

ARE TEXAS STUDENTS CAREER-READY?

CTE Program Design and Funding in Texas



by Jorge Borrego and Erin Davis Valdez

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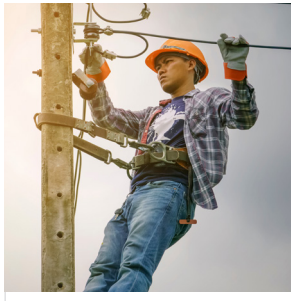


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Executive Summary

Are Texas students leaving high school career-ready? The Texas Education Code spells out the mission and eleven objectives of the public education system. Objective four ([Texas Education Code §4.001\(b\)](#)) reads, “A well-balanced and appropriate curriculum will be provided to all students. Through that curriculum, students will be prepared to succeed in a variety of postsecondary activities, including employment and enrollment in institutions of higher education.” Despite this, the Foundation polling shows that 69% of rural Texans do not believe that students in their area are ready to enter the workforce successfully. An October 2022 poll by the Foundation showed that a plurality of Texas parents—29%—identified their greatest concern about schools today as their “kids aren’t getting an education that will prepare them to be successful.” This option was selected over safety and political bias. Ninety-four percent of rural Democrats and 87% of rural Republicans are in favor of students being offered workforce training programs that offer a debt-free alternative to college.

Parents’ concerns about their students’ postsecondary preparation are well-grounded. Data from the Texas Public Education Information Resource (TPEIR) reveals that 32% of Texas high school graduates in 2019 were neither employed nor found in the Texas higher education system six months after graduation ([TPEIR, n.d.](#)). However, 3.1% of the class of 2019 were enrolled in Texas private colleges or universities in the fall after graduation ([Texas Higher Education Coordinating Board \[THECB\], n.d.](#)). The most recent data from THECB on Texas high school graduates enrolled in out-of-state institutions the fall after graduation are from the class of 2015, at 5.4% ([THECB, 2017](#)). Based on these data, we estimate that about 23% of the class of 2019 was not enrolled in any postsecondary education or found in the Texas workforce. Launching students from high school into postsecondary pathways is all the more important since jobs increasingly require postsecondary credentials. While credential inflation is an increasingly recognized reality in the job market ([Fuller & Raman, 2017](#)), Texans understand the need for practical knowledge and desire more opportunities for high school students to make progress toward earning the workforce skills they need.

The demand for middle skills jobs—or those jobs that require some postsecondary education but less than a bachelor’s degree—has been increasing for years ([Texas Workforce Investment Council, 2021, p. 1](#)). At the same time, fewer students are choosing to enroll in higher education ([National Student Clearinghouse Research Center, 2022](#)). This has led to the emergence of the

Key Points

- Technical education is focused on college-bound programs such as Health Sciences and STEM, corresponding with a shortage of workers in traditional vocational occupations and Information Technology. Texas cannot prosper without people to build and maintain its physical and technological infrastructure.
- Annual career and technical education (CTE) spending in Texas exceeds that of the federal government by nearly \$2 billion.
- Despite billions in government spending, Texas students are not leaving high school career-ready.
- Traditional CTE programs are being crowded out by new-era CTE courses, exacerbating the middle skills gap in the state.

middle skills gap—or the gap between the demand of middle skill jobs and labor market supply. This gap creates opportunities that Texas high schools and other institutions are already well positioned to seize by offering students to accelerate their career-readiness. Yet there is room for improvement. As we will show in this paper, Texas secondary career and technical education (CTE) could serve students better by focusing more on the occupations where this gap is the widest and most persistent or allowing students to pursue these options at other institutions. In other words, high school could become more responsive to both regional labor market demand *and* student preferences.

In our analysis, we used the Texas Workforce Commission’s target occupations list to identify those careers that require some postsecondary education but less than a bachelor’s degree. Cross-referencing this occupation list with that of school districts’ self-reported CTE programs of study, we were able to identify gaps between CTE availability and the regional needs. Our analysis has uncovered that while the so-called middle skills gap is widespread across various economic sectors, it is especially striking in construction, information systems, and transportation. To address this talent pipeline issue, we offer recommendations to create better incentives for school districts to offer programs more aligned with regional needs by making modifications to the college, career, and military readiness bonus structure, improving the transparency and oversight of the industry-based credential list, expanding high-quality virtual options, empowering parents and students with access to more institutions, and utilizing industry partnerships to increase program offerings.

Part I: Introduction and Background

In March 2016, Gov. Greg Abbott launched the Texas Tri-Agency Workforce Initiative—a collaboration between the Texas Education Agency, the Texas Higher Education Coordinating Board (THECB), and the Texas Workforce Initiative—to ensure continued economic growth in the state ([Texas Tri-Agency, 2020a](#)). A goal that emerged from this initiative was “60x30TX”—a goal to have 60% of Texans aged 25–34 obtain a bachelor’s degree or a certificate by 2030 ([THECB, 2015, p. 5](#)). This was an ambitious objective as only 41% of the Texas population had earned a postsecondary credential in 2015 ([60x30TX, n.d.](#)). According to the most recent 60x30TX progress report, by 2020, 45.3% of Texans had acquired a postsecondary credential ([THECB, 2021](#))—this is shy of the 48% benchmark laid out in the initiative. Recently, the Texas Higher Education Coordinating Board broadened the goal—newly branded as *Building a Talent Strong Texas*—to include the entire working population ([Keller, 2022, 17:30–19:00](#)). To meet this

goal, addressing the needs of the more than 50% of annual graduates of Texas high schools ([THECB, 2022, “Statewide Summary”](#)) who do not immediately enroll in postsecondary education will have to be a priority.

In a May 2022 committee hearing on higher education, Commissioner Harrison Keller of the Texas Higher Education Coordinating Board discussed his concern over lower enrollment levels in universities and community colleges across the state ([Keller, 2022, 8:50–9:06](#)). Community college enrollment tends to track with unemployment, meaning that as workforce opportunities increase, enrollment in community colleges decreases. But without valuable industry skills acquired through postsecondary education, career outcomes for recent graduates are largely limited to unskilled, low-paying careers. For this reason, Texas taxpayers have for over 25 years made a significant commitment to a strong career and technical education (CTE) system by funding CTE through both federal and state funds created by SB 1 ([1995](#)), passed by the 74th Texas Legislature. On a federal level, Texas receives the second most federal funding from the Strengthening Career and Technical Education for the 21st Century Act (Perkins V) at \$123,144,902 ([U.S. Department of Education, 2022a](#)) and is unique among states by further funding CTE courses in public schools via the state’s CTE allotment. This allotment amounts to roughly \$2.8 billion annually, which exceeds the total amount of federal spending on CTE nationally by over \$1 billion ([U.S. Department of Education, 2022b](#)).

As we will show in this paper, despite this significant commitment by taxpayers, Texas’ secondary CTE programs may not have the necessary variety and numbers to prepare students to enter the workforce, especially in so-called middle skills occupations. This paper seeks to clarify the issue by outlining the current funding sources and program design, comparing the workforce demand for middle skills occupations with the programs of study offered by local public schools, and recommending reforms—including public-private partnerships—that help bridge the divide.

Definitions

Career Clusters & Programs of Study

Perkins V requires states to create academic and career sequences of CTE courses to help students achieve a postsecondary degree or credential of value that yields a positive return on investment ([Advance CTE, 2022a](#)). Texas CTE programs use the National Career Clusters Framework as an organizing tool for curriculum design and instruction ([Advanced CTE, 2022b](#)). **Career Clusters** are defined by the U.S. Department of Education as “occupational categories with industry-validated knowledge and skills statements

that define what students need to know and be able to do in order to realize success in a chosen field” ([U.S. Department of Education, n.d.-a, para. 2](#)). There are a total of 16 career clusters under the national framework, but the Texas Education Agency utilizes a 14-cluster framework, in which some federal clusters are consolidated or dropped, and the state energy cluster is added. The career cluster framework helps to guide and develop programs of study that bridge secondary and postsecondary institutions.

Programs of study¹ are developed by the Texas Education Agency’s (TEA) Division of College, Career, and Military Preparation in collaboration with workforce, secondary education, and higher education institutions ([TEA, 2019a](#)). Programs of study are defined by Perkins V as:

a coordinated, nonduplicative sequence of academic and technical content at the secondary and postsecondary level that incorporates challenging State academic standards[;] ... addresses both academic and technical knowledge ... including employability skills; is aligned with the needs of industries of the State, region, Tribal community, or local area; progresses in [content] specificity ...; has multiple entry and exit points that incorporate credentialing; and [ultimately] culminates in the attainment of a recognized postsecondary credential. ([Strengthening Career and Technical Education for the 21st Century Act, 2018, 132 STAT. 1572](#))

Certifications & Industry-Based Certificates

Industry-based certifications (IBC) are granted by employers or groups of employers to enable employees to certify their competence in certain professional domains. These certifications are the product of an educational course that typically takes a semester to complete. These courses can be taken at a postsecondary institution or through a high school’s career and technical education program. Perkins V calls on states to create programs of study that culminate in industry-recognized credentials of value. HB 22 ([2017](#)) overhauled the public school accountability system. One key provision in this bill was that it included an indicator in the student achievement domain for students ([Texas Education Agency, n.d.-a](#)). The TEA then promulgated rules to determine which industry certifications would count toward a school’s accountability rating, beginning in the 2019–2020 school year. HB 3 ([2019](#)) created bonuses for schools that met college, career, and military readiness (CCMR) outcomes, which partially

relied on the industry-based certification list (IBC list) approved by the TEA ([HB 3, 2019, pp. 65–68](#)).

The National Center for Education Statistics ([n.d.](#)) defines sub-baccalaureate **certificates** as “postsecondary awards conferred as the result of successful completion of a formal program of study below the baccalaureate level.” Level I and Level II certificates are granted by institutions of higher education. Level I certificates require between 15 and 42 semester credit hours and Level II certificates require between 30 and 51 credit hours ([THECB, 2018](#)).

Employers and industry associations supported HB 3938 ([2021](#)), which sought to better align the TEA’s IBC list with workforce skills demands. It created an industry-based certification advisory council, composed of nine members representing K–12 CTE teachers or administrators, industry, and postsecondary education. The council was selected by the governor, lieutenant governor, and speaker of the House. Its role is to advise the Texas Workforce Commission “regarding the alignment of public high school career and technology education programs with current and future workforce needs in communities, regions, and the state” ([Texas Labor Code. §312.002](#)). In addition, HB 3938 ([2021](#)) charged this council with developing “an inventory of industry-recognized credentials and certificates that may be earned by a public high school student through a career and technology education program” and that meet other criteria. The inventory is to be reviewed annually and shared with the TEA and all public secondary and postsecondary institutions offering career and technology programs.

In January 2022, the TEA adopted new rules regarding what certificates are placed on its Industry-Based Certification List for Public School Accountability (IBC list) for the school year 2022–23 ([Texas Administrative Code §74.1003](#)). These new rules gave the TEA greater discretion in choosing which credentials to include on the industry-recognized credentials list. As we will show in this paper, this greater discretionary ability could, in the absence of objective labor market signals, foster a growing disconnect between CTE course offerings and labor market demands.

The new rules incorporated the advisory committee’s role, making its recommendations one of a number of ways that IBCs could be referred to the Texas Education Agency ([Texas Administrative Code §74.1003\(2\)\(A\)\(i\)\(I\)](#)). House Bill 3938 did not require that the inventory or any

1 For the complete list of the 53 statewide programs of study organized by career cluster, please turn to Appendix I.

credentials included in it be adopted by the agency. The Texas Public Policy Foundation supported this legislation, acknowledging that it was a “step in the right direction” to improve the alignment of the TEA’s IBC list with workforce demand *if* paired with a career-readiness indicator that took into account post-graduation wages ([Valdez, 2021](#)).

House Bill 3767 ([2021](#)) established the statutory framework for the Tri-Agency Workforce Initiative, wherein the three agencies are required to work together in response to the governor’s charges to advance key priorities and strategies to create economic growth ([Texas Tri-Agency, 2020b](#)). The legislative intent of the bill was that these agencies be required to “align or realign education and workforce systems to meet workforce demand” ([HB 3767 Bill Analysis, 2021, p. 1](#)).

HB 3767 ([2021](#)) allowed the Texas Workforce Commission (TWC) and the Texas Higher Education Coordinating Board (THECB) to jointly establish a credential library. These credentials can include “diplomas, certificates, certifications, digital badges, apprenticeships, licenses, or degrees that are: (1) delivered, issued, funded, or governed by the state; (2) aligned with recognized skills and industry standards; (3) available to residents of the state; and (4) used by employers in the state” ([Texas Government Code §2308A.007](#)). The TWC and THECB are required to “solicit input from the agency [TEA] and relevant stakeholders” ([Texas Government Code §2308A.007\(c\)](#)) in the creation of this library.

In testimony on the implementation of HB 3767 ([2021](#)) before the International Relations and Economic Development Committee on May 19, 2022, Texas Workforce Commissioner Bryan Daniel stated that the intention of the Tri-Agency was to make the TEA’s IBC list a subset of the credential library ([Daniel, 2022, 34:15–38:13](#)). The methodology for selecting credentials for the library will be guided by the principle that credentials of value in public secondary and postsecondary systems should be aligned with workforce opportunities. The current IBC list will be in place through 2024 ([TEA, 2022a](#)).

The misalignment between career education and workforce demand that HB 3767 ([2021](#)) sought to address is particularly evident in the middle skills gap. The industries affected by this exist across most sectors of the economy and are experiencing robust growth. The growing distance between workforce skills and labor market needs has been

the focus of a robust corpus of scholarly and governmental work ([Texas Workforce Investment Council, 2020](#); [Mosier & Kaiser, 2019](#); [Dennett & Modestino, 2011](#); [Lund, 2021](#)). Scholars, governmental agencies, and private enterprises see that closing the middle skills gap is the key to economic prosperity for individuals and the nation. In Texas, the middle skill labor market is flourishing with an abundance of occupations—with an estimated 626,767 annual openings at an average median salary of \$57,153.39 ([Texas Workforce Commission, 2022](#)).

In Part II of this paper, we highlight the secondary programs of study that require less than a bachelor’s degree and have the largest gap between regional demand for high-paying jobs.² This analysis builds on our prior research on this topic ([Valdez & Johnson, 2020](#)). Understanding the design and incentive structure of secondary CTE programs is essential to discovering why the middle skills gap has persisted.

Secondary Career and Technical Education in Texas

History

Since the reauthorization of the Perkins Act in 2006 (Perkins IV), what was once called vocational education has been rebranded as career and technical education. Rebranding was an effort to address the social stigma associated with the practice of funneling academically low-performing students into vocational programs, a policy known as “tracking.” This practice led to declining enrollment in the latter half of the 20th century ([Malkus, 2019, p. 3](#)). Nat Malkus’ *The Evolution of Career and Technical Education* offers an analysis of the data on CTE outcomes from 1982 to 2013. Malkus suggests a new framework for categorizing CTE education. He divides subjects into “New Era” courses and “Traditional Vocational” courses.

One of the salient changes from vocational education to CTE was the inclusion of New Era subject—computer science, communications, healthcare, hospitality, and engineering—that were subsidized with federal funds through Perkins IV. CTE still included the traditional vocational subjects, that is, construction, agriculture, transportation, human services, manufacturing, and public service. Malkus’ analysis found that from 1982 to 2013, enrollment in traditional vocational courses decreased by over one third while New Era CTE courses increased by over 238% ([Malkus, 2019, p. 12](#)). Our research shows a similar trend emerging

² For a complete analysis of programs of studies compared with high-wage, high-demand occupations, see [Appendix IV](#).

in Texas, with an increase in New Era CTE programs and a decline in traditional vocational programs. This shift has contributed to the middle skills gap in several traditional trades, leading to loss of economic opportunity for both students and employers across the state.

Funding

CTE programs in Texas are funded through federal, state, and local tax dollars, and within each funding stream are implicit and explicit incentives. These incentives directly impact the career and academic outcomes of students. This section will briefly discuss both CTE funding and the policy levers at the federal, state, and local level.

At the federal level, Texas receives funds via Perkins V. This piece of legislation provides nearly \$1.3 billion annually in federal funds for career and technical education programs across the country ([U.S. Department of Education, 2022b](#)). Texas received \$123,144,902 in 2022 for programs, state leadership, and state administration of CTE programs ([U.S. Department of Education, 2022a](#)). This figure pales in comparison to the funding provided by the state. Texas provides more than \$3 billion to CTE programs in public schools (Texas Education Agency, personal communication, November 10, 2020). This means that Texas outspends the federal government in CTE investments by nearly a 3-to-1 margin. This funding comes in mainly three forms: (a) via the CTE allotment, (b) through college, career, and military outcomes bonuses program (CCMR bonuses), and (c) local bonds.

The 74th Legislature established the Career and Technology Education allotment through the passage of SB 1 ([1995](#)). The Legislature has since modified the funding formula for the allotment a handful of times, most recently through HB 3 ([2019](#)) and HB 1525 ([2021](#)). The CTE allotment makes up the majority of CTE funding, funding over 90% of CTE program expenditures. An important feature of the CTE allotment is that school districts are only required to spend 55% of their funding from the allotment on actual CTE expenditures. The remaining balance can be reallocated to the school district's general fund. The statutory minimum can incentivize school districts to offer the programs of studies that have the lowest capital and maintenance expenditures. The other portion of state funding comes from the CCMR bonus program. The Texas Educational Agency established, as a condition for districts to be eligible to receive an outcomes bonus, that a certain percentage of graduates in those districts must be able to demonstrate college, career, or military readiness³ ([Texas](#)

[Administrative Code, §74.1007](#)). The percentage of each of the three cohorts that must demonstrate readiness are:

- 11% of educationally disadvantaged graduates;
- 24% of non-educationally disadvantaged graduates;
- 0% of graduates enrolled in a special education program.

In other words, if a district has 100 graduates, and 12 educationally disadvantaged graduates meet the criteria for the outcome's bonus, the district will receive a bonus of \$5,000 for the twelfth such student and each subsequent student. These bonuses add up quickly. In the school year 2019–2020, the statewide outlay for the outcomes bonus program for the class of 2018 was \$240,222,000, dropping to \$216,362,000 in 2020–2021 for the class of 2019 (Texas Education Agency, personal communication, September 16, 2022). Similar to the CTE allotment, districts are only required to spend a minimum of 55% of these bonuses on college, career, and military readiness activities.

The Jobs and Education for Texas Grant Program (JET) provides grants to eligible institutions to purchase and install equipment for its CTE courses and programs that lead to an occupational license, certificate, or post-secondary degree in a high-demand occupation. In 2020, the year for which we have most recent data, the grant awarded more than \$8.2 million to public school districts and community colleges ([Texas Workforce Commission, 2020](#)).

The final major source of CTE funding comes from school district bonds. District bonds are commonly used to fund large capital expenditures such as the erection of new facilities and the purchase of new equipment. School districts often use new CTE programs as a way to raise the profile of these bonds, but they are not required to detail how the funding will be used. A search in the archives of the Texas Bond Review Board ([n.d.](#)) reveals that since 2018, 808 school district bond proposals (over \$70 billion worth) have made it on to the ballot.

Part II: Analysis of Programs of Study

Texas parents want their children to be prepared for success after graduation. Yet about one third of Texas public high school graduates are neither employed nor enrolled in a Texas public postsecondary education institution six months after graduation ([TPEIR, n.d.](#)). Our analysis of secondary CTE programs of study in Texas has uncovered

3 Appendix II is an in-depth view of college, career, and military readiness criteria.

striking gaps between regional labor market needs and the programs of studies offered in those regions, and builds on our prior research on this topic ([Valdez & Johnson, 2020](#)). While employers are clearly stakeholders in the conversation about the skills gap, we wish to start our analysis at the level of the individual student, whose preferences, talents, and needs are not currently being served by an adequate range of options for development.

Who Benefits from CTE in Texas?

In this section, we will examine who benefits from the significant taxpayer expenditure in career and technical education in Texas. As a starting point, we know that there is a correlation between levels of engagement in CTE and employment and education outcomes. Nationwide data show that eight years after graduation, students who were “CTE concentrators” (defined as students who completed at least two courses in a single program of study) were employed full time (72%) or employed part time (12%), compared with non-CTE concentrators (67% and 14%, respectively). CTE concentrators also have higher median wages than non-concentrators eight years after graduation ([U.S. Department of Education, 2019](#)).

