MEMORANDUM   November 16, 2018

TO: Michael Love
                     Assistant Superintendent, Major Projects-Career Readiness

FROM: Carla Stevens
                     Assistant Superintendent, Research and Accountability

SUBJECT: **CAREER AND TECHNICAL EDUCATION: PREVALENCE, STUDENT PERFORMANCE, AND PROGRAM OUTCOMES, 2017–2018**

The purpose of this evaluation was to determine the trends in CTE enrollments in HISD and to analyze CTE students' performance relative to their peers who did not participate in the program using the State of Texas Assessments of Academic Readiness (STAAR) End-of-Course (EOC) examinations results. The study was guided by four questions and used descriptive statistics and trend data to answer the questions. Finally, multiple regression analyses were used to predict students' performance on the STAAR Algebra I, Biology, English I, and II, and U.S. History EOC exams using selected predictors.

Key findings include:
- While the number of students who were not enrolled in a coherent sequence of CTE courses declined, the number of students enrolled in a coherent sequence of CTE courses increased by 10.8 percent from the 2016–2017 to the 2017–2018 academic year.
- Higher percentages of at-risk (76.9 v. 68.0%) and economically disadvantaged (73.9 v. 70.7%) students were enrolled in a coherent sequence of CTE courses compared to their peers who were enrolled in the HISD population in grades 6-12.
- A higher percentage of students enrolled in a coherent sequence of CTE courses performed at or above the Approaches Grade Level standard on the 2018 STAAR Algebra I and U.S. History EOC exams compared to their peers who were not enrolled in any CTE courses during the 2017–2018 academic year.
- Overall, 91. 5 percent of CTE students received an industry certification during the 2017–2018 academic year.
- There was a 20.1 percent increase in the number of CTE graduates between 2015–2016 and 2016–2017 compared to a 3.8 percent increase for the district for the same period.
- The 2017 annual school dropout rate for CTE students stood at 2.7 percent compared to 4.1 percent for HISD.
- Being identified as G/T was a positive predictor of CTE students' performance on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams.
- Being identified as at-risk, an English language Learner, economically disadvantaged or receiving special education services were adverse predictors of students' performance on the 2018 STAAR EOC exams.

Further distribution of this report is at your discretion. Should you have any further questions, please contact me at 713-556-6700.

_____ CJS

Attachment
cc: Noelia Longoria
    Rick Cruz

HOUSTON INDEPENDENT SCHOOL DISTRICT

RESEARCH
Educational Program Report

HISD | Research and Accountability
ANALYZING DATA, MEASURING PERFORMANCE.

2018 BOARD OF EDUCATION

Career and Technical Education: Prevalence, Student Performance, and Program Outcomes, 2017–2018

Executive Summary

Section 29.182 of the Texas Education Code (TEC) makes provision for all students in the State of Texas to participate in Career and Technical Education (CTE) programs. CTE programs incorporate competencies that lead to the attainment of academic and technical skills, industry recognized certificates, licenses, and credentials for employment as well as provide opportunities for students to earn college credit for completed coursework (State of Texas, 2013). The Houston Independent School District (HISD) offers non-coherent and coherent-sequence of CTE courses with rigorous content in 16 high school programs.

The purpose of this evaluation was to determine trends in CTE course enrollment in HISD, and to analyze students' performance relative to their peers who did not participate in the program using the State of Texas Assessments of Academic Readiness (STAAR) End-of-Course (EOC) examination results. The study was guided by four questions and used descriptive statistics and trend data to answer these questions. Finally, multiple regression analyses were used to predict students' performance on the STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams using selected demographic and educational predictors.

Key Findings

- While the number of students who were enrolled in a non-coherent sequence of CTE courses declined by 6.2 percent, the number of students enrolled in a coherent sequence of courses increased by 10.8 percent between the 2016–2017 and the 2017–2018 academic years.

- Higher percentages of at-risk (76.9 v. 68.0%) and economically disadvantaged (73.9 v. 70.7%) students were enrolled in a coherent sequence of CTE courses compared to their peers who were enrolled in the HISD population in grades 6–12.

