic disadvantage if they (1) form a family with an annual income at or below the official federal poverty line, (2) are eligible for Temporary Assistance to Needy Families or other public assistance, (3) received a Pell Grant or comparable state program of need-based financial assistance, (4) are eligible for programs assisted under Title II of the Job Training Partnership Act, or (5) are eligible for benefits under the Food Stamp Act of 1977. See Texas Education Agency, https://tea.texas.gov/.

39. In Texas, advanced technical credit courses are articulated for college credit at a specific community or technical college in the state. The college credit is not awarded and transcripted until the student graduates from high school and enrolls in that postsecondary institution. If a student enrolls in a different postsecondary institution after high school, it is unlikely that they will receive college credit for the courses.

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