According to data from Texas Public Education Information Resource ([TPEIR, n.d.](#)), CTE participants (defined as students who completed at least 2 courses within a single program of study) from the class of 2019 were more likely to be employed, enrolled in Texas public postsecondary institution, or both six months after graduation compared to non-participants (70.8% vs. 64.1%). Beyond this overall positive correlation, we sought to discover what levels of program participation could tell us about student preferences.

The analysis of the persistence of students in secondary CTE programs of study in this section is based on the 2018–2019 Statewide Perkins V Indicator Report,⁴ which was required by this federal legislation. It captures the total number of graduates in 2019 who either concentrated in (took two courses for three or more credits) or completed (took three courses for four or more credits) a program of study. The TEA grouped both concentrators and completers together into the “CTE learner” category for the purposes of this report (TEA, personal communication, December 12 and 14, 2022). Note that the term “concentrator” here is synonymous with the definition of “participant” used in the TPEIR report cited above. On September 6, 2019, the TEA issued guidance

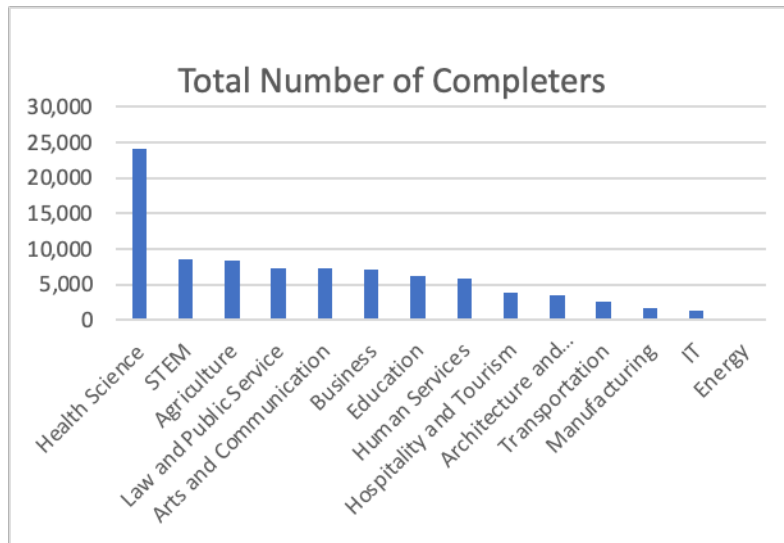
updating the following definitions for student engagement in CTE to accord with Perkins V ([TEA, 2019c](#)), and going into effect in the 2020–2021 school year: “**Concentrator:** Completes two or more courses in a single program of study. **Completer:** Completes 3 or more courses for 4 or more credits including an advanced course (level 3 or level 4) within an approved program of study.” The TEA will be distinguishing concentrators from completers going forward as an optional performance indicator, as it did on sheet 5S4 of the 2018–2019 Statewide Perkins V Indicator Report (TEA, personal communication, December 13 and 14, 2022).

CTE learners represented 65% (49.8% male and 50.2% female) of the graduates of Texas public high schools in 2019 ([TEA, 2020b](#)) were CTE learners. Twenty-four percent of graduates completed programs of study (44% male and 56% female) (see [Appendix V](#)).

This difference in engagement prompted us to look more deeply into the question of male participation in workforce and education. We found that we were not alone in this line of inquiry. There is a growing national concern that males are dropping out of both the labor market and education at an alarming rate. In *Men without Work*, Nicholas Eberstadt (2022), of the American Enterprise Institute, finds that 11% of prime-age working age men (ages 25–54) are neither employed nor looking for work (p. 11). Richard V. Reeves (2022), of the Brookings Institute, finds similar trends relating to male disengagement with work and school in his book *Of Boys and Men* (2022), pointing out that the female to male ratio in bachelor degree attainment is now 65–35 (p. 3) and that “almost one in four boys (23%) is categorized as having a ‘developmental disability’” (p. 8). Male students are more likely to be academically disinclined (as seen, for instance, in higher high school graduation rates among girls; [Texas Education Agency, 2020a](#)). One potential remedy for this male flight from work and school is to implement approaches that encourage participation in and completion of CTE programs while in high school, particularly in traditional vocational fields and Information Technology, both of which typically do not require four-year degrees. This approach builds on the revealed preference of male students, who already make up the majority of completers of traditional vocational programs of study and Information Technology ([Appendix III](#)). Specific program-level data reinforces this distribution of student interests.

4 Appendix V contains the updated version of the Statewide Perkins V Indicator Report provided by the TEA via personal communication.

Figure 1
CTE Completers by Program of Study

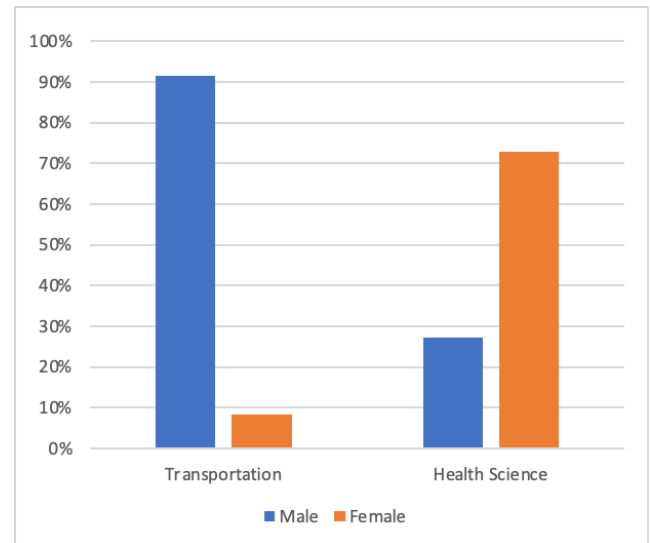


Note. Data from an updated Perkins V Indicator Report provided to us by the Texas Education Agency via personal communication, 2021 (see **Appendix V**).

We found that Health Sciences make up the lion's share of completers at just under 28% (or 24,127 students). **Figure 1** shows the total number of completers broken down by Texas career clusters. **Figure 2** displays the gender breakdown of the federal equivalent of the state clusters with the lowest and highest participation rates. It is important to note that disaggregated gender data on state clusters was not made readily available by the TEA. We are therefore using federally available Perkins V data for the state of Texas ([National Alliance for Partnership in Equity, n.d.](#)). This will not have a large impact on our analysis as the state clusters are based on the federal clusters. However, one area that will be impacted is the loss of analysis of the Texas state cluster on energy. Because there is no federal energy cluster, and because the energy cluster is by far the lowest-enrolling cluster in the state, we were not able to draw a gender breakdown of the lowest and highest enrolling *state* clusters.

Our analysis revealed that the Health Sciences federal cluster was predominately female (73% vs 27%) and that the lowest-enrolling cluster, Transportation, was predominately male (92% vs 8%). A complete list of federal cluster analyzed by gender is provided in **Appendix III**. Looking at the specialization of the topics within the programs of study with the highest completers confirms a preponderance of majority female programs and clusters. Indeed, as **Table 1** shows, 3 out of the top 5 programs of study with the largest

Figure 2
Highest Enrolling Cluster vs Lowest Enrolling Cluster - Federal



Note. Data from *Perkins State Plan and Data Explorer*, U.S. Department of Education, n.d.-b, retrieved July 21, 2022 (https://cte.ed.gov/dataexplorer/build_enrollment).

numbers of completers are in the Health Sciences state cluster, and in **Table 2** we find that the programs of study with some of the lowest number of completers come from the Architecture and Construction cluster.

Our analysis of secondary CTE programs of study leading to middle skills occupations reveals that there is greater accessibility to programs that are preferred by female students, as well as higher numbers of completers for these programs. As noted above, fewer male students complete programs of study than females (44% vs 56%) despite having close to equal (49.8% male vs 50.2% female) concentration rates. This attrition hints at male disaffection with CTE offerings or program design in secondary education. Fortunately, this disaffection is not found in all workforce training in the state. One model to turn to in regards to increasing male engagement in education and workforce is demonstrated by the majority male to female enrollment ratio at Texas State Technical College ([Texas Higher Education Accountability System, n.d.](#)). This system's focus on hands-on learning, competency-based education ([Texas State Technical College, n.d.](#)), and employment outcomes ([Valdez & Borrego, 2022](#)) seems to have revealed a demand for these program design features among male students. It is conceivable that secondary CTE programs—especially in the fields of Construction, Automotive, Manufacturing, and Information Technology—that adopt these approaches

Table 1
Breakdown of Programs of Study With the Highest Number of Completers

Program of Study	Number of Completers	State Cluster
Healthcare Therapeutic	23,739	Health Sciences
Healthcare Diagnostics	23,326	Health Sciences
Medical Therapy	15,323	Health Sciences
Law Enforcement	6,705	Law and Public Service
Engineering	6,397	STEM

Note. Data from *The Perkins V Indicator Data Statewide Report*, Texas Education Agency, n.d.-b, (<https://tea.texas.gov/sites/default/files/2018-2019-perkins-v-statewide-report.pdf>) with a corrected CTE completer total (82,076) (see **Appendix V**).

Table 2
Breakdown of Programs of Study With the Lowest Number of Completers

Program of Study	Number of Completers	State Cluster
Electrical	196	Architecture and Construction
HVAC and Sheet Metal	123	Architecture and Construction
Plumbing and Pipefitting	103	Architecture and Construction
Oil and Gas Exploration and Production	34	Energy
Diesel and Heavy Equipment	1	Transportation, Dist. & Logistics

Note. Data from *The Perkins V Indicator Data Statewide Report*, Texas Education Agency, n.d.-b, (<https://tea.texas.gov/sites/default/files/2018-2019-perkins-v-statewide-report.pdf>) with a corrected CTE completer total (82,076) (see **Appendix V**).

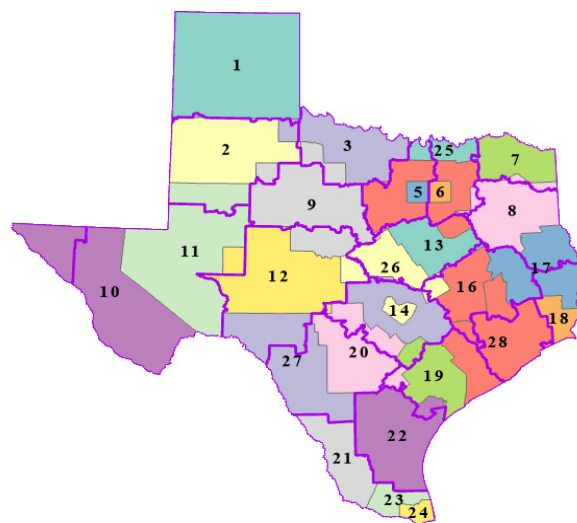
might find an increase in the number of males persisting in their skill development.

Methodology

Data Sources

The data used for our analysis came from two sources: the Texas Workforce Commission and the Texas Education Agency. To identify high-wage, high-demand jobs in Texas, this analysis relied on the Target Occupations list developed by the Texas Workforce Commission (2022). This list is a result of the Texas Workforce System’s charge of developing strategies to target high-growth, high-demand, and emerging jobs that are critical to the state and local economies. The jobs on the list are determined by workforce development boards and are selected by using various economic indicators and regional input data. To identify the programs of study offered at each school district, we used information provided by the Texas Education Agency and the Texas Labor Market Information, 2020–2030 report (specifically for our analysis, we used the Texas regional report, which is a compilation of all of the workforce development board area reports; [TEA, 2022b](#)).

Figure 3
ESC Regions and Workforce Development Board Areas



Note. Data from Texas Education Service Center regions, Map Application, Texas Education Agency, 2019d (https://schoolsdata2-tea.texas.opendata.arcgis.com/datasets/12142ff8beec4a1797334c9c41ba7b18_0/explore?location=31.066081%2C-99.885000%2C6.31).

Identifying Skills Gaps

To identify middle skill gaps in each region, we cross-referenced the jobs on the TWC occupations list with the Labor Market Information (LMI) report. Using the Standard Occupational Classification Code as a unique identifier for each occupation, we mapped information such as demand, wage, state cluster, required education, median wage, growth rate, and total annual openings from the LMI report onto the occupations list.

From there we set out to identify the Education Service Center (ESC) region within each TWC board area. To accomplish this, we identified the counties in each ESC region and TWC board area and identified the overlapping areas. **Figure 3** depicts each ESC region boundary (colored purple) drawn over each TWC Board Area (uniquely colored and labeled in black).

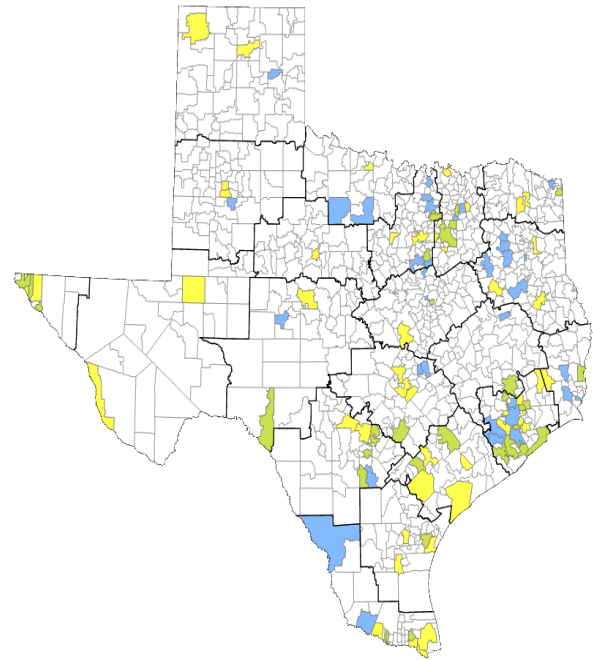
Once we identified which board areas mapped to which ESC region, then we filtered the occupations list to only those occupations that required less than a bachelor's degree to obtain, were in high demand, and had a high wage according to the LMI report to create a middle skills list.

To identify the middle skill gaps, we further filtered our middle skills list by state cluster to identify occupations within that cluster and their corresponding programs of study. Lastly, we searched for the number of school districts that offered those programs of studies that were on our middle skills list and organized them by ESC region ([Texas Education Agency, 2021a](#)). This list of programs of study offered by school districts is currently self-reported to the TEA, and as a result, some information may be missing.

For example, to find the middle skill gap in the Houston area, we relied on the target occupations list for the workforce development board 28 (the Gulf Coast) and used the industry standard occupation classification (SOC) codes to merge the wage and growth data from the LMI report. Next, we filtered the occupations for those jobs that required less than a bachelor's degree of education and salaries higher than the state median wage. After we applied the filters, we found that HVAC technicians were in high demand. We then searched the school districts in ESC regions 3 & 4 (the ESC regions that overlapped with workforce development board 28) to find the number of school districts that have a HVAC and Sheet Metal program of study.

Figure 4

Texas School Districts Colorized by Program Offering in HVAC & Sheetmetal or Electrical Studies



Note: Data from *The Perkins V Indicator Data Statewide Report*, Texas Education Agency, 2020, (<https://tea.texas.gov/sites/default/files/2018-2019-perkins-v-statewide-report.pdf>) with a corrected CTE completer total (82,076) (see [Appendix V](#)).

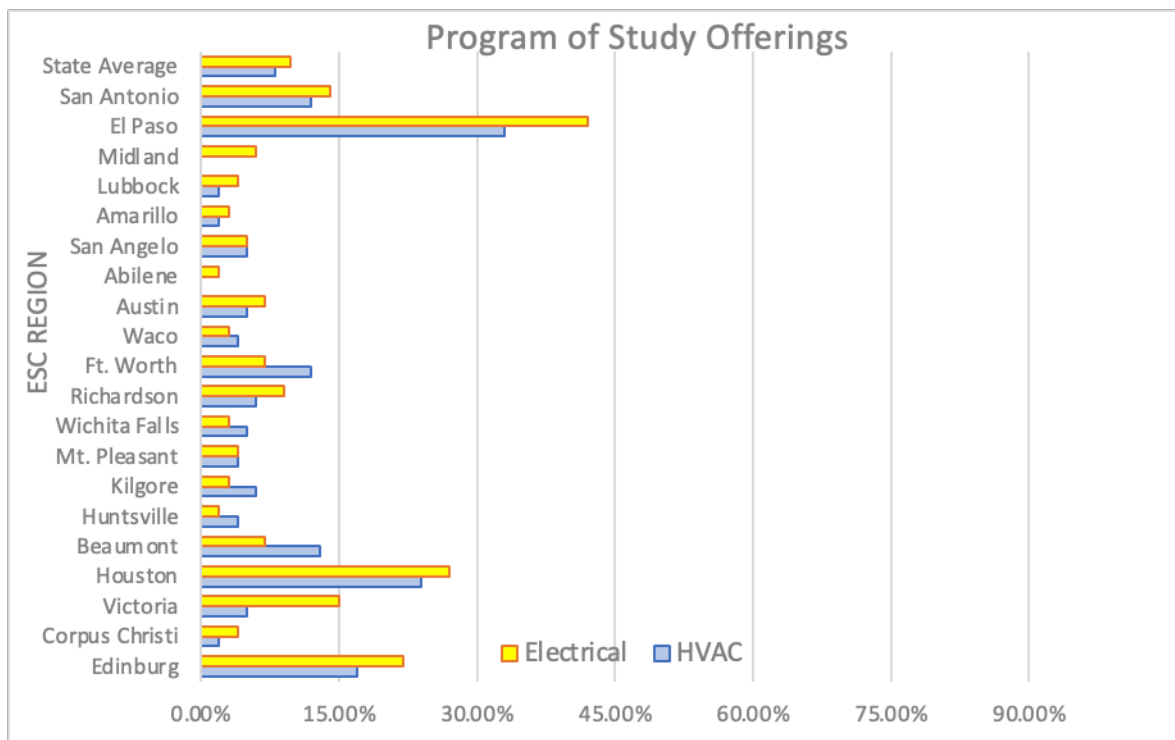
Findings

Those ESC regions with low program offerings compared with high regional workforce demand were then considered to be areas in which a skills gap existed. In the following section, we will be exploring three state clusters in which the skills gap was especially striking. These cluster areas are Architecture & Construction, Information Technology, and Transportation. We note with interest that 2 out of the 3 clusters would fall under the traditional vocational programs under Malkus' model. What all of them have in common is that they offer pathways to above median salary jobs that do not typically require a bachelor's degree, and are traditionally populated by mostly male students ([Texas Workforce Commission, 2022](#)).

Architecture & Construction

In the state cluster of Architecture and Construction, there are two programs of CTE study that stand out as having a particularly mismatched relation to labor market demand: (a) HVAC and Sheet Metal and (b) Electrical. Every workforce region in the state has identified a high need for HVAC technicians and electricians in their region ([Texas](#)

Figure 5
Breakdown of HVAC and Electrical Programs of Study by ESC Region



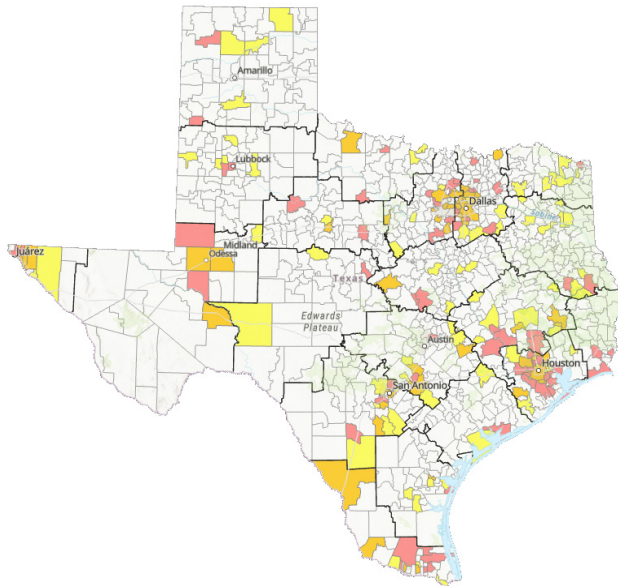
Note: Data from The Perkins V Indicator Data Statewide Report, Texas Education Agency, 2020, (<https://tea.texas.gov/sites/default/files/2018-2019-perkins-v-statewide-report.pdf>) with a corrected CTE completer total (82,076) (see Appendix V).