- Compared to their peers who were not enrolled in any CTE courses, a higher percentage of students who were enrolled in a coherent sequence of CTE courses performed at or above the Approaches Grade Level standard on the 2018 STAAR Algebra I and U.S. History EOC exams.

- Overall, 91.5 percent of the 6,170 CTE students who took an industry certification exam received an industry certification during the 2017–2018 school year.

- There was a 19.5 percent increase in the number of CTE graduates compared to a 4.2 percent increase for the district between the Class of 2016 and the Class of 2017.

- The CTE class of 2017 graduation rate of 88.4 percent exceeded the district rate of 78.8 percent by nearly 10 percentage points.

- The 2017 annual grades 9–12 school dropout rate for CTE students was 2.7 percent compared to 4.6 percent for HISD.

- Being identified as gifted and talented (G/T) was a positive predictor of the performance of students who were enrolled in a coherent sequence of CTE courses on the 2018 STAAR EOC exams for Algebra I, Biology, English I, English II, and U.S. History. Being identified as at-risk, economically

disadvantaged, or receiving special education services were adverse predictors of students' performance on the five STAAR EOC exams included in this study.

Recommendations

- Since HISD data on graduates beyond high school follow a one-year lag, further studies should focus on CTE graduates' enrollment in higher education or the extent to which graduates are able to find employment in their related coherent sequence of courses or certification and to better determine the longer-term outcomes of CTE.

- Based on the results of this study, the CTE Department and schools should build on relevant instructional strategies and support services that address the adverse performance of at-risk CTE students.

- STAAR EOC exams may not be designed to get a valid measure of students' CTE performance. It may be necessary to identify more appropriate ways to measure students' CTE performance that are compatible with the nature of program.

- Given the adverse impact that CTE workload can have on the acquisition of academic skills and the CTE students' performance on the 2018 STAAR EOC exams relative to their peers, the CTE Department should review CTE enrollment to ensure that there are no adverse effects between students' CTE workload and the acquisition of academic skills required to meet standards on STAAR or in preparation for postsecondary education.

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Introduction

Section 29.182 of the Texas Education Code (TEC) provides for the opportunity for all secondary students to participate in Career and Technical Education (CTE) programs in the State of Texas. These CTE programs incorporate competencies that lead to academic and technical skill attainment, industry-recognized licenses, credentials, and certificates, and provide opportunities for students to earn college credit for their coursework (State of Texas, 2013). CTE programs may be developed and delivered with assistance from contracted local businesses or institutions of higher education (Section 28.187b).

CTE programs provide coherent and rigorous content in a sequence or cluster of courses. This content is aligned with academic standards that are challenging and provide technical knowledge and skills that are relevant in preparing students for higher education and careers in current or emerging professions (Texas Education Agency, 2018). There are sixteen CTE career clusters. The CTE Texas Essential Knowledge and Skills (TEKS) that guide CTE instruction became effective during the 2017–2018 school year (Texas Education Agency, 2018).

The Houston Independent School District (HISD) offers sixteen CTE programs at several high school locations (HISD, 2017). These are grouped as follows: (1) Agricultural; (2) Architecture, Construction, Manufacturing, and Transportation; (3) Science, Technology, Engineering, and Mathematics (STEM); (4) Communications and Information Technologies; (5) Business Operations, Management, and Hospitality; (6) Human and Social Services; and (7) Health Science. Each program consists of a career pathway that provides a coherent, articulated sequence of rigorous academic and CTE courses. CTE enrollment can commence in the ninth grade and leads to an associate degree, baccalaureate degree, industry recognized certification, and/or licensure related to the sixteen career clusters (HISD, 2017). These clusters are grouped to organize educational programs and curricula according to occupations and common knowledge skills (HISD, 2017). **Appendix A**, **Table A1**, p. 19–21 lists the programs and the HISD schools where they were offered during the 2017–2018 school year, the associated certifications, and areas of potential employment.