Workforce Commission, 2022). Despite the vigor of these industries, over 66% of school districts in the state do not offer a program in this cluster. When examining the occupations in high demand within this cluster we find that HVAC mechanics and installers (median salary \$47,171.29) and electrical power-line installers and repairers (median salary \$55,722.59) are in high demand by every Workforce Board in the state. Despite this high demand, fewer than 10,500—less than 3% of the total number of high school graduates in 2018—students take a course in the architecture and construction state cluster and of these, only 34% of students are CTE completers (with 196 Electrical completers in the state and 123 HVAC and Sheet Metal completers; U.S. Department of Education, 2022b). A possible explanation for this low completion rate is program accessibility. We found that the programs that feed into HVAC & Sheet Metal and Electrical are scarcely found in the state. Less than 9% of school districts in the state offer an HVAC program of study and approximately 10% of districts offer a program of study in Electrical studies. Figure 4 is a spatial representation of the programs offered in the state. With school districts colored in yellow (Electrical POS offering), blue (HVAC POS offering), or green (both Electrical and

HVAC POS offering). Figure 5 displays the percentage of school districts by ESC region that offers programs of study in HVAC and Electrical studies.

The data show that there are large geographic areas in which students do not have access to career training in this high-demand field (Texas Education Agency, 2021a). The ESC regions of Midland and Abilene—home to more than 138,000 students—do not have an HVAC program. In fact, 12 of the 20 ESC regions of the state have fewer than 10% of their school districts offering an HVAC program. Put another way, in Texas, 3,788,999 students (nearly 75% of the state) do not have access to an HVAC program in their district. In the realm of Electrical studies, the findings are only relatively better. While there is an Electrical program in every ESC region, a greater number of ESC regions—15 out of the total 20—have less than 10% of their districts offer an Electrical program. This equates to a statewide total of approximately 3,394,828 students (more than 66% of the state total) that do not have access to an Electrical program in their district. These numbers were striking as both programs offer a path to a career that pays well above the state’s median salary of \$39,030 (Texas Career Check, 2022).

Figure 6
Texas School Districts Colorized by Program Offering in Networking Systems and Web Development



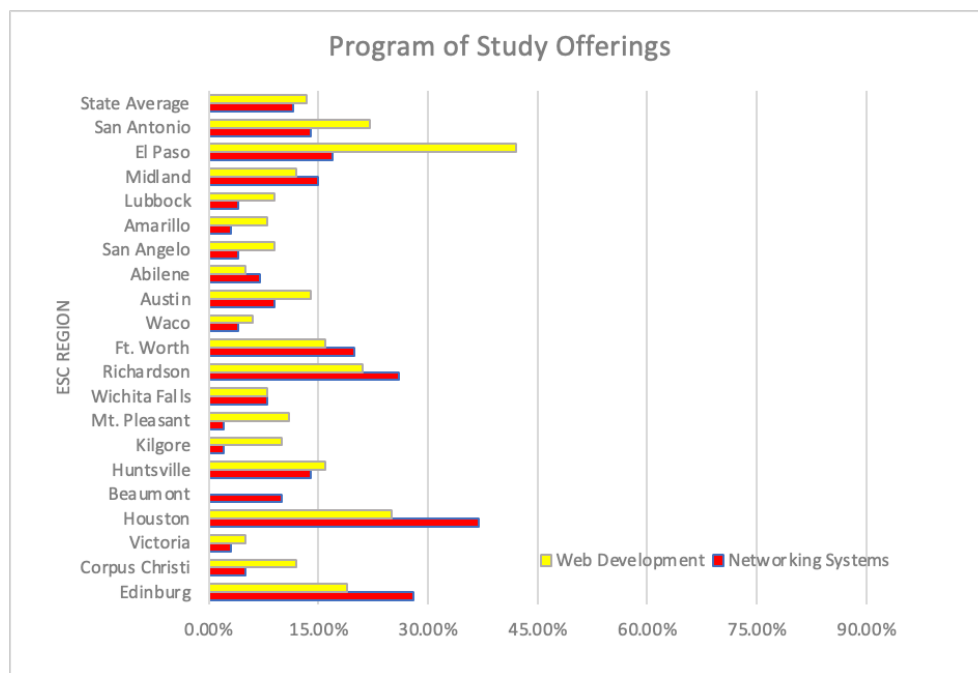
Note: Data from Texas Career and Technical Education, Program of Study, Map application, by the Texas Education Agency, n.d.-d (<https://experience.arcgis.com/experience/f0dc818f3900452ea7cb25a95add1dfc>).

Information Technology

Texas is a national leader in the Information Technology (IT) industry. With nearly 30,000 computer, software, and technology companies calling the Lone Star State home, this industry employs an estimated 370,000 workers ([Office of the Texas Governor, 2021a](#)). One would expect that there would be an adequate supply of programs of study to meet this demand. Yet, we do not find the program of study offerings in school districts commensurate with the demands of the labor market. Indeed, the three occupations identified in the IT middle skills list—Computer networking support specialist (median salary \$47,464.37), web developers (median salary \$66,346.99), and digital interface designers (median salary \$66,346.99)—had an average program of study offering of 12.4% statewide. The two programs of study that feed into these occupations are Networking Systems and Web Development. The number of CTE completers for Networking Systems and Web Development were 614 and 659, respectively, out of more than 82,000 CTE completers statewide (see **Appendix V**).

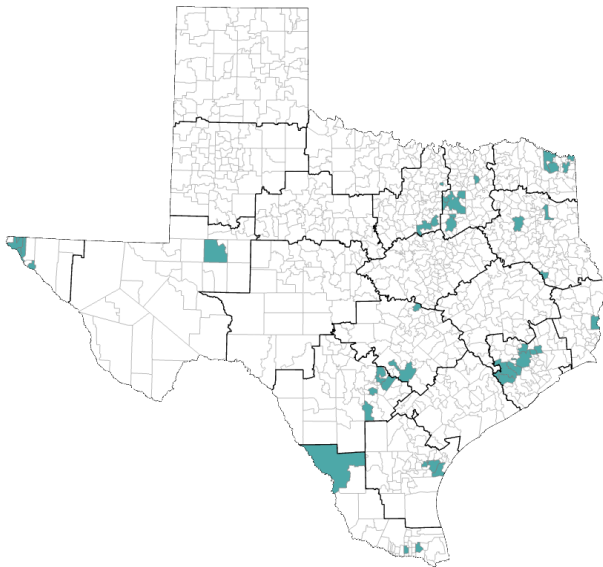
Figure 6 is a spatial representation of the programs offered in the state, with school districts colored in red (Networking Systems POS offering), yellow (Web Development POS offering), or orange (both Networking Systems and Web

Figure 7
Breakdown of Web Development and Networking Systems Programs of Study by ESC Region



Note: The data is from Texas Education Agency, <https://tea.texas.gov/sites/default/files/2018-2019-perkins-v-statewide-report.pdf>, with a corrected CTE completer total (82,076) on sheet 5s4 via personal correspondence.

Figure 8
Texas School Districts Colorized by Program Offering in Diesel & Heavy Equipment



Note: Data from Texas Career and Technical Education, Program of Study, Map application, by the Texas Education Agency, n.d.-d (<https://experience.arcgis.com/experience/f0dc818f3900452ea7cb25a95add1dfc>).

Development POS offering). **Figure 7** displays the percentage of school districts by ESC region that offers programs of study in Networking Systems and Web Development.

In an ideal relationship, there would be at least one school district offering an IT program of study in each board area that has a middle skill IT occupation listed as a targeted occupation. However, much like the previous state cluster, Information Technology has large geographic gaps in which students do not have access to this pathway. While every ESC region has at least 1 school district offering a POS in Networking Systems, 12 of the total 20 regions have less than 10% of their school districts offering Networking Systems. Statewide the total number of students who do not have access to this high-demand, high-wage program of study is approximately 2,556,149—just under half of the state’s student population. In Web Development—the other high-wage, high-demand program of study—the findings fair marginally better. Although the Beaumont ESC region does not offer a program of study in Web Development in its school districts, overall offerings in the state are higher than Networking Systems at 13.4% compared to 11.5%. However, this modest advantage amounts to far less than it seems, for there are still 3,279,797 students who do not have access to this program of study, representing over 63% of the state’s student population. These numbers are again

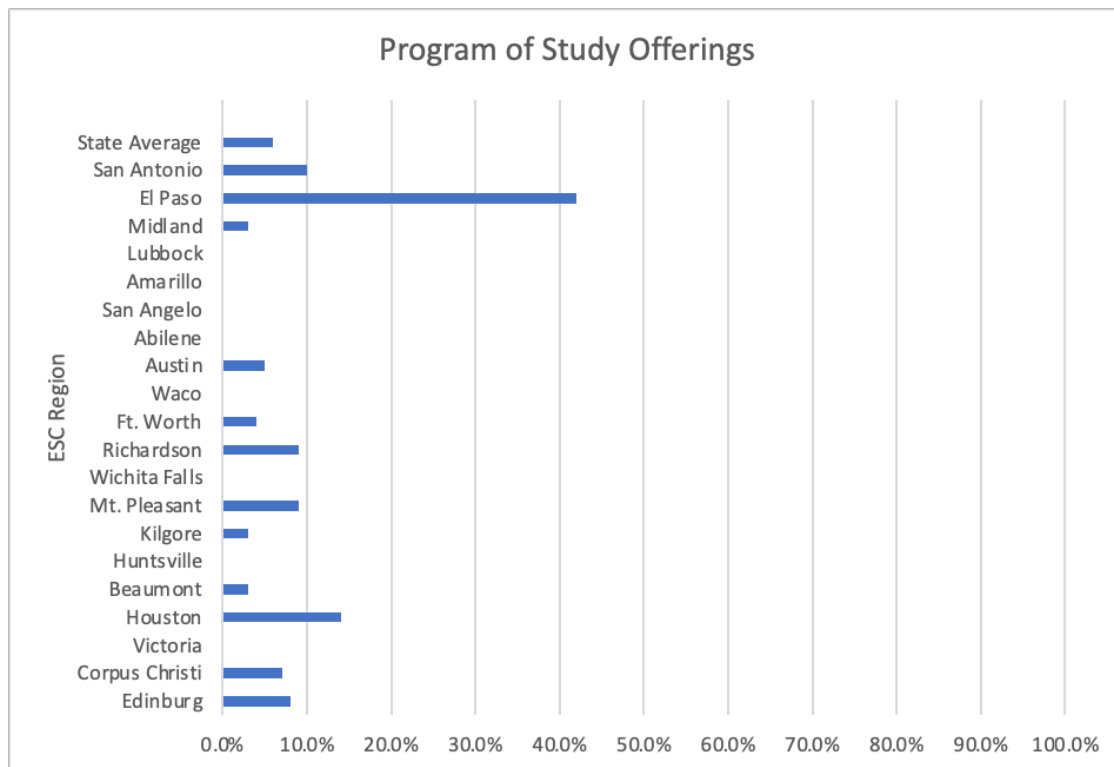
striking as both programs offer a path to a career that pays well above the state’s median salary and do not typically require a bachelor’s degree.

Transportation

Much like the fields of construction and agriculture, transportation has long been a fixture of the middle skills workforce. Texas is no stranger to the automotive and transportation industry. In 2014, Texas was home to more than 400 automotive manufacturing firms and 1,750 manufacturing plants that employ more than 40,000 Texans ([Office of the Texas Governor, 2015](#)). Since then, the manufacturing output in the state has increased by over 17% ([Office of the Texas Governor, 2021b](#)). There are two target occupations: (a) bus and truck mechanics and (b) diesel engine specialists. The Texas Workforce Commission conflates both occupations in its high-need occupations list, giving a projected median wage of \$49,195.79 and an expected job growth of 11%; with this limitation we move forward with our analysis. While there are plentiful programs offered in the state for general Automotive studies (more than 77% of students in the state have access to an Automotive POS), the program of study that leads to these occupations is Diesel and Heavy Equipment. This program of study is scarcely found in the state—only 5.9% of school districts offer it. This difference in program access helps explain the disparity in completers between Automotive (2,397 completers) and Diesel and Heavy equipment (1 completer). **Figure 8** provides a spatial representation of the programs offered in the state, with school districts colored in teal being the districts that offer a Diesel program. **Figure 9** displays the percentage of school districts by ESC region that offer programs of study in this field.

Our analysis shows that 8 ESC regions do not offer a program of study in Diesel and Heavy Equipment mechanics, despite the fact that every ESC region in the state has a workforce board that identified bus and truck mechanics and diesel engine specialists as a target occupation ([Texas Workforce Commission, 2022](#)) These regions are Lubbock, Amarillo, San Angelo, Abilene, Waco, Wichita Falls, Huntsville, and Victoria. In fact, all but two regions (El Paso, 42%, and Houston, 14%) had program offerings at or under 10% in the region. Statewide, only 5.9% of school districts offer a program of study in Diesel and Heavy equipment. This equates to a total of more than 3,900,000 students without access to such a program. Therefore, despite the growing demand for technicians, and the availability of facilities via the Automotive program of study, Texas school districts are not offering this high-need program at rates similar to that of Automotive studies. Indeed, the program gaps discussed in

Figure 9
Breakdown of Diesel & Heavy Equipment Programs of Study by ESC



Note: The data is from *The Perkins V Indicator Data Statewide Report*, Texas Education Agency, n.d.-b, (<https://tea.texas.gov/sites/default/files/2018-2019-perkins-v-statewide-report.pdf>) with a corrected CTE completer total (82,076) on sheet 5s4 via personal correspondence.

this paper have revealed that there is a striking gap between program offerings and regional workforce demands. These gaps represent lost opportunities for Texas high school students and constraints on the growth of our economy. In the following section, this paper will discuss policy recommendations that will help bridge these gaps.

Possible Constraints to Programs of Study & Further Considerations

Constraints

The Texas Legislature recognizes that CTE programs are often more expensive than traditional academic courses in terms of equipment and faculty—Texas taxpayers funded secondary CTE programs in public schools by approximately \$2.8 billion in 2020. Adding the federal funding through Perkins V, the total amount was over \$2.9 billion (Texas Education Agency, personal communication, November 10, 2020). This amount only accounts for yearly expenditures and not capital expenditures that are paid for through school district bonds or through the Jobs in Education and Training Program ([Texas Workforce Commission, n.d.](#)).

Despite the additional funding, the large number and variety of programs of study makes it unreasonable to expect that every high school offer every program. But this does not mean that Texas must accept a state of affairs in which students cannot find the programs that attract their interests or skills at the high school to which they are zoned to. Students who participate in CTE courses in their junior and senior years of high school are more likely to graduate than non-CTE course takers ([Pals & Fera, 2017](#)). Employers, moreover, may find that the growth of their businesses is constrained by the lack of skilled workers in their industries.

Further Considerations

Throughout this paper we have suggested the existence of an imbalance in the labor market manifesting as a middle skills gap. From this suggestion, a question rooted in economic theory emerges: Why hasn't the market created a solution to the middle skills gap through increased wages or the entry of additional firms? It is true that the labor market has attempted to correct itself by way of increasing wages for many occupations within the middle skills gap.

The simple answer to the question is because of institutional barriers. A more nuanced answer can be broken down into two points: student information asymmetry and bias within the educational system in favor of new-era, college-bound courses.

Speaking to the first point, there is significant information asymmetry between the labor market and students regarding median wage, average debt incurred, and other economic outcomes. Students are not routinely given information regarding the median earnings for different CTE programs of study. This reduced the ability of students and their parents to be informed and rational actors in their decision to select a program of study. Regarding the later point, as mentioned in the section on finance, because school districts are only required to spend 55% of their CTE allotment on actual CTE expenditures and can reallocate the remaining funds as needed, there is an implicit incentive to offer the programs of study with the lowest operating cost. These lower-cost CTE programs of study are often courses such as introductory health sciences and business courses (both falling into the category of new-era CTE), while traditional vocational course such as Welding, Auto Mechanics, and HVAC are programs that have a much higher operational and maintenance cost. These two institutional barriers result from a lack of labor market signals in the form of incentives.

In the recommendation section that follows, we point out several public policy levers that could enable Texas to increase access to programs and close the gap between the labor market demand for certain skills and the supply of students qualified and ready to meet those opportunities. By doing so, Texas will help more students achieve success in their career of choice.

Part III: Recommendations

Changes to the Industry-Based Credentials List

1. HB 3767 (2021), which created the Tri-Agency Workforce Initiative, contains permissive language to allow the Texas Workforce Commission and Texas Higher Education Coordinating Commission to collaborate on creating a library of “credentials of value” (Texas Government Code § 2308A.007). According to a legislative briefing given by TEA Commissioner Morath on August 2, the intention of the Tri-Agency Workforce Initiative is that this library “be the source for the TEA’s IBC list moving forward” (Texas Education Agency, personal communication, June 24, 2021). While this accords with the Foundation’s prior recommendations (Valdez & Jones, 2022), it is paramount that
- TEA augment its selection criteria to prioritize those credentials that have the largest economic outcomes for students who are not planning to attend four-year institutions of higher education.
 2. Improve the public-facing transparency of the IBC list’s criteria. The general public and industry should have access to the metrics the TEA uses to determine whether an industry credential is able to make it onto the IBC list. This level of transparency will allow industries, if possible, to design or augment existing programs to meet the criteria of the state.
 3. The industry-based certification advisory council’s role could be clarified as that of working in partnership with the Texas Workforce Commission and the Texas Higher Education Coordinating Board to work cooperatively to create the above-mentioned library of “credentials of value.” Employer input is critical to the formation of a high value credentials list, as it allows Texas to identify those credentials that are “must haves” in an industry (Northern & Petrilli, 2022, p. 7).

Changes to School Finances

1. Make funding for career-readiness education portable.
 - a. If students find that their school does not offer a program of study that they desire to complete, they should be able to take courses from another provider, and funds, including the career and technical education allotment, should be allowed to follow them to the other provider via an education savings account. Providers could include other public schools, community colleges, technical colleges, virtual education programs, or training providers identified on the Texas Workforce Commission’s Eligible Training Providers list. Idaho’s Advanced Opportunities program allows students to access up to \$4,125 from the beginning of 7th grade to graduation for academic acceleration, enhancement, or CTE-specific programs (Idaho State Department of Education, n.d., “Overview”). Our 2019 estimate of the average expenditure over a four-year period per CTE completer was \$29,229 (Texas Education Agency, personal communication, November 10, 2020; Texas Education Agency, n.d.-b).
 - b. Ensure that an eligible expenditure of an education savings account includes work-based learning opportunities.

- c. Make transportation funding an eligible expenditure under an education savings account to allow students to get to these educational opportunities within their regions.
2. Reform the CCMR outcomes bonus for college and career-readiness by extending the window in which the success indicators “count” toward the bonus.
 - a. College readiness could be measured not by simply enrolling in college but also by earning at least 12 non-remedial credits within a year of graduation.
 - b. Career-readiness could be measured by earning a credential included in the library of credentials established by the Tri-Agency Workforce Initiative ([Texas Government Code § 2308A.007](#)) within one year of graduation, enrollment in an apprenticeship program, *or* demonstration of earnings above the statewide median wage within at least one of graduation. These indicators should be an alternative to the existing indicator that a student earn an industry-based credential from a list curated by the Texas Education Agency by August 31 after a student graduates. As Matt Giani ([2022](#)) shows, those industry-recognized credentials that do not require an education beyond that of a high school diploma are weakly related to positive employment and earning potential compared to other high school graduates. Reporting of career-readiness indicators could be based on either data from the Tri-Agency Workforce Initiative or one of its agencies or based upon self-reported data by students. Students who voluntarily produced verified evidence of employment above the median wage or attainment of a credential of value could be eligible for a portion of the bonus that the district receives. Tying outcomes bonuses to employment outcomes in the secondary CTE space would lead to the adoption of a key component of the successful approach taken by Texas State Technical College’s returned-value funding model, providing better labor market signals to programs.

Changes to School Enrollment

1. Improve inter-district transfers (student transfers between school districts) and intra-district transfer (student transfers within the same school district) opportunities. The Foundation’s research indicates

that a main reason students wish to transfer to another public school is to pursue certain academic programs not offered in their home district ([Sass et al., 2022](#)). In fact, Petek ([2021, p. 2](#)) found that students who transferred in their study gained access to an average of five to seven courses not offered by their home districts. Improving intra-district transfers and inter-district transfers could be done, as Sass et al. ([2022, p. 21–23](#)) point out, by:

- a. Revising current open enrollment policy to provide clarity and predictability to parents.
- b. Augmenting parent resources provided by the state to help parents explore their open enrollment options.
- d. Adopt a comprehensive open enrollment policy.
 - i. An open enrollment policy would call for districts to accept non-resident students until they reach classroom capacity.
 - ii. Students would be automatically readmitted to their transfer school once admitted.
 - iv. Prohibit non-resident tuition in public schools.
 - v. Create a uniform admission policy across the state.

Opportunities to Improve CTE Instruction

1. Allow professionals in high-demand occupational fields to enter into part-time arrangements with districts for CTE instruction, and remove local obstacles to hiring for professionals in these fields.
2. Expand apprenticeship opportunities by removing the requirement for apprenticeships to be registered with the Office of Apprenticeship under the Department of Labor ([Texas Education Code §113.001](#)) and allowing the TWC to create standards for state-approved, industry-based apprenticeship programs.
3. Facilitate school-private sector partnerships to expand the number of paid work-based learning opportunities. These kinds of partnerships would provide students with structured opportunities to begin their careers

and minimize the capital expenditure required by the school district.

4. Follow the model of HB 1650 (2021) by,
 - a. allowing high school students to begin taking required coursework for high-wage skilled-trade occupational licenses; and
 - b. waiving fees and continuing education requirements for skilled trade professionals who are teaching CTE courses in high schools.
5. Empower students to “know before you go” by informing them of the average economic outcomes for college majors and vocational programs before they enroll in these programs. Economic outcomes include student debt-to-earnings ratios, wages, and placement.
6. School district leaders can currently leverage funding created under SB 1882 (2017) to create inter-district, postsecondary, charter, and other eligible entity partnerships, as exemplified in the Rural School Innovation Zone (n.d.).

Conclusion

The middle skills gap could cost the U.S. economy more than \$2.5 trillion over the next decade (Giffi et al., 2018). In Texas, 56% of the labor market is made up of middle skills workers but only 42% of workers have the required middle skills level training (Texas Workforce Investment Council, 2021). This 14% gap can be used to approximate the number of Texans that are not career-ready. Texas made addressing the middle skills gap, which is at the heart of the career-ready issue, a priority by launching the Texas 60x30 campaign. One way Texas hopes to reach its 60x30 goal is by encouraging students to obtain occupational

certificates while in high school via CTE programs of study. However, despite the nearly \$3 billion investment in these programs in 2020, millions of students across the state do not have access to programs of study that lead to high-wage, high-demand occupations. This is particularly true for traditional vocational programs such as construction, transportation, and electrical studies, which are being crowded out by New Era CTE fields such as Health Sciences and Engineering. More than two thirds of Texas students do not have access to an Electrical or HVAC program, half do not have a Network Systems or Web Development program, and more than three quarters do not have a Diesel and Heavy equipment program in their home district. And because of current restrictions on inter- and intra-school district transfers, restrictions on program offerings, and the current incentive structure for public schools, most of these students will never have the opportunity to receive a jump start on their career path while still in high school.

In this paper, we examined the accountability and incentive system of public schools, analyzed the demographics of the programs of studies with the most and least enrollment, and showed the degree of availability for the programs of study that contribute most to the middle skills gap. To address the middle skills gap and increase student outcomes, we recommend that Texas make changes to school finance, improve the industry-based credentials list, change current rules regarding student enrollment, and modify restrictions relating to CTE course instruction.

Texas policy should recognize that skills development in the 21st century will continue to evolve, and no single pathway will serve all students well. Policy should not restrict access to programs that lead to a family-sustaining occupation. Our prosperity as a state depends on giving students the opportunity to develop their unique abilities. ★

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Appendix I: Texas CTE Programs of Study by State Career Cluster

In Texas, there are a total of 53 statewide programs of study spanning the 14 state career clusters:

Agriculture, Food, & Natural Resources

- Agribusiness
- Animal Science
- Applied Agricultural Engineering
- Environmental and Natural Resources
- Food Science
- Plant Science

Architecture & Construction

- Architectural Design
- Carpentry
- Construction Management and Inspection
- HVAC and Sheet Metal
- Masonry
- Plumbing and Pipefitting

Arts, A/V Technology & Communications

- Graphic Design and Multimedia Arts
- Digital Communications

Business Management & Administration

- Accounting and Financial Services
- Business Management
- Entrepreneurship
- Marketing and Sales

Education & Training

- Early Learning
- Teaching and Training

Energy⁵

- Oil and Gas Exploration and Production
- Refining and Chemical Processes

Health Sciences

- Exercise Science and Wellness
- Health Informatics

- Healthcare Diagnostics
- Healthcare Therapeutics
- Medical Therapy
- Nursing Science

Hospitality & Tourism

- Culinary Arts
- Lodging and Resort Management
- Travel, Tourism, and Attractions

Human Services

- Family and Community Services
- Health and Wellness

Information Technology

- Information Technology Support and Services
- Networking Systems
- Web Development

Law and Public Service

- Emergency Services
- Government and Public Administration

Manufacturing

- Advanced Manufacturing and Machinery Mechanics

Science, Technology, Engineering & Mathematics

- Biomedical Science
- Cybersecurity
- Engineering
- Programming and Software Development
- Renewable Energy

Transportation, Distribution & Logistics

- Automotive
- Aviation maintenance
- Diesel and Heavy Equipment
- Distribution and Logistics

⁵ The Texas State Energy Cluster merits a deeper exploration. The following are distinct characteristics of this cluster versus the others identified above:

- No federal career cluster equivalent
 - Texas is unique in that it offers a career cluster in energy that is not offered on the federal level.
- IBC List Exclusion
 - In versions two and three of the IBC list ([Texas Education Agency, 2019b](#); [Texas Education Agency, 2022a](#)), no certificates align with this cluster. This has the effect of disincentivizing school districts from offering CTE courses in this career area because:
 - Certificates earned by students in this cluster do not count toward a school district's accountability rating.
 - School districts will not receive a CCMR bonus for their completers.
- Renewable Energy is not included in the energy cluster ([Texas Education Agency, n.d.-c](#))
 - Programs of study that align with the renewable energy sector are included in the STEM (science, technology, engineering, and math) cluster. Oil and gas programs of study are thus isolated from the cluster where they might naturally fit.

Appendix II: College, Career, and Military Readiness

What Are the CCMR Outcomes Bonus Criteria?

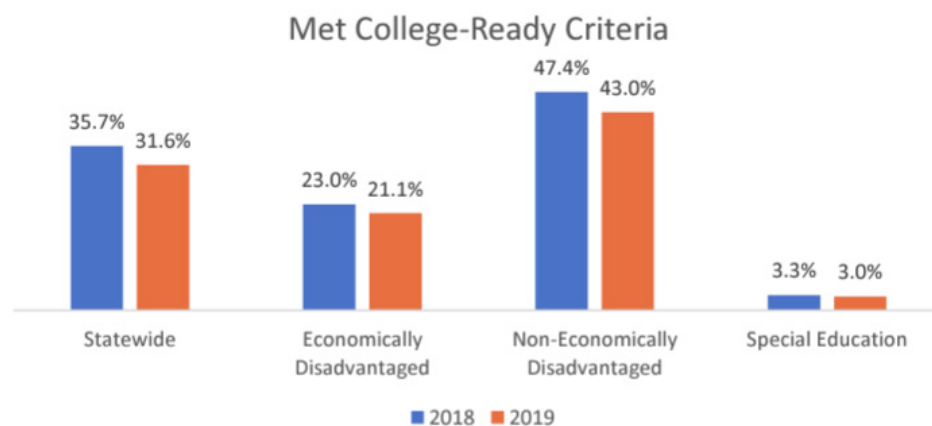
Table 3 depicts the way that graduates are determined to be either college, career, or military ready according to Texas statute ([Texas Education Code §48.110](#)) and its accompanying administrative rules (TAC):

Table 3
Breakdown of College, Career, and Military Readiness Criteria

College Ready Criteria			
Examination Criteria		Track Specific Criteria	
Attains Texas success initiative (TSI) college readiness score on SAT/ ACT/ TSIA and	In the fall after graduation, enrolls in a postsecondary institution	=	College Ready
	Earns an associate degree by the fall after graduation		
Career-Ready Criteria			
Examination Criteria		Track Specific Criteria	
Attains Texas success initiative (TSI) college readiness score on SAT/ ACT/ TSIA and	Receives an industry-based certification or Level I/ Level II Certificate (see below) by the summer after graduation.	=	Career-Ready
Military Ready Criteria			
Examination Criteria		Track Specific Criteria	
Achieves a passing score on the Armed Services Vocational Aptitude Battery (ASVAB) and	Enlists in the U.S. Armed Forces or the Texas National Guard.	=	Military Ready

The majority of the CCMR bonuses for the classes of 2018 and 2019 were generated by graduates meeting the college readiness criteria, as seen in **Figure 10**. Nearly 36% of all Texas students graduated career-ready in 2018 and 32% in 2019.

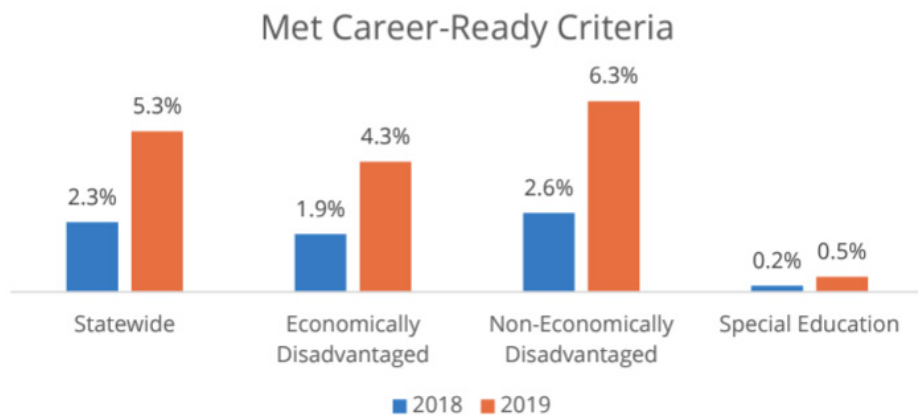
Figure 10
Breakdown of Students Who Met College-Ready Criteria



Note. Data is from the CCMR Outcomes Bonus Report by the Texas Education Agency, 2022c (<https://tea.texas.gov/sites/default/files/updated-ccmr-ob-one-pager-april-2022.pdf>).

Only 2.3% and 5.3% of high school graduates were career-ready, as seen in Figure 11, this means that graduates from the same cohorts meeting the career-readiness criteria generated far less revenue for districts than graduates meeting the college-readiness criteria.

Figure 11
Breakdown of students that met Career-Ready criteria

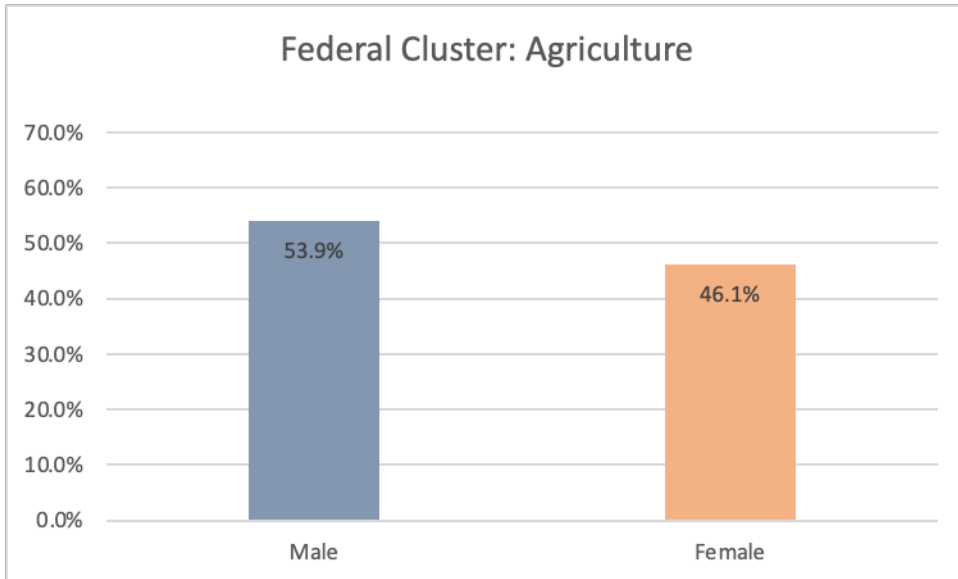


Note. Data is from the CCMR Outcomes Bonus Report by the Texas Education Agency, 2022c (<https://tea.texas.gov/sites/default/files/updated-ccmr-ob-one-pager-april-2022.pdf>).

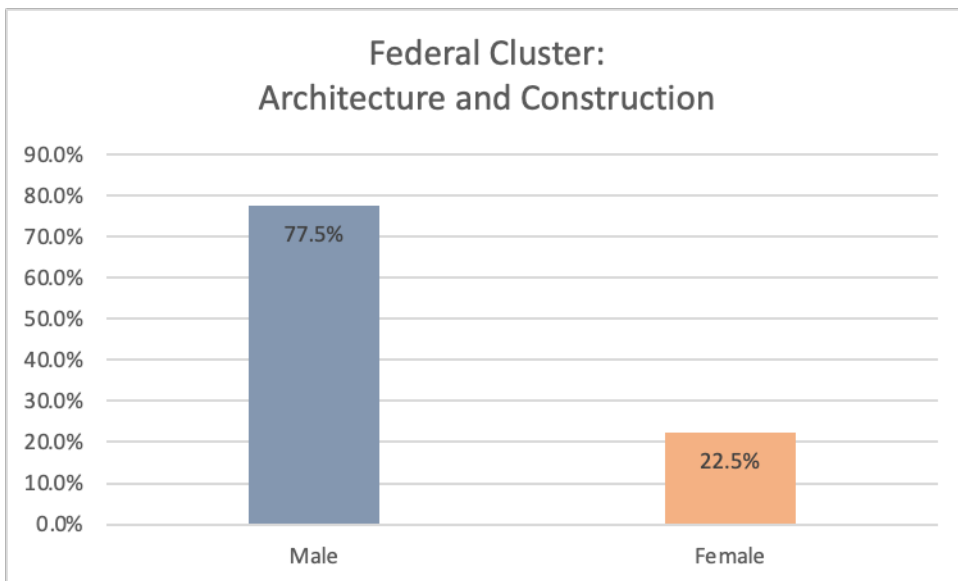
Based on the fact that the TSIA test is used as an indicator for both college and career-readiness and that college readiness can be demonstrated by merely enrolling in a postsecondary institution in the fall after graduation, whereas a career-ready graduate must earn an IBC by the summer after graduation, it is not surprising that most outcomes bonuses are generated by college-ready graduates. Put simply, it is easier for schools to demonstrate the college readiness of their graduates than their career-readiness

Appendix III: Relative CTE Completion Rate by Gender: Federal Clusters, 2019-2020⁶

Agriculture

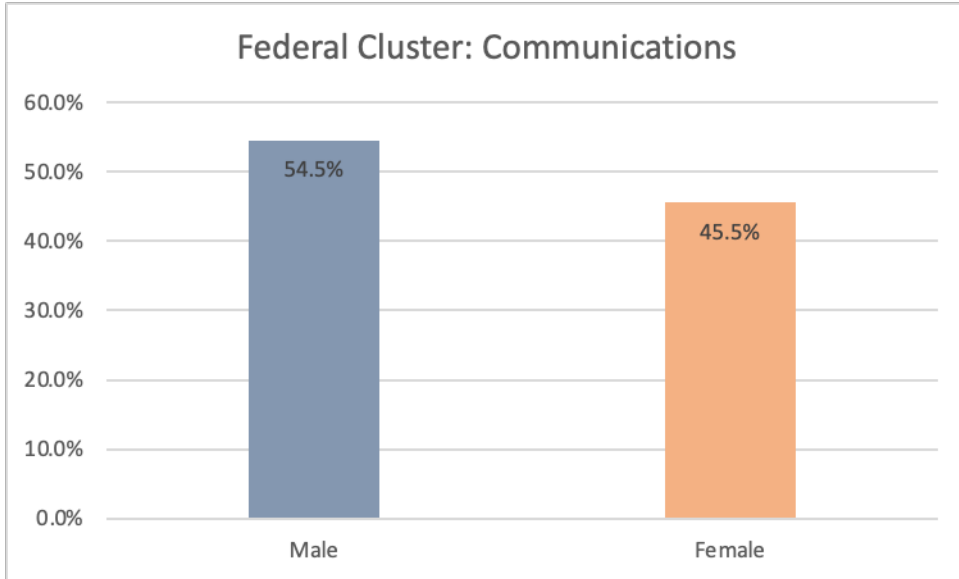


Architecture and Construction

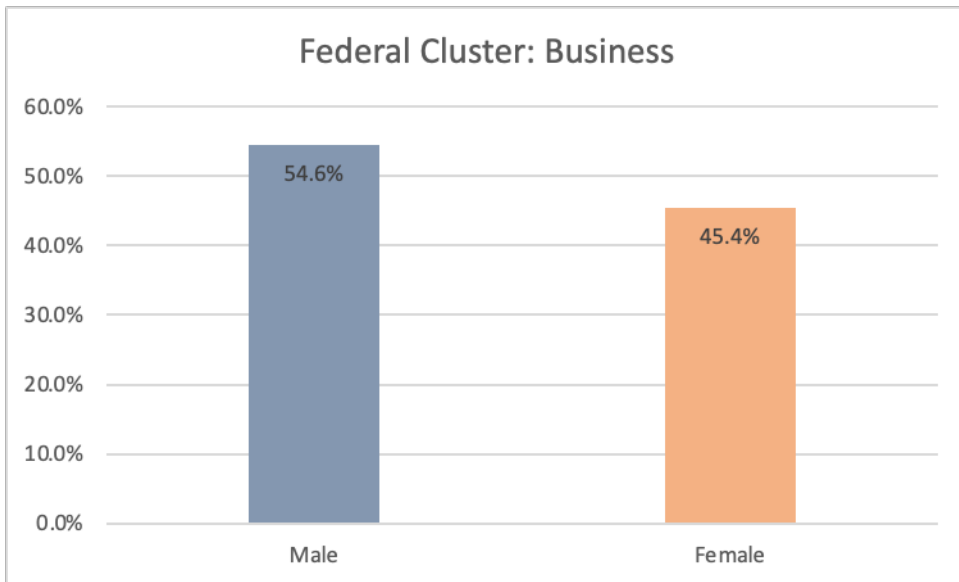


⁶ Data used in **Appendix III** is from *Perkins State Plan and Data Explorer*, U.S. Department of Education, n.d.-b, retrieved July 21, 2022 (https://cte.ed.gov/dataexplorer/build_enrollment).