An overview of CTE research called for "overlapping studies of diverse efforts…each with a slightly different lens and methods" (Castellano, Stringfield & Stone III, 2003, p. 263). Studies should be longitudinal and employ mixed methods and naturally occurring experiments…with effects that include standardized test scores, graduation rate, postsecondary transition rates, and labor market participation (Castellano, Springfield & Stone III, 2003). Diverse studies are also required to capture students' perceptions and outcomes, classroom processes, school and district leadership, and micro and macro political perspectives (op. cit, pp 263–264).

The purpose of this evaluation was to describe HISD students' enrollment in a coherent sequence of CTE courses, and analyze these students' performance, relative to their peers who were not enrolled in a coherent sequence of CTE courses or in any CTE course. The evaluation was guided by the following questions:

1. What were the 2009–2010 through 2017–2018 enrollment trends and the 2017–2018 demographic characteristics of students who were enrolled in HISD CTE programs?

2. What were the key CTE program initiatives implemented in HISD during the 2017–2018 academic year?

3. How did the performance of students enrolled in a coherent sequence of CTE courses compare with their Non-CTE peers on the 2018 STAAR EOC assessments?

4. What were the longitudinal graduation and annual dropout rates for students enrolled in a coherent sequence of CTE courses compared to HISD students districtwide and students who graduated in the class of 2016 and 2017?

Literature Review

CTE studies undertaken in the last few years appear to focus on CTE's association with college enrollment (Dougherty, 2016a); secondary school outcomes, high school graduation, college graduation, employment, and wages (Dougherty, 2016b; Hart, 2017); postsecondary education (U.S. Department of Education, 2016, 2017; Betts, Zou, McAdams & Dotter, 2014); math performance and dropout prevention (Bozick & Dalton, 2013). CTE research has also focused on variations in courses offered and high school academic achievement (Betts, Zou, McAdams & Dotter, 2014). Researchers also looked at CTE impacts on postsecondary outcomes in a large urban district (Neild & Brynes, 2014) as well as trends in Texas high school student enrollment in math, science, and CTE-STEM courses.

Various analytic methods have been used in research regarding CTE students' achievements. Quasi-experimental studies used regression models with covariates related to students' CTE participation and completion (Dougherty, 2016a). Covariate-adjusted regression models controlled for key demographic, academic, attendance and discipline factors, instrumental variables, and applied propensity score matching on three cohorts of high school graduates (Dougherty, 2016b). Yet another study used lottery admission based on three analytical methods (Neild & Brynes, 2014). Studies were also descriptive using two cohorts of public and private high school graduates and their transcripts. Another study used correlational data of 8th grade students and their subsequent high school transcripts and postsecondary attainment eight years after graduating in 1992 and 2004 (U.S. Department of Education, 2016, 2017). Mean scores for grades 9–12 math, science and CTE enrollment data from Texas disaggregated by key demographic characteristics between 2008 and 2013 were also used to analyze CTE achievement (Yoon & Strobel, 2017). One study used two-stage sampling, surveys, and math and reading cognitive assessments of private and public high school students as well as surveys of related principals, parents, teachers, and librarians (Bozick & Dalton, 2013). The Betts, Zou, McAdams & Dotter's (2014) study used exploratory models and confirmatory analysis of instrumental variables to determine causal links between CTE enrollments and postsecondary outcomes and achievement. Finally, one study was a comparative analysis of graduation rates for 36 CTE-specific and comprehensive high schools in 21 New Jersey (NJ) counties using graduation data published on the NJ Department of Education website between 2011 and 2014 (Hart, 2017).

The findings from these studies vary. Dougherty's (2016a) study found higher probabilities of college enrollment for graduates of CTE concentrators[1] versus non-concentrators, particularly outside of rural areas in Arkansas. Dougherty (2016b) found that most CTE concentrators were identified as White or female and there was a positive relationship between the number of CTE courses students took and their education and labor outcomes. Findings indicated that high school graduation increased by 3.2 percent for every additional CTE course and quarterly wages were boosted by $28. Concentrators were 21 percent more likely to graduate high school. Males and low-income students experience the largest benefit of concentrating (Dougherty, 2016b). Using national data, the U.S. Department of Education (2017) found that postsecondary enrollment was lower among CTE concentrators (82%) compared to non-concentrators (91%). Concentrators had three or more credits in an occupational area (U.S. Department of Education, 2017). The department also found that postsecondary enrollment was higher among more recent graduates (89% in 2004) compared to 83 percent in 1992 particularly among those who earned more credits (U.S. Department of Education, 2016). Taking more occupational and less academic courses in the last two years