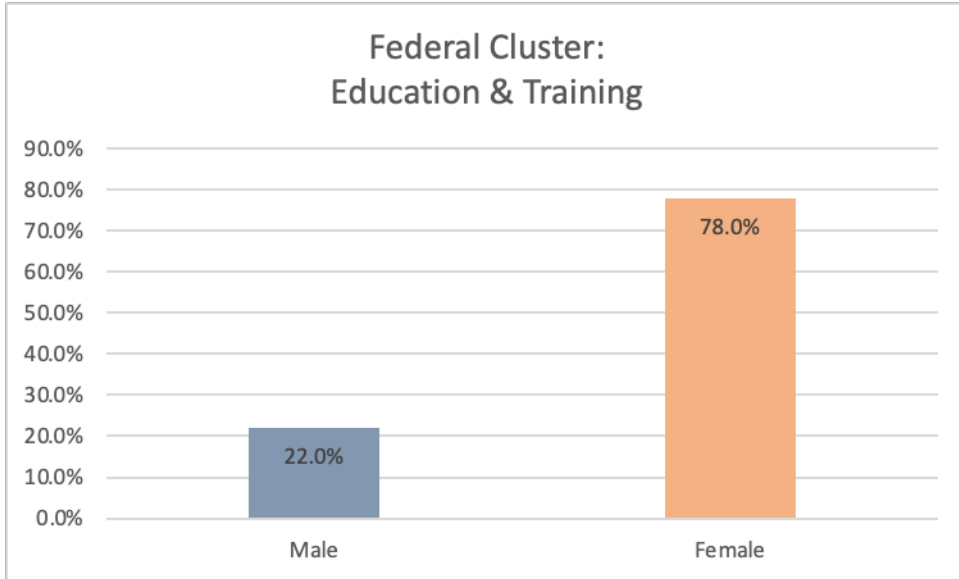
Communications



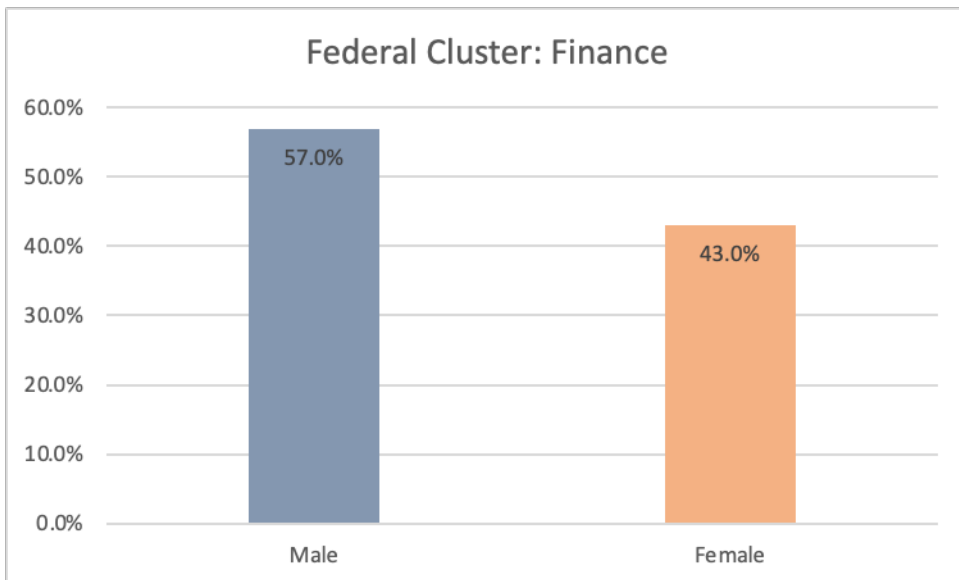
Business



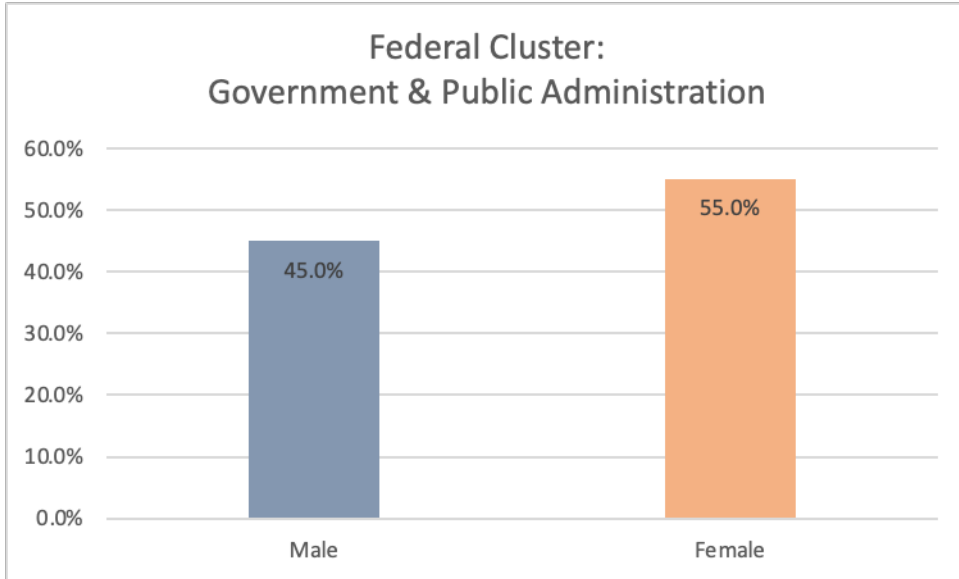
Education



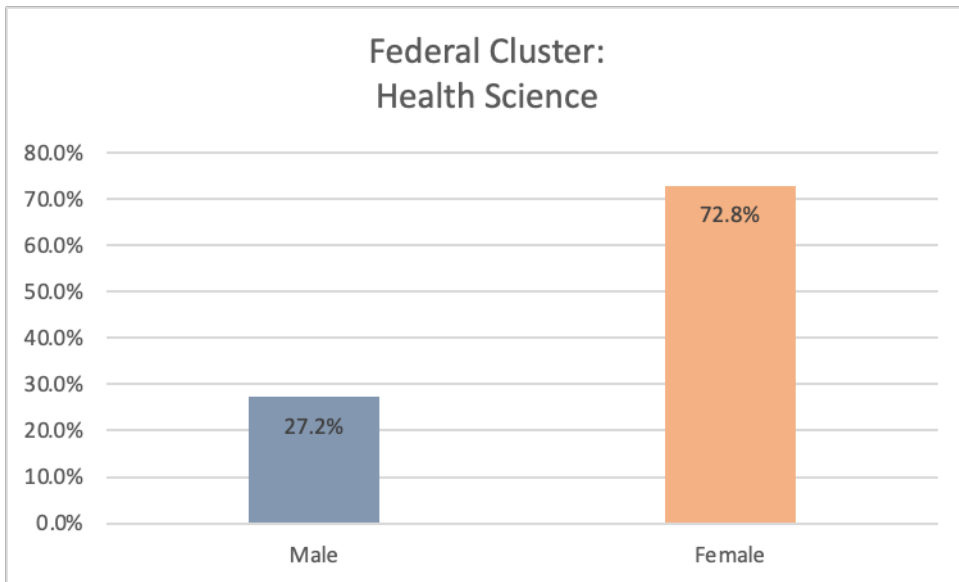
Finance



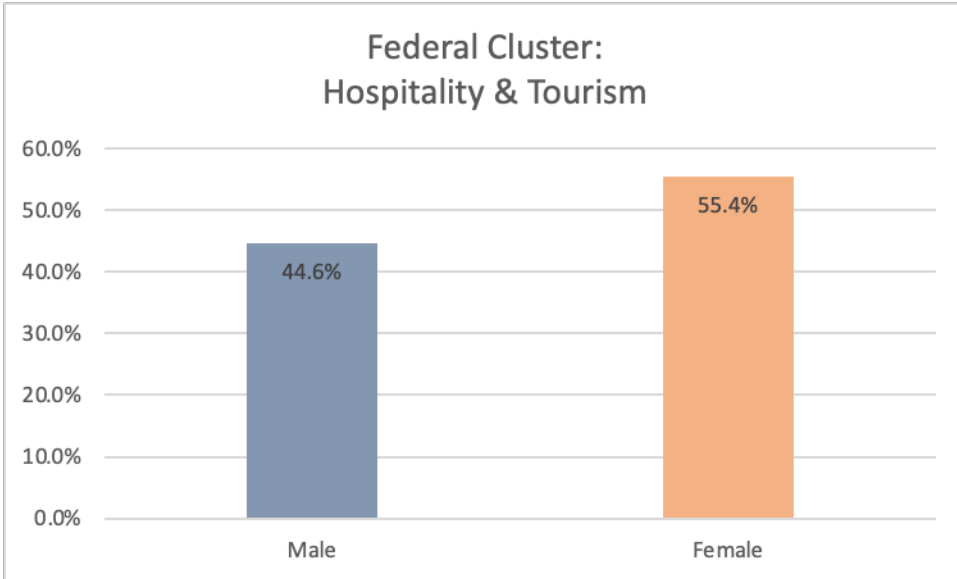
Government and Public Administration



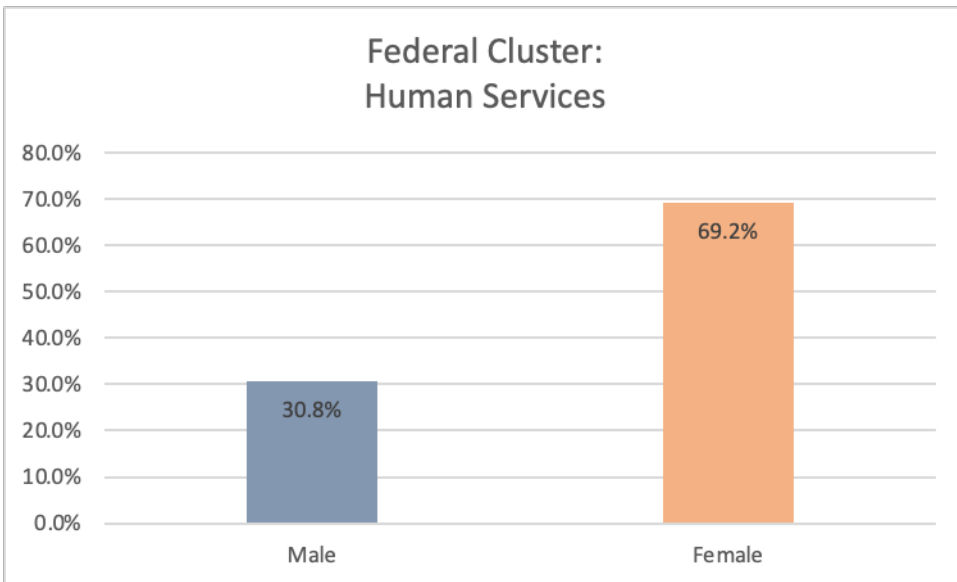
Health Sciences



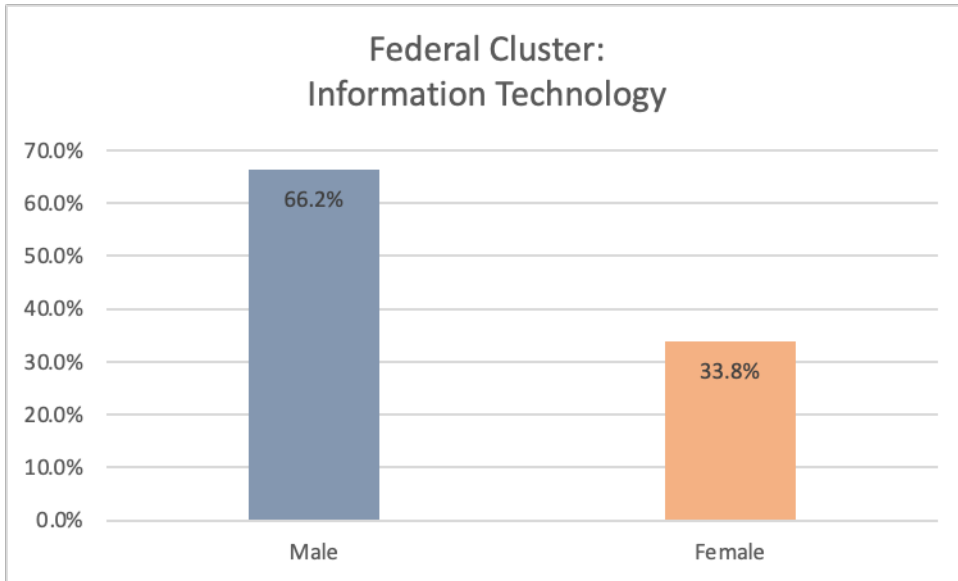
Hospitality & Tourism



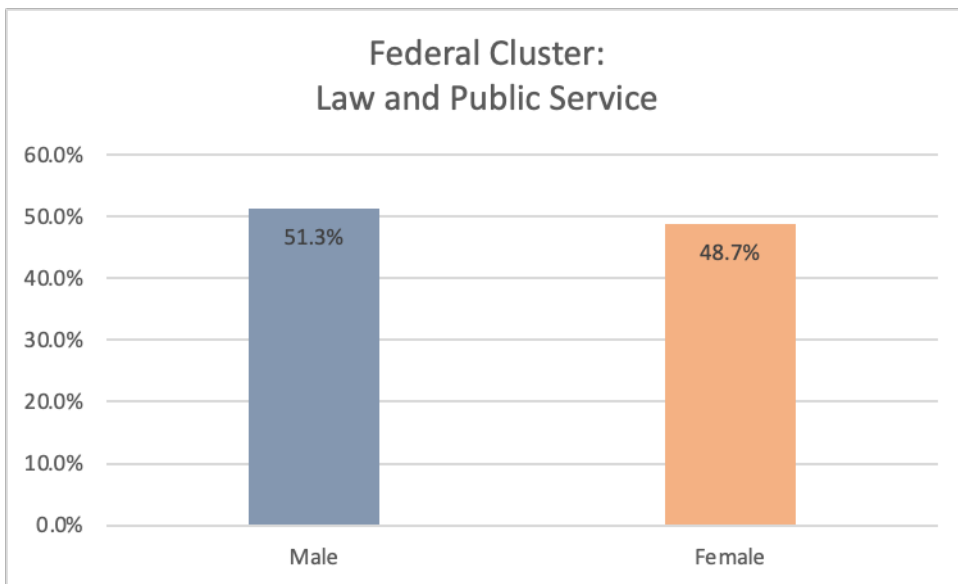
Human Services



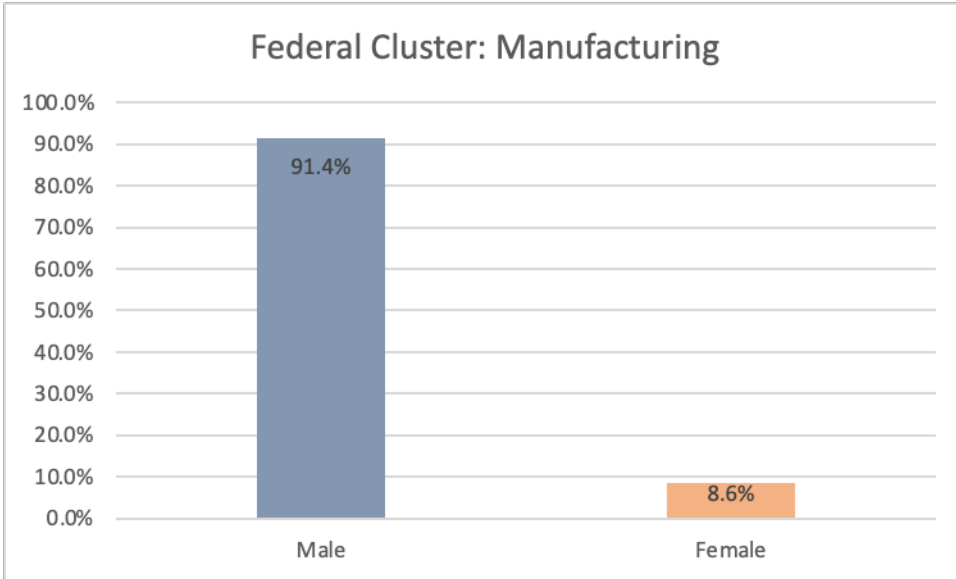
Information Technology



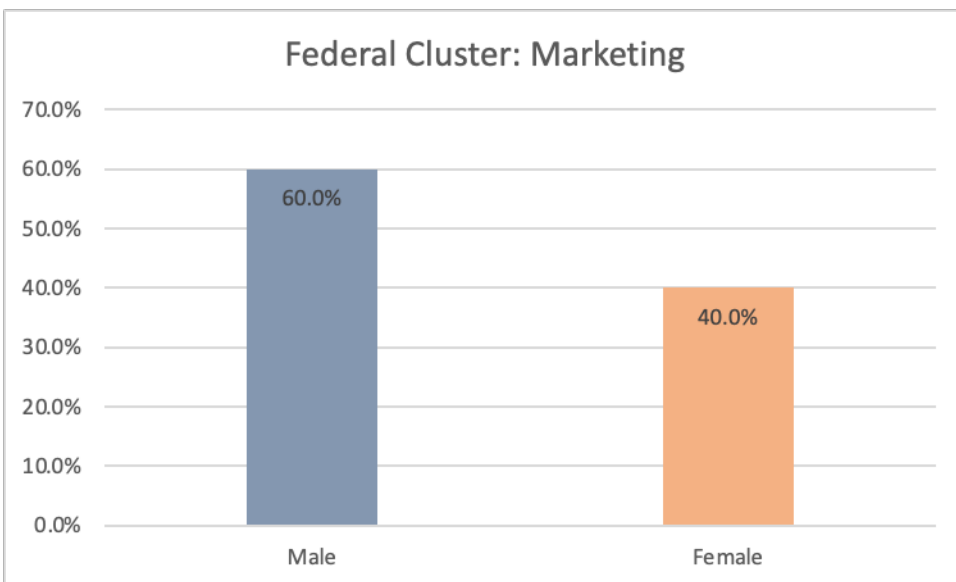
Law and Public Service



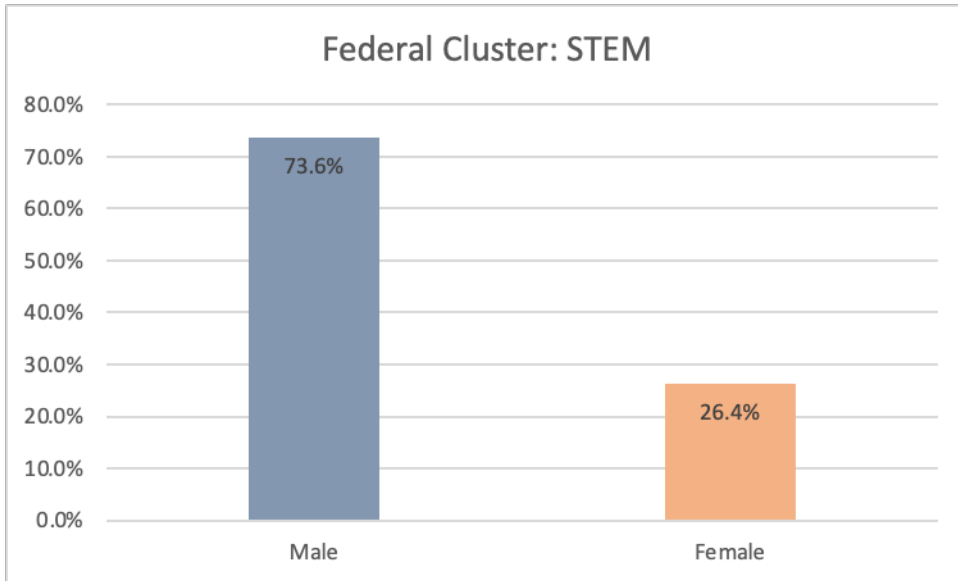
Manufacturing



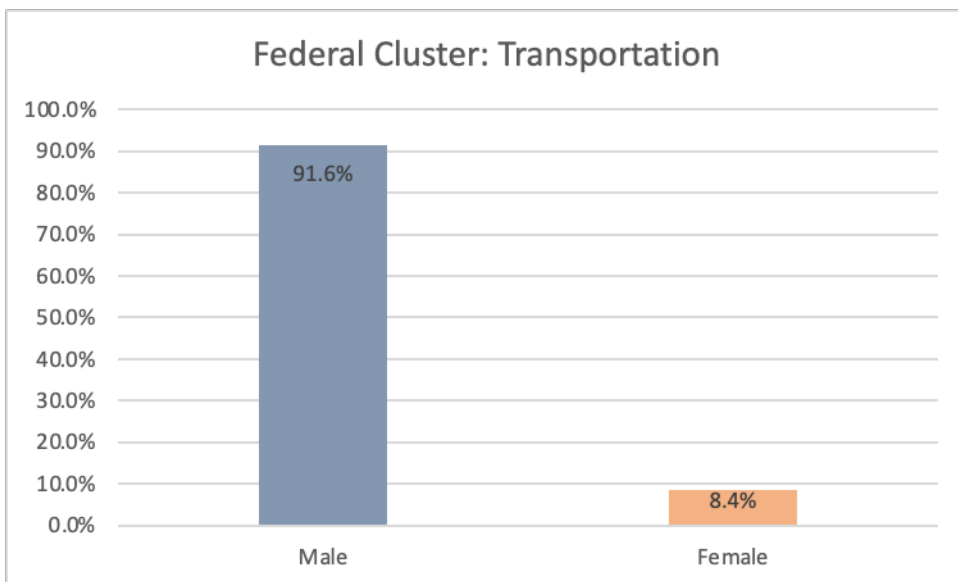
Marketing



STEM



Transportation

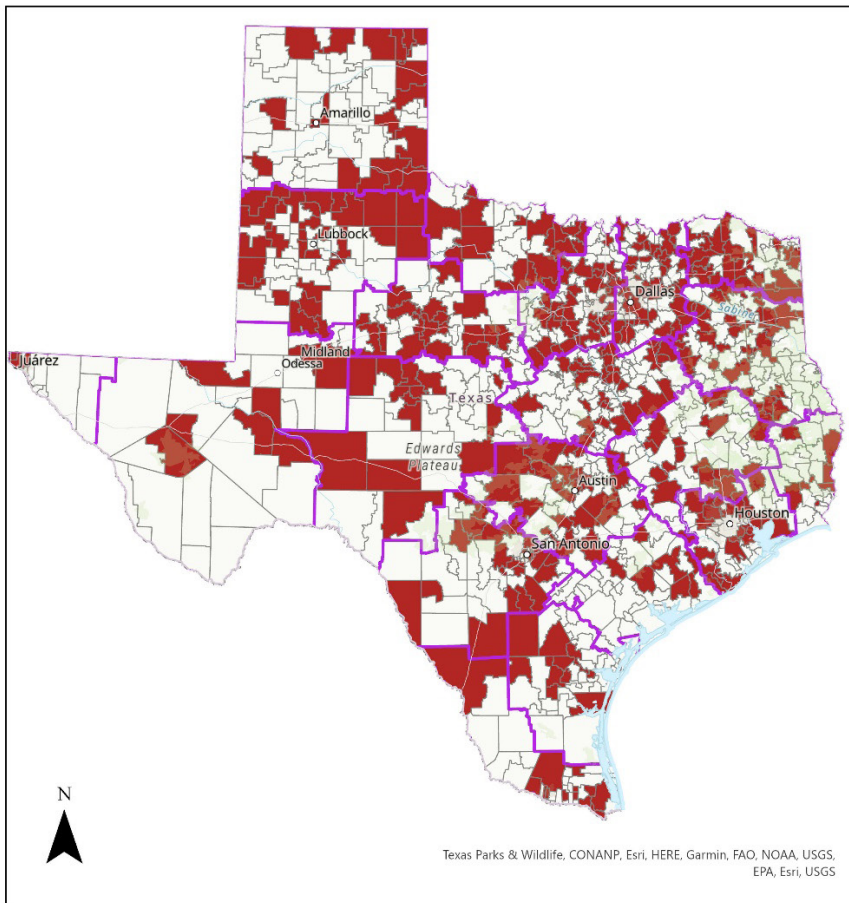


Appendix IV: Programs of Study by State Clusters⁷

I. Agricultural, Food, and Natural Resources

Applied Agricultural Engineering

Occupation	Industrial Machinery Mechanics
Median Salary	\$54,769.53
Growth Rate	15%
Total Annual Openings	4,539



Legend

- ESC_Regions
- Agriculture, Food, and Natural Resources**
- Applied Ag Engineering*
- ISD W/O Program
- ISD W/ Program

Map Analysis

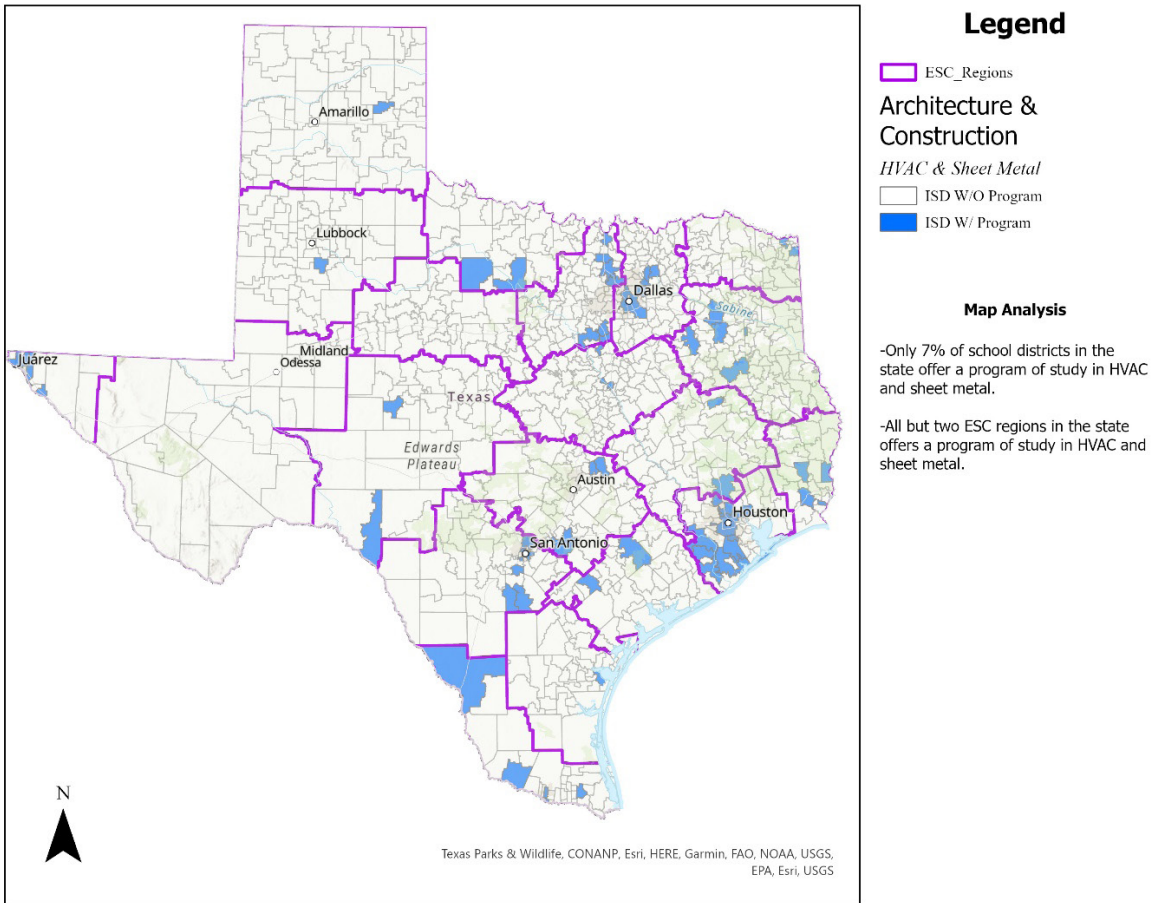
- 39% of school districts in the state offer a program of study in applied agricultural engineering.
- Every ESC region in the state offers a program of study in applied agricultural engineering.

⁷ Data used in **Appendix IV** is from *All Programs of Study Polygons 2*, Texas Education Agency, 2021-b (<https://tea-texas.maps.arcgis.com/home/item.html?id=d4f2f2bd82a24e7a86b088bdfb6744b6#overview>).

II. Architecture and Construction

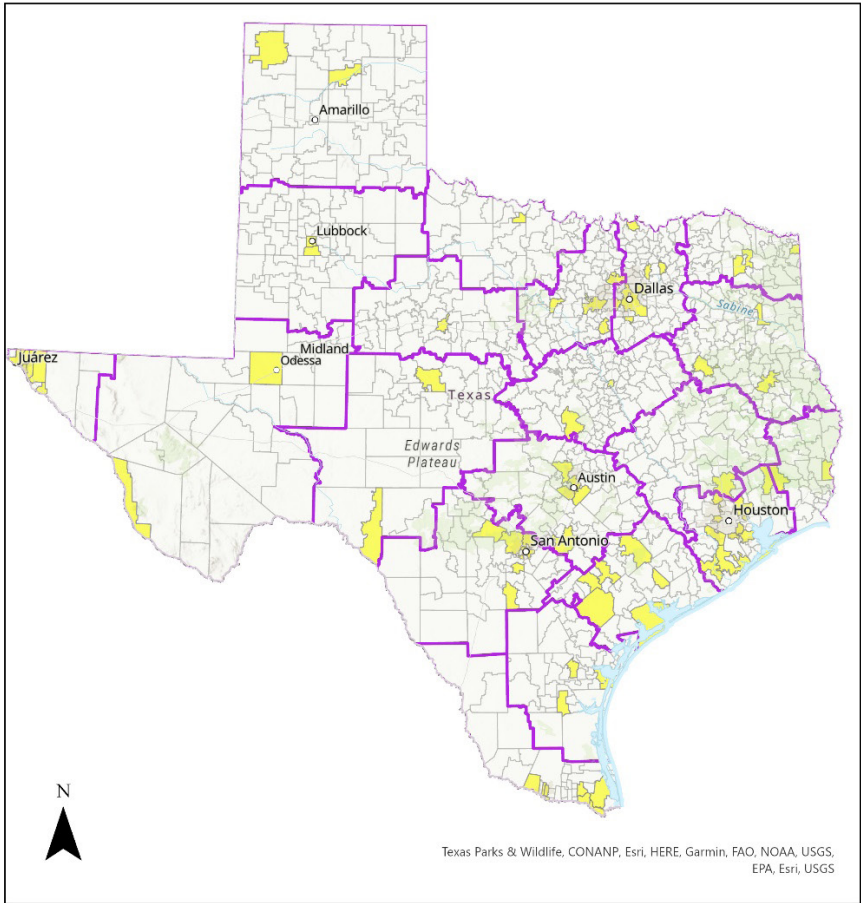
HVAC and Sheet Metal

Occupation	HVAC Mechanics and Installers
Median Salary	\$47,171.29
Growth Rate	12%
Total Annual Openings	3,865



III. Electrical

Occupation	Electrical Power-Line Installers and Repairers
Median Salary	\$55,722.59
Growth Rate	10%
Total Annual Openings	1,1131



Legend

- ESC_Regions
- Architecture and Construction**
- Electrical*
- ISD W/O Program
- ISD W/ Program

Map Analysis

- Only 8% of school districts in the state offer a program of study in electrical studies.
- Every ESC regions in the state offers a program of study in electrical studies.

Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS

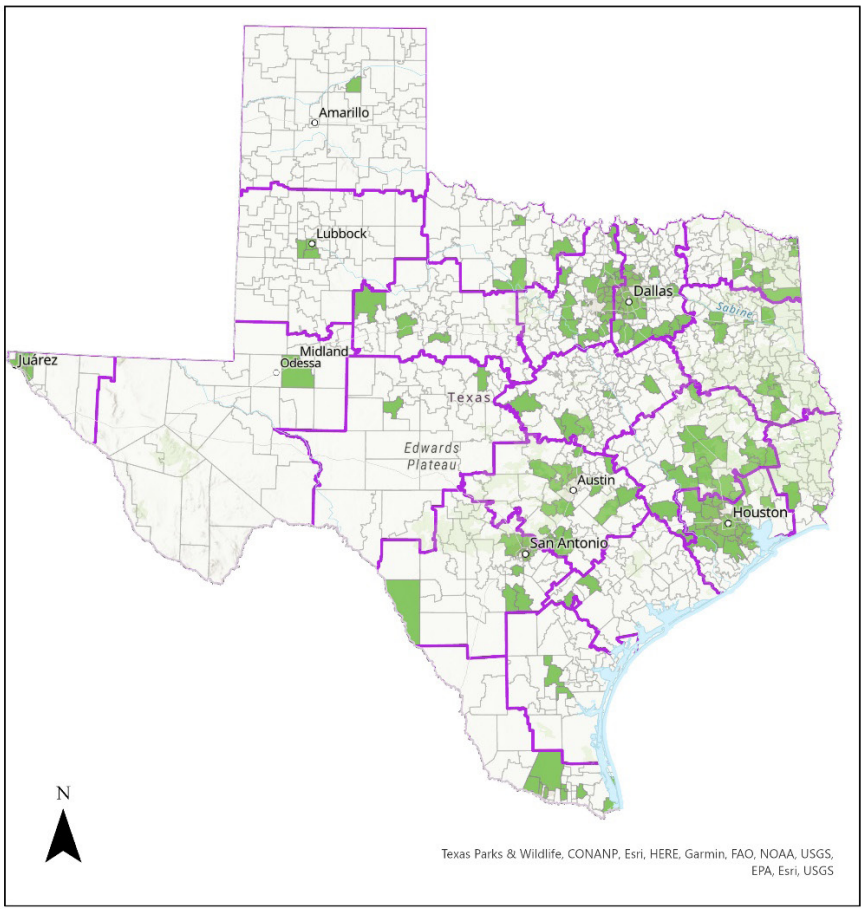
IV. Business, Marketing, and Finance

Marketing and Sales

Occupation	Insurance Sales Agents
Median Salary	\$50,834.24
Growth Rate	22%
Total Annual Openings	8,028

Occupation	Tax Preparers
Median Salary	\$54,281.20
Growth Rate	20%
Total Annual Openings	1,199

Occupation	Real Estate Sales Agent
Median Salary	\$51,372.90
Growth Rate	21%
Total Annual Openings	5,571



Legend

- ESC_Regions
- Business, Marketing, and Finance**
- Marketing & Sales*
- ISD W/O Program
- ISD W/ Program

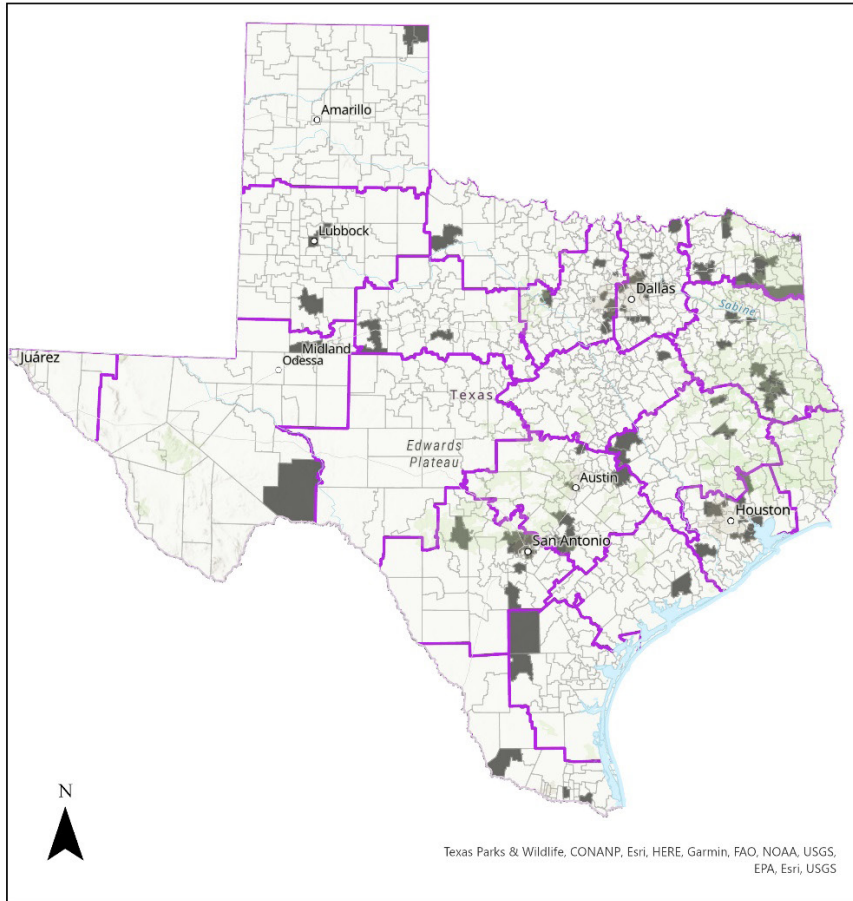
Map Analysis

- Only 16% of school districts in the state offer a program of study in marketing and sales
- Every ESC region in the state offers a program of study in marketing and sales.

V. Health Sciences

Health Informatics

Occupation	Health Information Technologists, Medical Registrars, etc.
Median Salary	\$51,090.73
Growth Rate	18%
Total Annual Openings	475



Legend

- ESC_Regions
- Health Sciences**
- Health Informatics*
- ISD W/O Program
- ISD W/ Program

Map Analysis

-Only 8% of school districts in the state offer a program of study in health informatics.

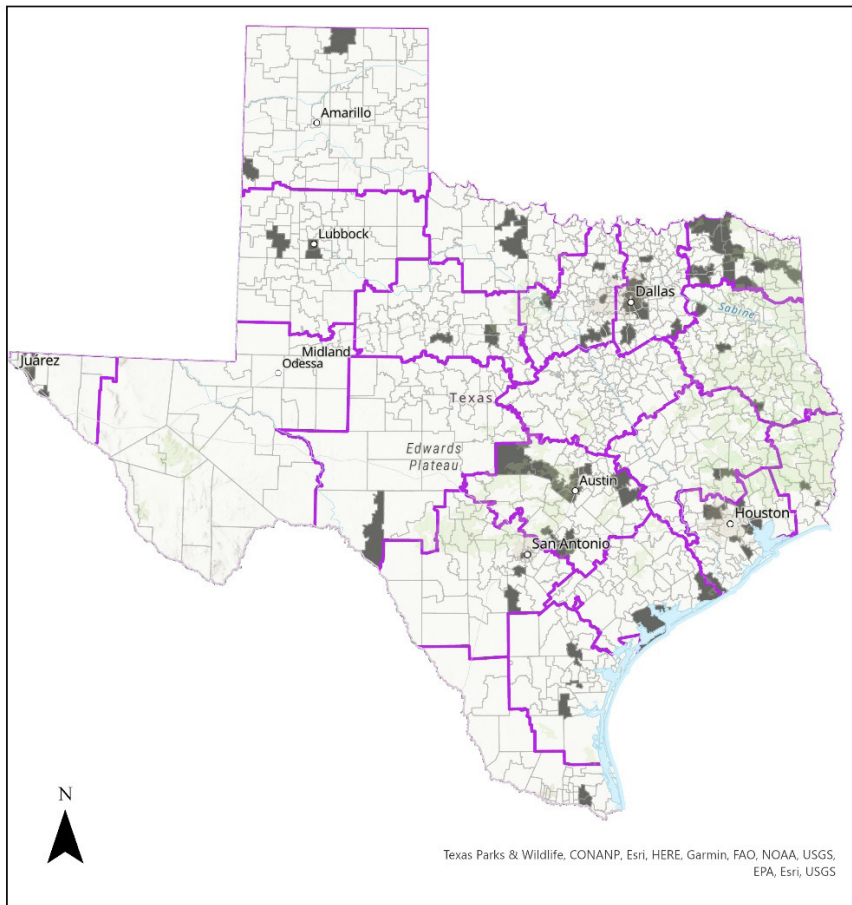
-All but two ESC regions (San Angelo and Beaumont) in the state offers a program of study in health informatics.