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[1] Concentrators are a coherent sequence of CTE courses, and non-concentrators are a non-coherent sequence of CTE courses.

of high school limits students' acquisition of advanced academic skills and concepts (Bozick & Dalton, 2013). Black and Asian students benefit more from occupational courses than White kids (Bozick & Dalton, 2013).

In a San Diego, California study, Betts, Zou, McAdams and Dotter (2014) found that 80 percent of CTE courses were occupationally-focused, 30 percent were community-college, and 4 percent were in engineering or STEM courses, and that variations were related to school size. They found that the average effect of taking one additional CTE course was about 0.12 years increase in postsecondary attendance during the first four years after high school graduation. CTE-specific high schools were shown to have higher graduation rates (94.8%) compared to comprehensive high schools (88.7%) in NJ and the difference was statistically significant (p =.006) (Hart, 2017). Nationally, CTE schools had a positive effect on postsecondary enrollment, according to Neild and Brynes (2014), however, the effects across cohorts were inconsistent and CTE had no significant impact on postsecondary outcomes. In the case of Texas, there were wide variations in CTE-STEM enrollment trends by types of courses, gender, and race/ethnicity (Yoon & Strobel, 2017). Yoon and Strobel (2017) found that the gender gap in CTE-STEM courses increased at a rate greater than in advanced math and advanced science courses across the years, 2008–2013.

The positive effects of CTE on high school graduation and postsecondary enrollment are evident in these studies and are also evident among minority students who tend to benefit most from enrollment in CTE. Further, CTE participation showed positive outcomes for boosting income. Few studies, however have focused on the employment or career outcomes of CTE graduates or controlled for the courses, particularly occupational courses that may not require postsecondary qualifications for employment. This study disaggregated results by key demographic and educational variables.

Method

This study used descriptive data to determine the association between CTE course enrollment and student performance, graduation, CTE certification, and annual dropout rates. HISD students enrolled in CTE courses were identified in the Public Education Information Management System (PEIMS) and the Cognos data warehouse. Cognos is an IMB business intelligence and performance management software suite. PEIMS data were collected in the fall of 2017. Students enrolled in a non-coherent sequence of courses were coded 1 and those who were enrolled in a coherent sequence of courses were coded 2 in PEIMS and the data warehouse. PEIMS key demographic and educational data for these students, including gender, ethnicity and race, economic status, gifted and talented (G/T) status, and at-risk[2] status were also used in the analysis.

The 2018 State of Texas Assessments of Academic Readiness (STAAR) End-of-Course (EOC) exams scores were used as the outcome data. All students who had a score on Algebra I, Biology, English I, English II, and U.S. History STAAR EOC exams Spring administration, 2018 were included in the study along with their met-standards status on these exams. Only regular STAAR was included. STAAR is a state-mandated criterion reference test that measures student academic performance and achievement. Retesters were not included in the study due to over exposure to both the program and outcome measures.

Students' STAAR data used in this study were retrieved from Cognos. The dataset was cleaned and organized for analyses. Non-CTE students were coded 0; students enrolled in a non-coherent sequence of

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[2] At risk indicates whether a student is currently at-risk for dropping out of school using state-defined criteria only. The student must be less than 21 years old and experiencing one or more of 13 criteria including unsatisfactory academic performance, retained in a grade, is pregnant or a parent, homeless, and prior expulsion (Texas Education Agency, 2015).

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courses were coded 1, and those enrolled in a coherent sequence of courses were coded 2 to facilitate the analyses of program associations (**Table B1**, **Appendix B**, p. 22).