Medical Therapy

Occupation Physical Therapist Assistants
 Median Salary \$67,261.85
 Growth Rate 33%
 Total Annual Openings 1132

Occupation Occupational Therapy Assistants
 Median Salary \$70,761.60
 Growth Rate 23%
 Total Annual Openings 645

Occupation Respiratory Therapists
 Median Salary \$60,590.40
 Growth Rate 17%
 Total Annual Openings 801



Legend

- ESC_Regions
- Health Sciences**
- Medical Therapy*
- ISD W/O Program
- ISD W/ Program

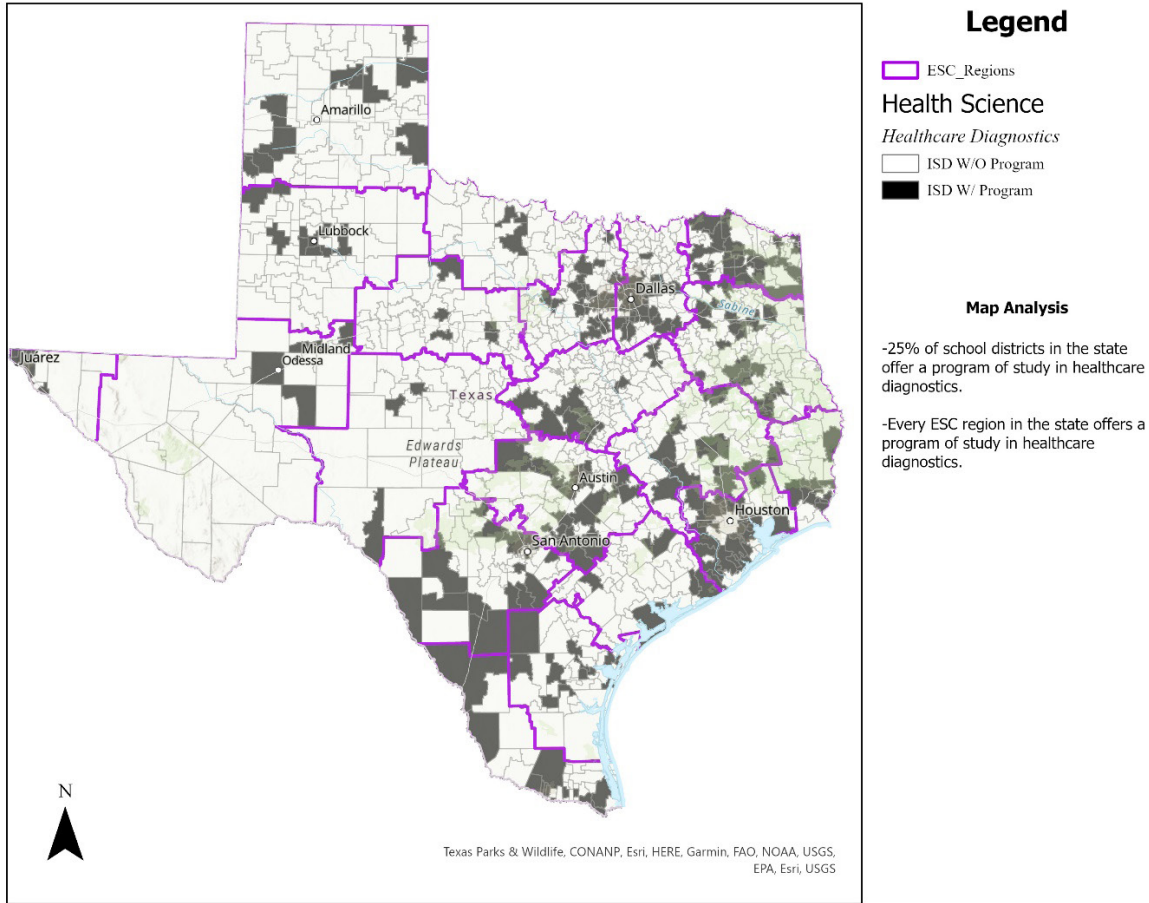
Map Analysis

- Only 7% of school districts in the state offer a program of study in medical therapy.
- All but two ESC regions (Midland and Waco) in the state offers a program of study in medical therapy.

Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS

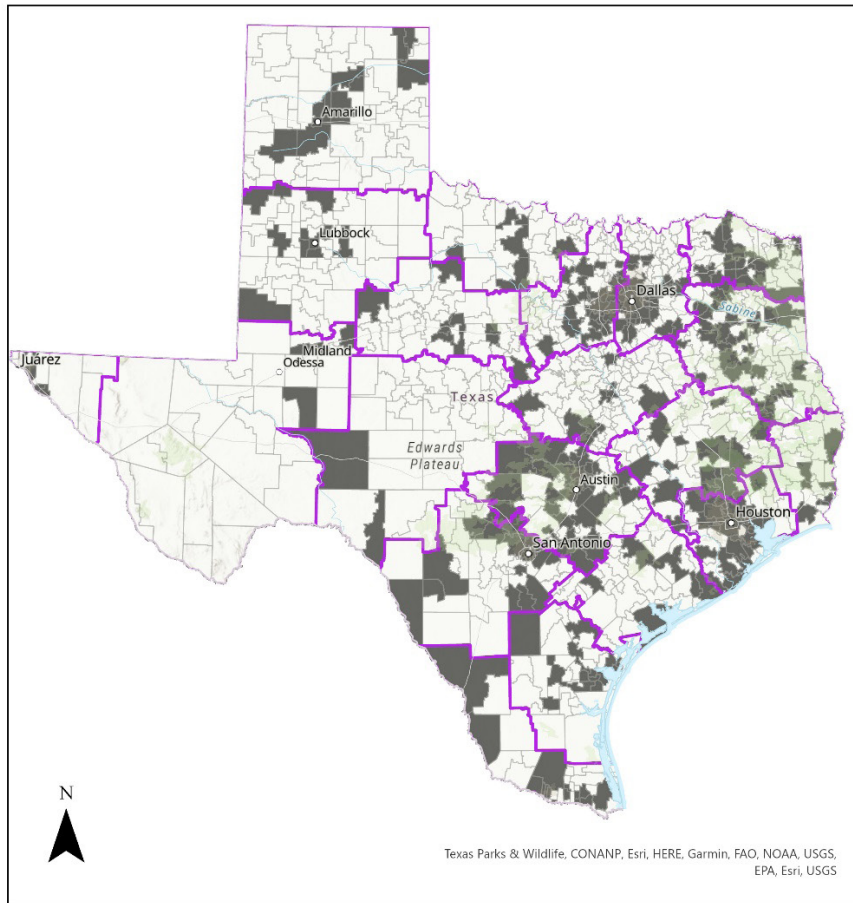
Healthcare Diagnostics

Occupation	Diagnostic Medical Sonographers
Median Salary	\$72,735.97
Growth Rate	20%
Total Annual Openings	545



Healthcare Therapeutics

Occupation	Dental Hygienists
Median Salary	\$77,994.85
Growth Rate	29%
Total Annual Openings	1447



Legend

- ESC_Regions
- Health Sciences**
- Healthcare Therapeutics*
- ISD W/O Program
- ISD W/ Program

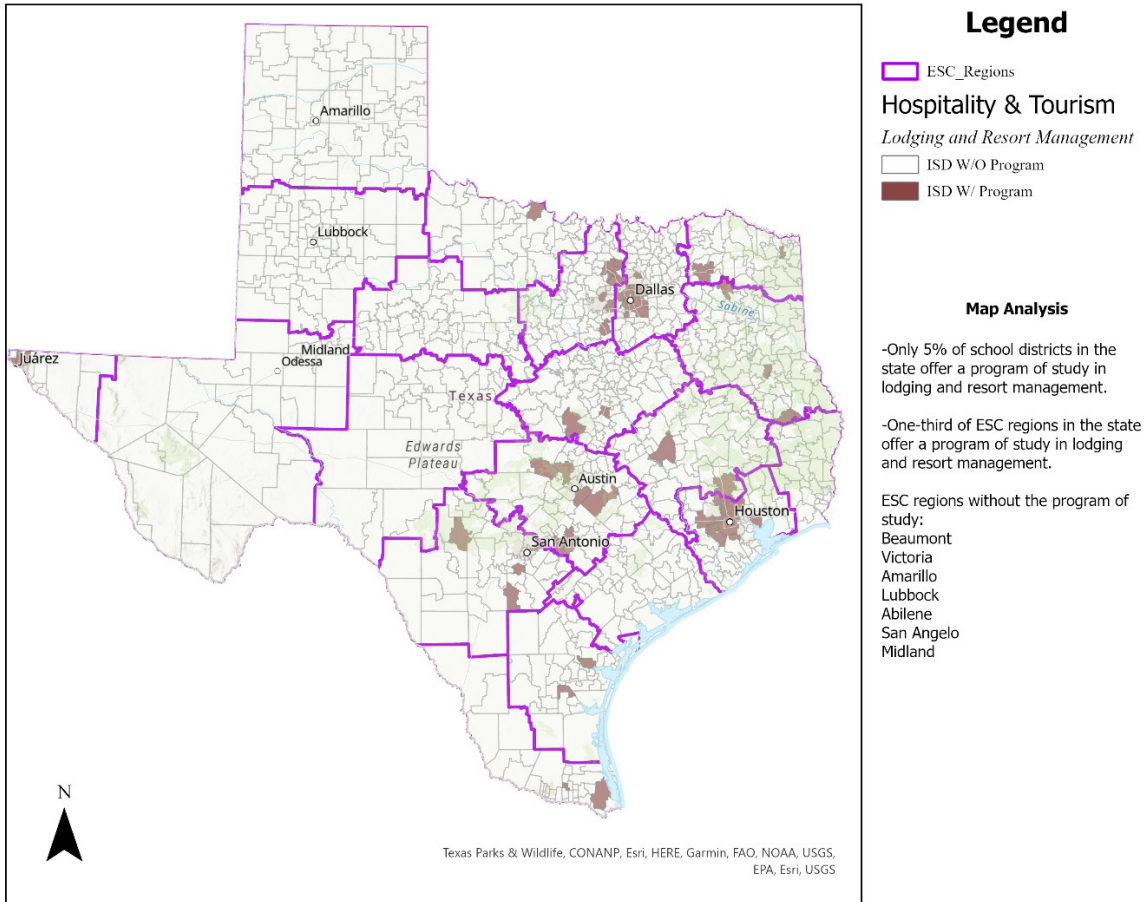
Map Analysis

- 30% of school districts in the state offer a program of study in healthcare therapeutics.
- Every ESC region in the state offers a program of study in healthcare therapeutics..

VI. Hospitality

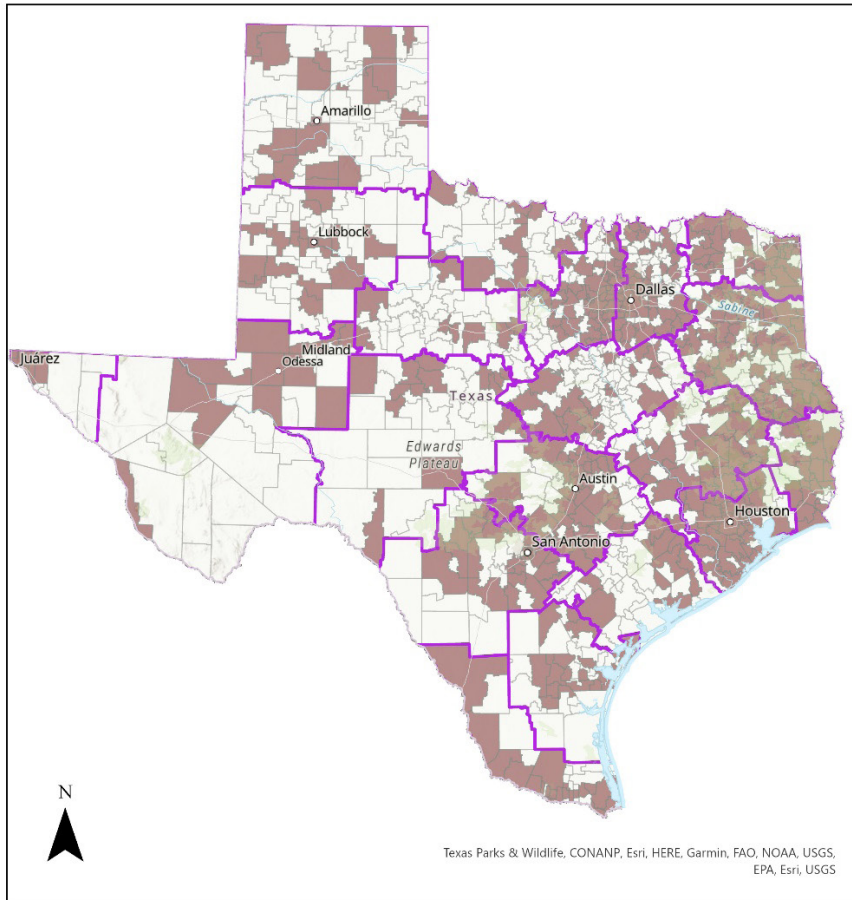
Lodging and Resort Management

Occupation	Food Service Managers
Median Salary	\$49,126.10
Growth Rate	28%
Total Annual Openings	3774



Culinary Arts

Occupation	Chefs and Head Cooks
Median Salary	\$49,809.10
Growth Rate	45%
Total Annual Openings	1574



Legend

- ESC_Regions

Hospitality & Tourism

Culinary Arts

- ISD W/O Program
- ISD W/ Program

Map Analysis

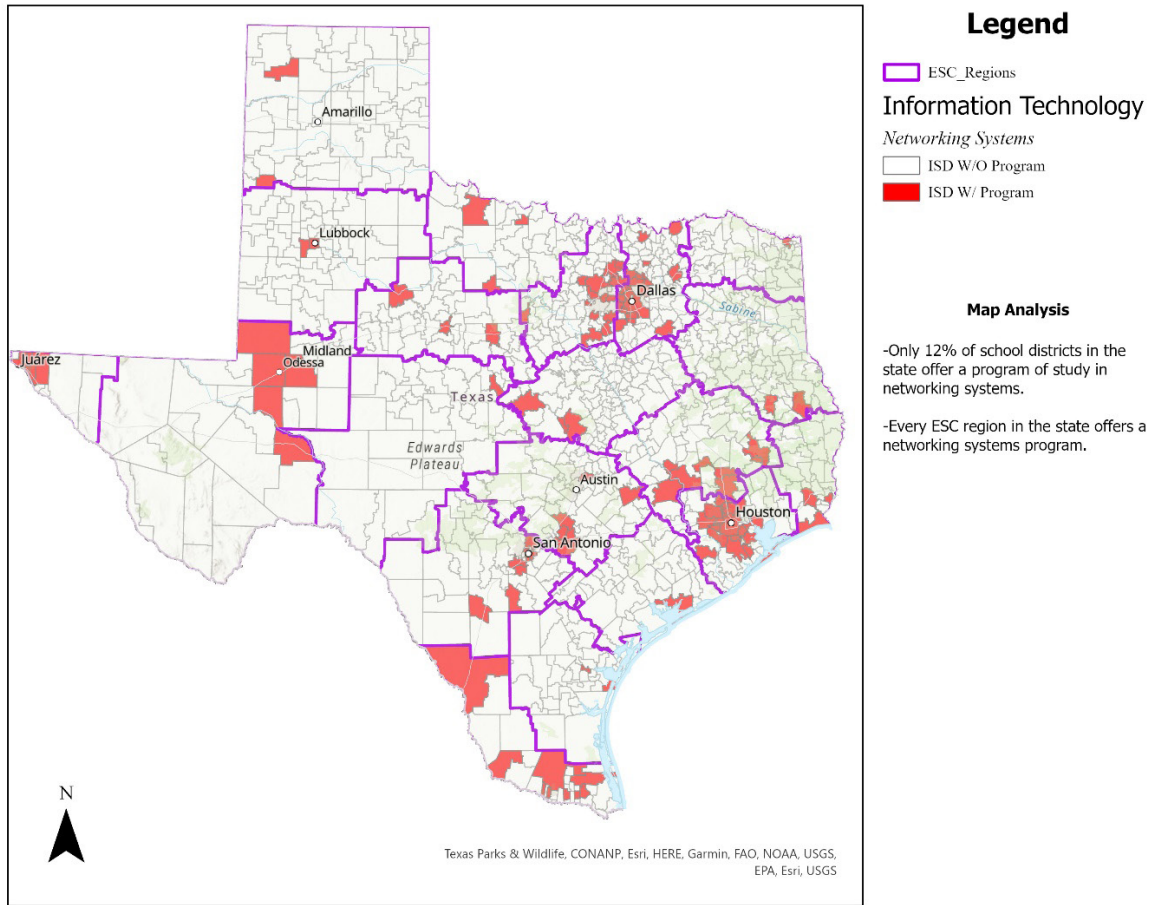
- Nearly half of all school districts in the state offer a program of study in culinary arts.
- Every ESC region in the state offers a culinary arts program.

VII. Information Technology

Networking Systems

Occupation	Computer Network Support Specialists
Median Salary	\$70,810.82
Growth Rate	14%
Total Annual Openings	1719

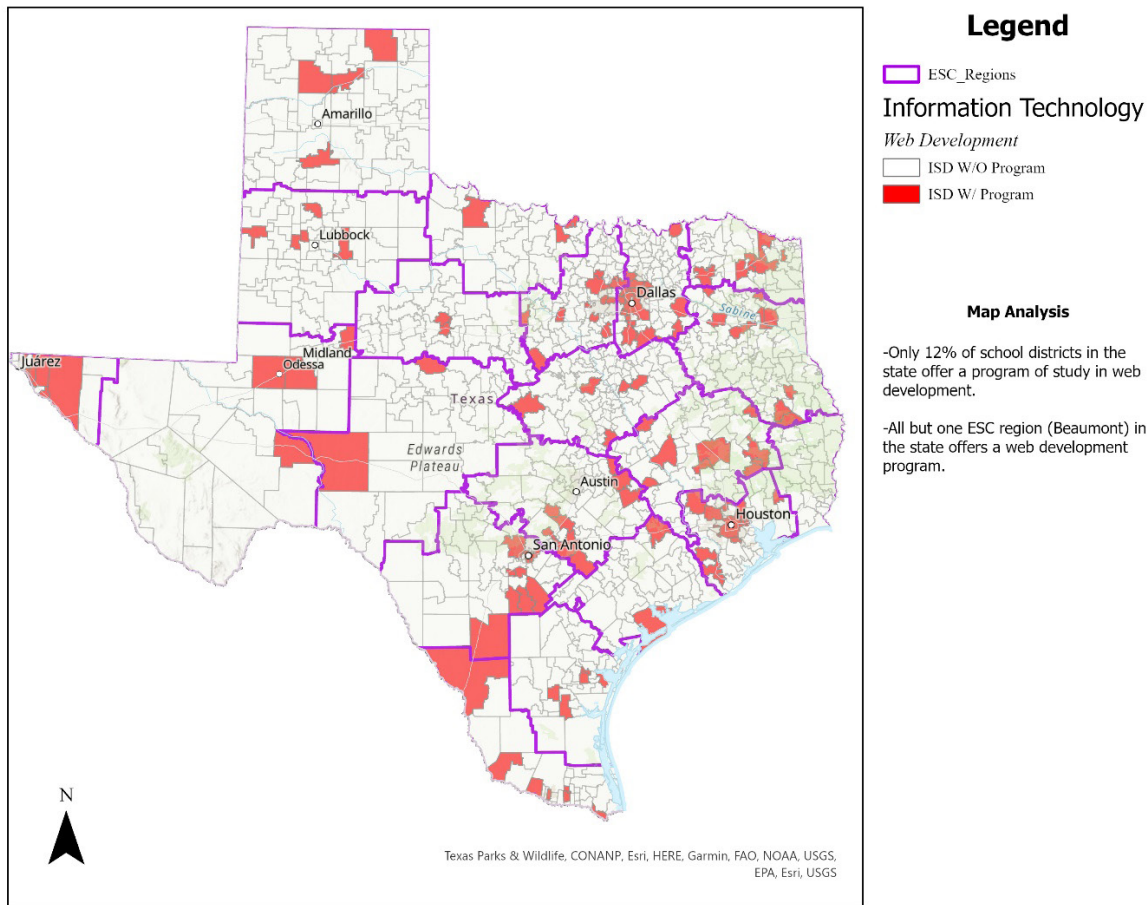
Occupation	Computer User Support Specialist
Median Salary	\$47,464.37
Growth Rate	16%
Total Annual Openings	6204



Web Development

Occupation Web Developers
 Median Salary \$66,346.99
 Growth Rate 27%
 Total Annual Openings 1518