Descriptive analyses were used to compare the CTE group composition relative to the district by key demographic and educational data. Further analyses were conducted to determine the extent to which students in the study met STAAR standards based on the scale scores students attained on these EOC tests. The 2017–2018 standard were classified as follows:

1. Does not meet grade level.
2. Approaches Grade Level Standard at the students' performance standard.
3. Meets Grade Level standard.
4. Masters Grade Level standard.

Standards 2 to 4 above reflect passing standards on STAAR EOC exams. Students who attained Masters Grade Level Standard would have also attained Approaches Grade Level Standard at the students' performance standard and Meets Grade Level standard.

Multiple linear regression analyses were conducted on each of the STAAR EOC rests in this evaluation to predict student performance regressed on selected demographic and educational factors, notably English language learners, economic status, G/T, special education, and at-risk status using Stata version 15. Stata is a StatsCorp LLC statistical software used to analyze quantitative data. The data used in this study met conditions of homoscedasticity, normality, and collinearity using Shapiro-Wilks test, the Normal Q-Q plot, and the Detrended Normal Q-Q plot. Missing data cases were treated to pairwise exclusions on the IBM Statistical Packages for Social Sciences (SPSS) software.

Data for students' CTE industry certification were retrieved from the HISD Chancery Ad Hoc data warehouse through Cognos. Graduation data from the Research and Accountability Microsoft Access data files and CTE and HISD longitudinal graduation rates obtained from the Texas Education Agency (TEA) 2017 Accountability Completion, Graduation and Dropout Summary Report were also used in the analyses. The evaluation study also used the TEA 2016–2017 Annual Dropout Summary Report for CTE and HISD annual dropout rates.

Limitations

*   It is assumed that all HISD 6–12th-grade students had the option and opportunity for CTE enrollment, although they may not have had similar motivations. Therefore, students who were not enrolled in CTE courses were included in the data analyses. This may create interpretation issues and may affect the external validity of the findings.

*   Students' self-selection into the CTE program made it challenging to find a comparable group of students with similar motivation for enrollment but who did not enroll, restricting the external validity of the results to only those students who were enrolled in a coherent sequence of CTE courses.

*   STAAR EOC tests were administered after courses were completed. Although there are retesters, prior scores for those courses are unavailable. This restricts the robustness of the analyses that could be undertaken.

*   CTE courses are designed to prepare students for college and careers. By the preparation date of this report, college enrollment or career decision data were not available as legitimate outcomes from which to measure the effectiveness of CTE course enrollment. However, CTE enrollment and enrollment completion are used as measures of postsecondary school readiness as part of Texas Education

Agency (TEA) school accountability system and are being treated in this report as a proxy, along with graduation data, to determine program impact.

- CTE is not an intervention in traditional academic programs. The use of STAAR results may not be a valid measure of CTE impact.

Results

What were the 2009–2010 through 2017–2018 enrollment trends and the 2017–2018 demographic characteristics of students who were enrolled in HISD CTE programs?

Figure 1 shows the comparative enrollment of CTE students in HISD between the 2009–2010 and 2017–2018 academic year, inclusive.

Figure 1. Comparative CTE Course Enrollments in HISD, 2009–2010 to 2017–2018
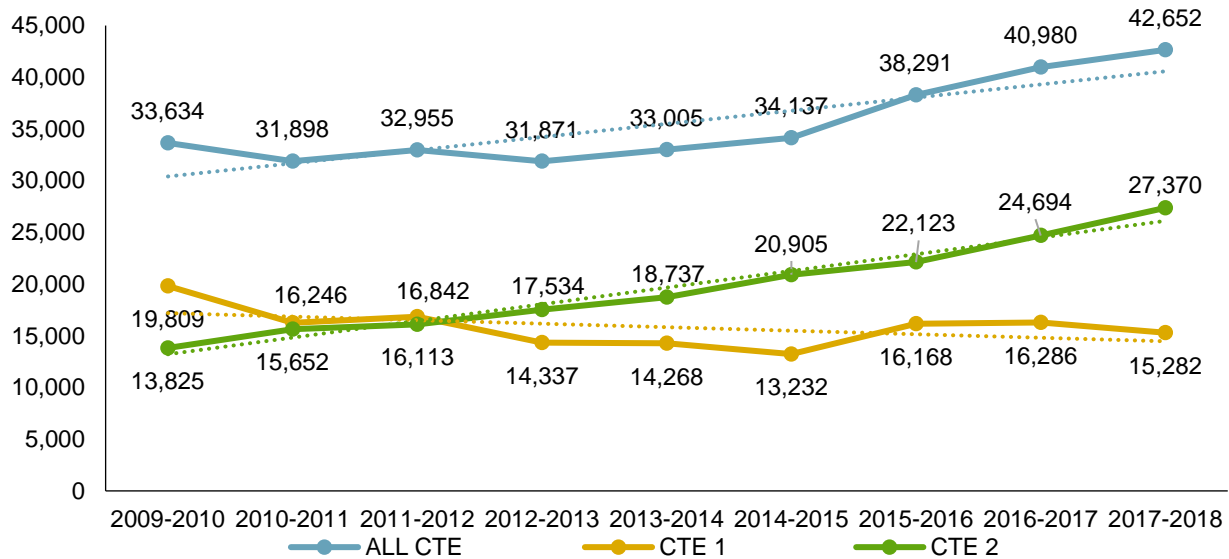
Source: PEIMS fall 2017 (Department of Research and Accountability database); HISD Report 2016–2017.
Note: CTE flags were revised in 2016–2017 to 0, 1 and 2 (See Appendix B, Table B1, p. 22); Figures from 2016–2017 reflect only Code 2 after the use of code 3 was discontinued. ADA-Eligibility code "0" has been excluded from the enrollments for 2017–2018.

- Overall, the number of students enrolled in CTE courses increased by 9,018, from 33,634 in 2009–2010 to 42,652 in 2017–2018.

- Figure 1 shows an increase of 1,672 students (4.1%) for all CTE course enrollment groups, from the 2016–2017 to the 2017–2018 academic year.

- The number of students enrolled in non-coherent sequence of courses (CTE 1) declined by 1,004, from the 2016–2017 to the 2017–2018 academic year.

- The number of students enrolled in a coherent sequence of courses (CTE 2) increased by 10.8 percent from the 2016–2017 to the 2017–2018 school year, from 24,694 to 27,370 students.

Figure 2 shows the demographic composition of students enrolled in CTE courses during the 2017–2018 school year.

Figure 2. Comparative Distribution of CTE and HISD 6-12th Grade Students by Demographic Groups, 2017–2018

	Gender		At Risk		SpEd		G/T		LEP		Econ Disadv.		Home Language			Ethnicity			
	Fem.	Male	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Span.	Eng.	Other	Asian	Black	Hisp.	White
CTE Non-Seq. Courses	49.5	50.5	31.8	68.2	92.4	7.6	82.4	17.6	83.6	13.7	32.3	67.7	41.3	55.7	3.0	3.9	23.4	61.0	10.2
CTE Seq. Courses	48.5	51.5	23.1	76.9	92.7	7.3	86.4	13.6	84.3	15.7	26.1	73.9	46.3	50.3	3.4	2.4	27.7	63.5	5.6
HISD (6-12th Grade)	49.7	50.3	32.0	68.0	91.3	8.7	81.1	18.9	81.4	18.6	29.3	70.7	43.1	53.2	3.8	3.8	24.2	61.0	9.5
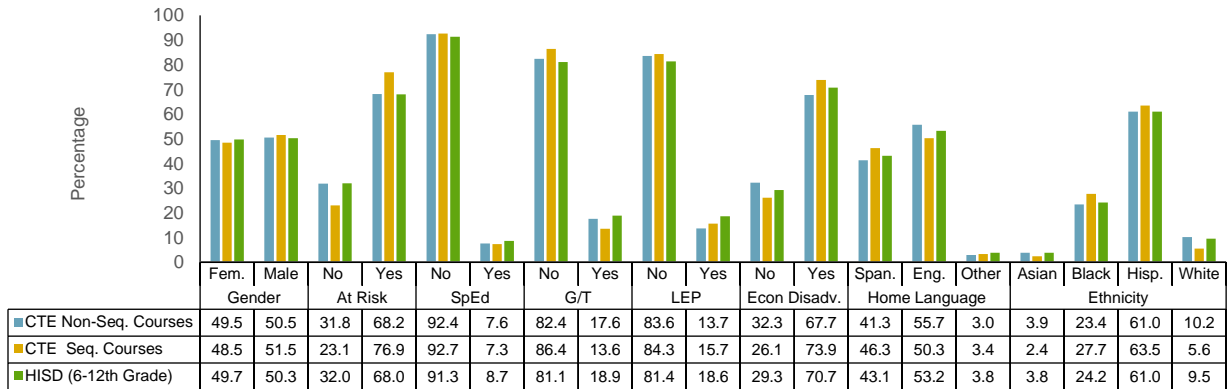
Source: PEIMS Fall 2017 (Department of Research and Accountability Access Database), HISD SIS Ad Hoc data warehouse