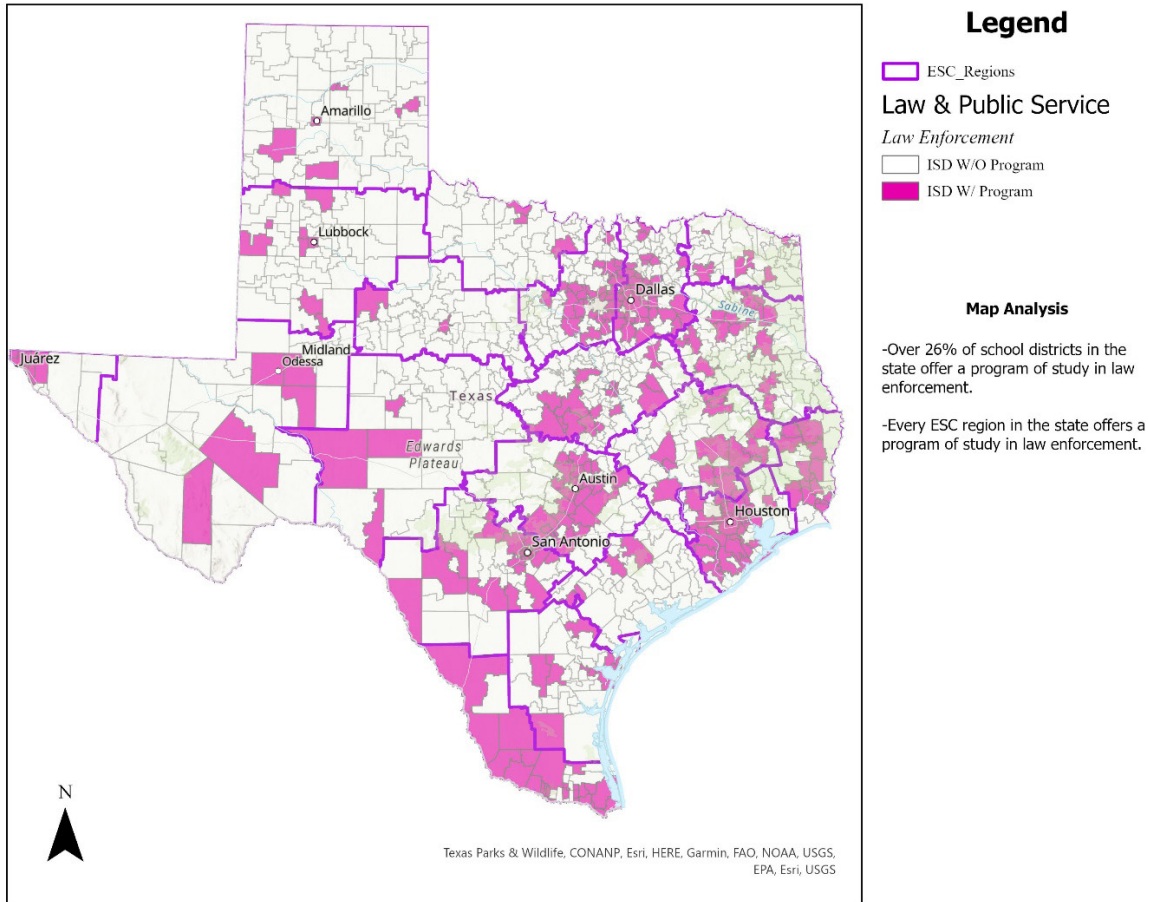
Occupation Web Developers and Digital Interface Designers
 Median Salary \$66,346.99
 Growth Rate 27%
 Total Annual Openings 1518



VIII. Law and Public Service

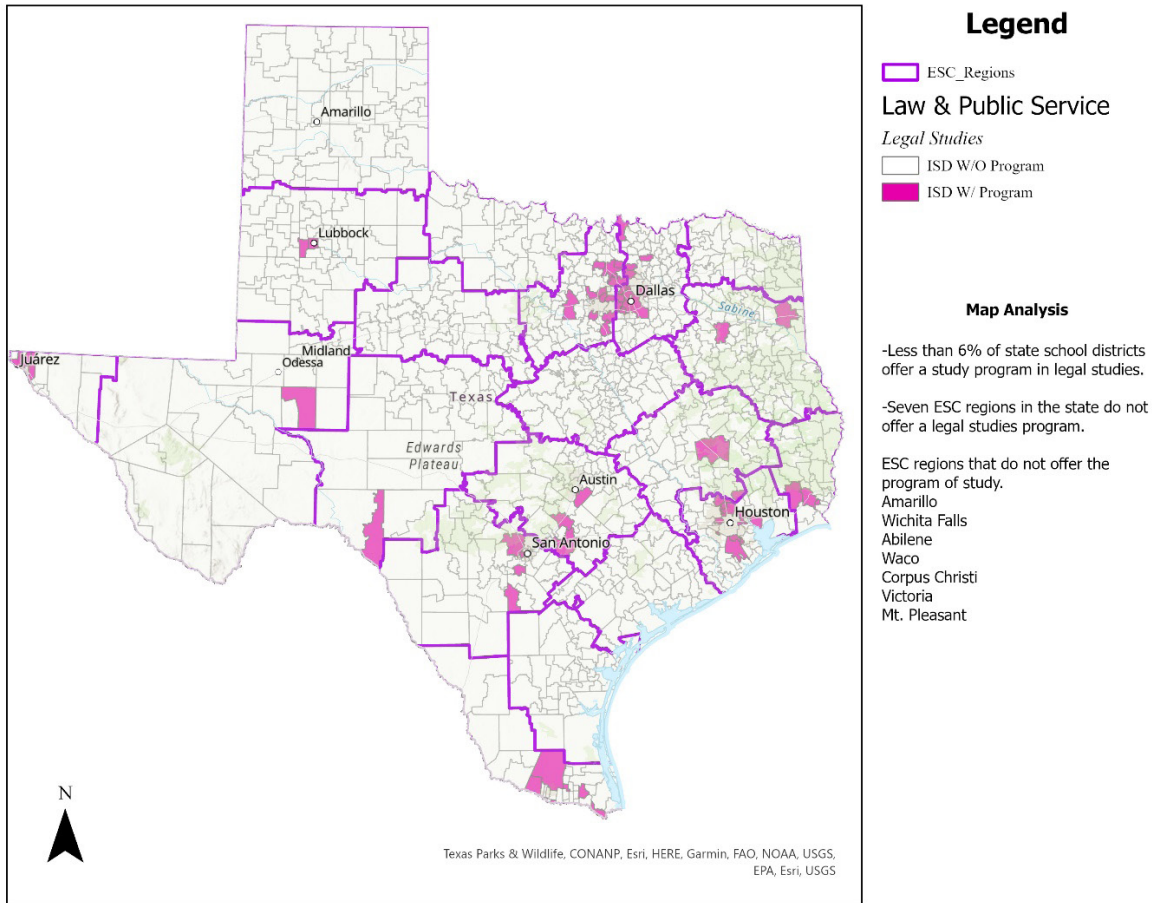
Law Enforcement

Occupation	Police & Sheriff’s Patrol Officers
Median Salary	\$64,973.50
Growth Rate	10%
Total Annual Openings	5500



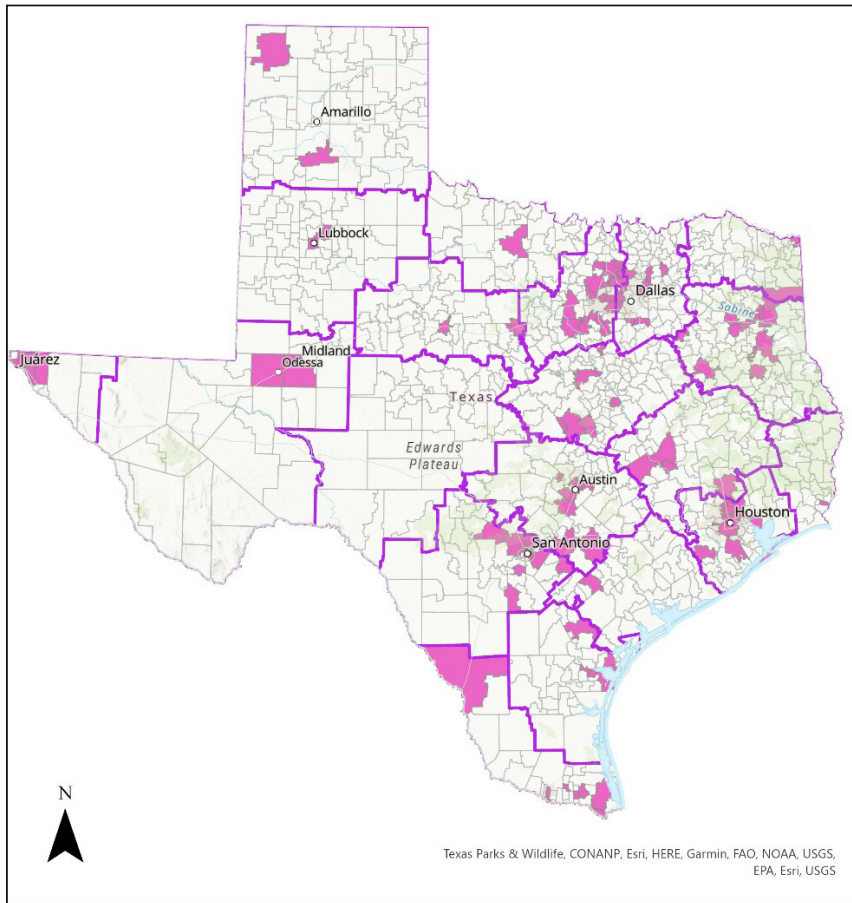
Legal Studies

Occupation	Paralegals and Legal Assistants
Median Salary	\$52,080.52
Growth Rate	18%
Total Annual Openings	3930



Emergency Services

Occupation	Firefighters
Median Salary	\$55,370.68
Growth Rate	11%
Total Annual Openings	2215



Legend

- ESC_Regions
- Law & Public Service**
- Emergency Services*
- ISD W/O Program
- ISD W/ Program

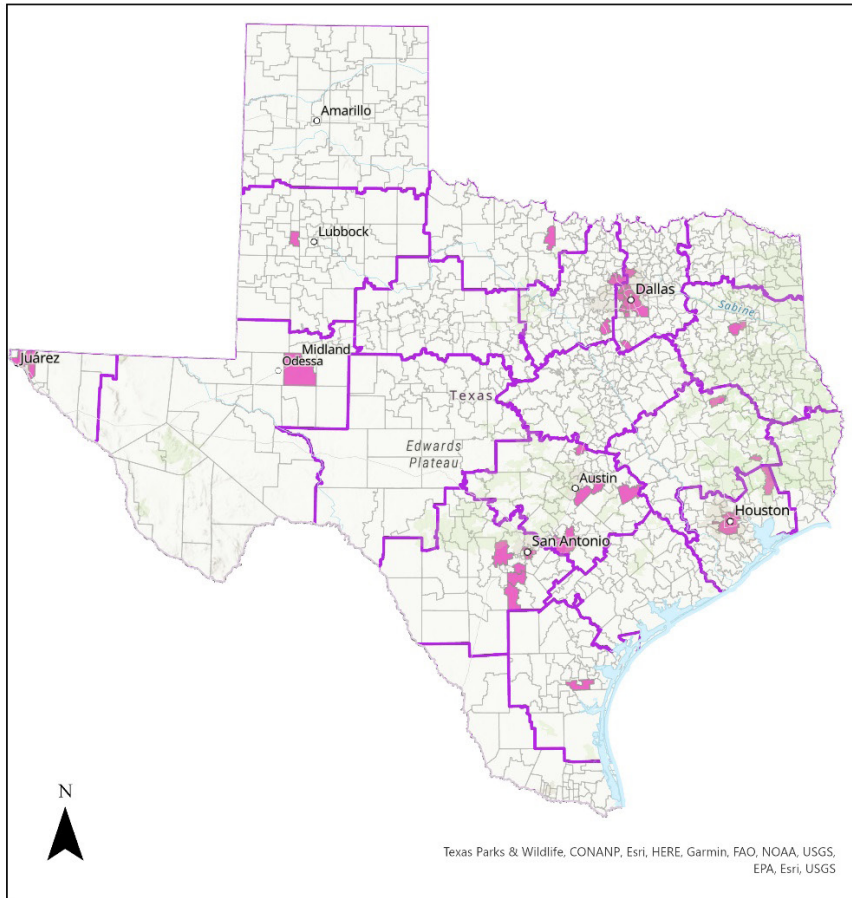
Map Analysis

- Just over 10% of state school districts offer a study program in emergency services.
- All but one ESC region (San Angelo) in the state offers an emergency services program.

Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS

Government & Public Services

Occupation	Property & Community Association Managers
Median Salary	\$61,904.34
Growth Rate	12%
Total Annual Openings	3012



Legend

- ESC_Regions
- Law & Public Service**
- Government & Public Admin*
- ISD W/O Program
- ISD W/ Program

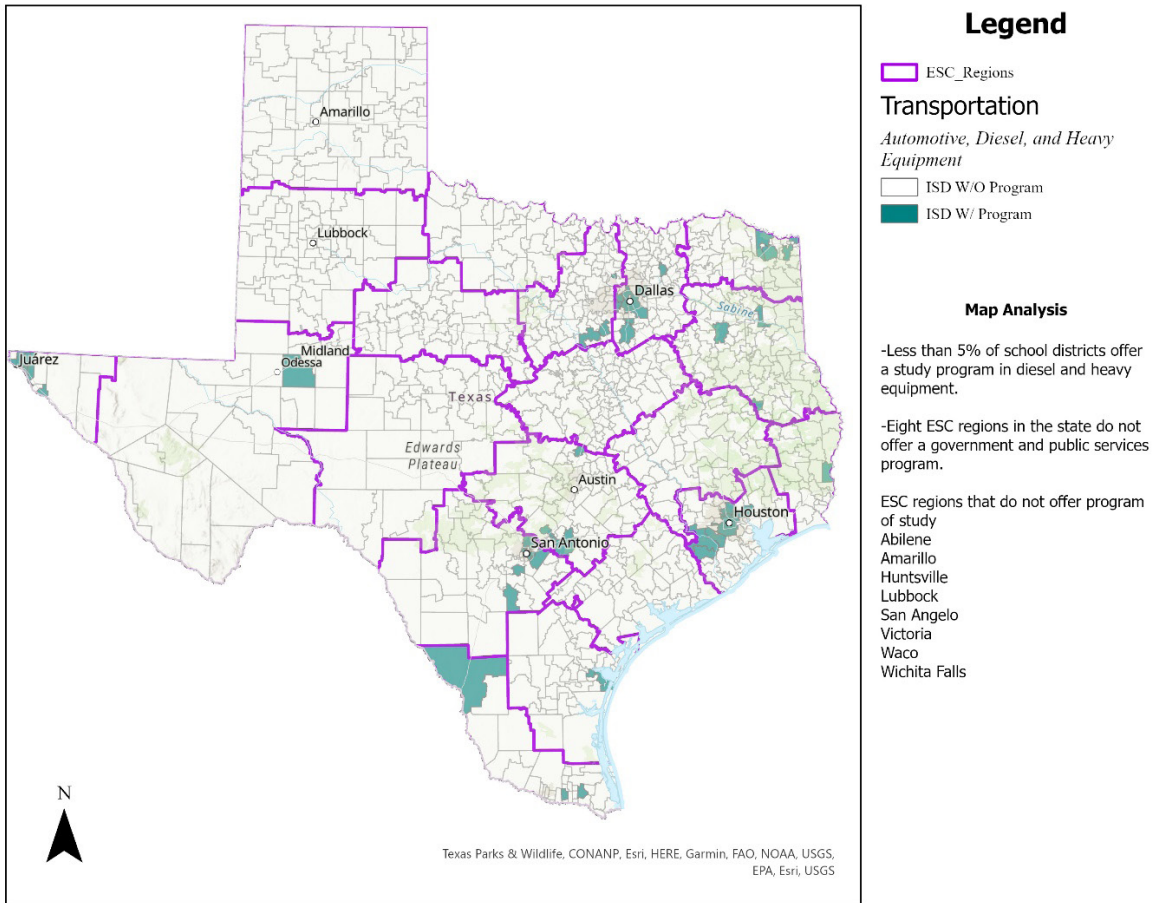
Map Analysis

- 3% of state school districts offer a study program in government and public services.
- Eight ESC regions in the state do not offer a government and public services program.
- ESC regions that do not offer program of study
 - Abilene
 - Amarillo
 - Beaumont
 - San Angelo
 - Waco
 - Victoria
 - Mt. Pleasant
 - Edinburg

Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS

IX. Diesel and Heavy Equipment

Occupation	Bus and Truck Mechanics and Diesel Engine Specialists
Median Salary	\$49,195.79
Growth Rate	11%
Total Annual Openings	3033



Appendix V: Corrected Statewide Perkins V Indicator Report⁸

Performance Indicator: 5S5 - Program Quality - CTE Completer

Population	CTE Completers	CTE Learners (Concentrators and Completers)
GRAND TOTAL - UNDUPLICATED		
GENDER	82,076	233,454
Male		
Female	36,117	116,332
Population	45,959	117,122
Major Racial and Ethnic Groups		
American Indian or Alaskan Native	264	828
Asian	3,460	9,787
Black or African American	8,823	27,652
Hispanic or Latino	46,370	120,943
Native Hawaiian or Pacific Islander	94	287
White	21,781	69,708
Two or More Races	1,284	4,249
Federal Career Clusters		
Agriculture, Food, and Natural Resources	8,421	39,342
Architecture and Construction	3,499	10,347
Arts, Audio/Visual Technology, and Communications	7,258	33,440
Business Management & Administration	3,382	36,301
Education and Training	6,174	25,382
Energy	34	641
Finance	4,173	42,470
Government & Public Administration	176	574
Health Sciences	24,127	58,475
Hospitality and Tourism	3,905	15,104
Human Services	5,818	36,430
Information Technology	1,388	10,705
Law, Public Safety, Corrections and Security	7,136	29,234
Manufacturing	1,644	16,562
Marketing	2,562	30,949
Science, Technology, Engineering and Mathematics	8,485	35,299
Transportation, Distribution and Logistics	2,516	7,937
State Career Clusters		
Agriculture, Food and Natural Resources	8,421	39,342
Architecture and Construction	3,499	10,347
Arts, Audio Visual Technology and Communication	7,258	33,440
Business, Marketing and Finance	7,134	60,436
Education and Training	6,174	25,382
Energy	34	641
Health Sciences	24,127	58,475
Hospitality and Tourism	3,905	15,104
Human Services	5,818	36,430
Information Technology	1,388	10,705
Law and Public Service	7,294	29,451
Manufacturing	1,644	16,562
Science, Technology, Engineering and Mathematics	8,485	35,299
Transportation, Distribution and Logistics	2,516	7,937

⁸ Information is from the Texas Education Agency, personal communication, June 24, 2021.

ABOUT THE AUTHORS



Jorge Borrego is a post-secondary education policy analyst for the Next Generation Texas initiative at the Texas Public Policy Foundation.

Prior to joining the Foundation, Borrego was a Legislative Director at the Texas House of Representatives. He also worked in the Nonprofit Sector, working for the Down Syndrome Association of Brazos Valley. Where he worked as an Event Coordinator, Data Administrator, and Policy Administrator. He is currently serving as the Treasurer on the organization's Board of Directors.

Jorge holds a Master of Public Administration from the Bush School of Government at Texas A&M University and a Bachelor of Science in Mathematics from the University of Texas at San Antonio. In his free time, he enjoys reading, meeting new people, and exploring new places with his wife and two dogs.



Erin Davis Valdez is the policy director for Next Generation Texas, an initiative of the Foundation. She has been passionate about the transformational power of education all her life, having been given the gift of being homeschooled. She taught for over a decade in Austin-area schools and served as an assistant principal at a charter school in Lewisville. These experiences have given her the opportunity to see first-hand how students can thrive when they have excellent options.

Since joining the Foundation, Valdez has conducted research on career and technical education at the secondary and post-secondary levels, civics education, and welfare to work programs in Texas.

Valdez earned an M.A. in classics from the University of California, Santa Barbara and a B.A. in classical studies from Hillsdale College.

Valdez enjoys cooking, audiobooks, and spending time with her family and friends.

About Texas Public Policy Foundation

The Texas Public Policy Foundation is a 501(c)3 nonprofit, nonpartisan research institute. The Foundation promotes and defends liberty, personal responsibility, and free enterprise in Texas and the nation by educating and affecting policymakers and the Texas public policy debate with academically sound research and outreach.

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