Note: Fem. = Female; Seq. = Sequenced; Hisp. = Hispanic; SpEd = Special Education; G/T = Gifted and talented; Span.= Spanish; Eng.= English. The total CTE Enrollment was N = 42,652, CTE Sequence enrollment was 27,370; and HISD 6th – 12th grade enrollment was 95,126

- Fewer limited English proficiency (LEP) (15.7 %) and G/T (13.6%) students were enrolled in a coherent sequence of CTE courses compared to their 6th through12th–grade peers in HISD (18.6% and 18.9%, respectively).

- Fewer Asian (2.4 v. 3.8%) and White (5.6 v. 9.5%) students were enrolled in a coherent sequence of CTE courses compared to their 6th through 12th grade peers in the HISD population.

- More at-risk (76.9 v. 68.0%) and economically-disadvantaged (73.9 v. 70.7%) students were enrolled in a coherent sequence of CTE courses compared to their 6th through 12th-grade HISD peers.

What were key CTE program initiatives implemented in HISD during the 2017–2018 academic year?

Under the umbrella of the Career Readiness department, HISD provided career awareness and technical education experiences to students in the 2017–2018 school year. Some key initiatives included: Broadening Work-Based Learning Opportunities through Business Partnerships, Providing Career Awareness to Elementary Students, Increasing Career Exploration Experiences for Middle School Students, and increasing the number of CTE programs offering industry certifications.

In addition to these key initiatives, the Career Readiness department offered a variety of programs through Career and Technical Education (CTE) coursework from which students could select a career pathway of study. Career pathways guide students in course selection regardless of their abilities, talents, or desired levels of education. By taking CTE courses, students are given opportunities to participate in hands-on training within their career pathway of interest. As such, HISD students engage in opportunities to explore career options and prepare for the workforce and/or post-secondary education. Additionally, several campuses offered dual credit courses to enhance their CTE pathways. The initiatives ensure that all CTE students develop career awareness within their selected course of study and receive exposure to

professional experiences to develop mastery, confidence, and leadership skills. The following provides additional details regarding key initiatives in Career Readiness:

Broadening Work-Based Learning Opportunities through Business Partnerships:
Business partnerships provide students with enriching learning experiences, including one-on-one mentoring and real-world work opportunities. CTE students are invited to participate in field trips, site visits, and internships at local businesses. These businesses recognize the need to expose local students to various aspects of the world of work and the importance of on-the-job training experiences. Such experiences in 2017–2018 included interning at several major hotel chains and offering an apprenticeship like program through Texas Masonry Council. HISD business partners, including Gilbane Building Company, Century AC, Merrick Brothers Construction, San Jacinto Junior College, and many hospital affiliations continue to partner with district high schools to provide assistance such as paid and unpaid internships for students, classroom speakers, facility tours, and teacher externships.

Expansion of Industry-Based Certifications Offered
Students engaged in Career and Technical Education programs across the district are afforded the opportunity to take an Industry Based Certification (IBC) intended to increase, enhance, and demonstrate knowledge and skills associated with each pathway of courses. In 2017–2018, the number of students earning TEA recognized industry-based certification, as part of the College, Career, and Military Readiness indicator for accountability, increased by 68%. Implementation of supplemental curriculum, credentialing, and accreditation of labs has increased to support the delivery and attainment of IBCs across the district.

Providing Career Awareness to Elementary Students:
HISD elementary school students are exposed to career exploration presentations to increase their career awareness and peak interest in various careers within the local labor market. The Career Ready Wagon provides students with interactive, hands-on demonstrations with information about various professions. Students also participate in activity stations and hands-on demonstrations that help them begin to develop connections between their skills, interests, and future career choices. In 2017–2018 year, the Career Cowboy visited 34 Elementary Schools and engaged over 10,000 students in the Career Ready Wagon, a converted school bus filled with hands-on interactive stations in career exploration.

Increasing Career Exploration Experiences for Middle School Students:
In 2017–2018, HISD encouraged middle school enrollment in three hybrid courses: Professional Communications, Principles of Information Technology, and Principles of Applied Engineering. The courses are designed to provide high school level credit in Information Technology or Engineering, while at the same time providing a specific curriculum that allows students to explore their own interests and aptitude as related to careers. Students are then able to make more informed decisions about their high school and endorsement choices.

Providing Print and Online Resources for Students and their Families:
The Career Readiness Department maintains an engaging and up-to-date online platform (website) and provides printed and online career program materials (Career Program booklet) to better inform students, parents, teachers, and business partners about career programming throughout the district. The website presence is audience-driven and targets three audience groups through key functions: PLAN (Students and Families), PREPARE (Teachers), and Partner (Businesses). The site can be visited at the following link: http://www.hisdcareerreadiness.org. Information regarding descriptions of Career and Technical Education Programs of study available can be found at the following link:
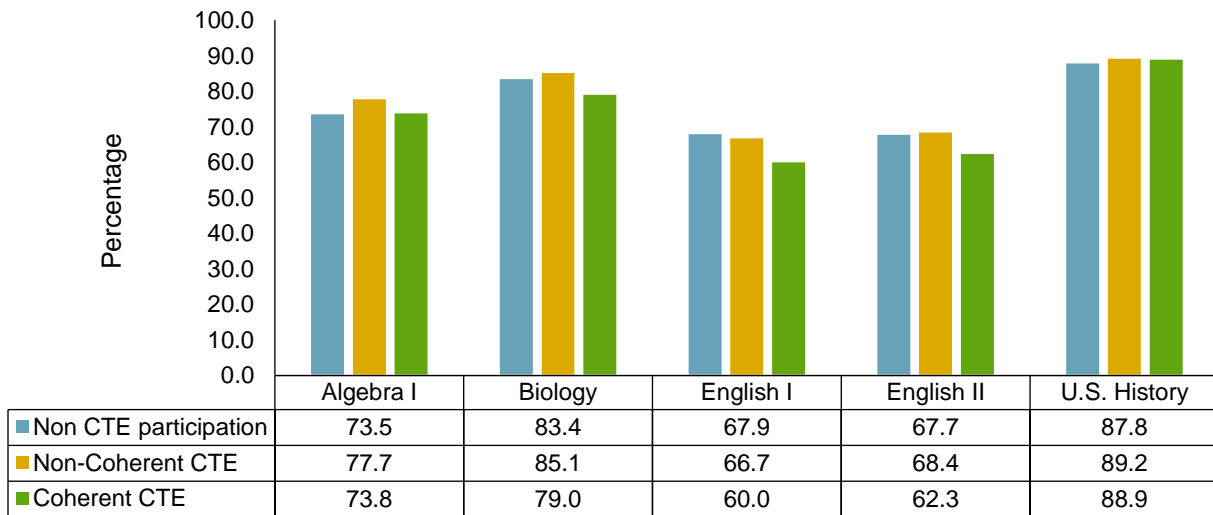http://www.hisdcareerreadiness.org/plan/programs/

Career and Technology Student Organizations (CTSO)
CTE students are encouraged to join student organizations that are directly related to their selected career pathway. These organizations offer students opportunities to develop leadership and teamwork skills that help prepare them for the workforce and/or for postsecondary education and training. HISD has developed several partnerships with local, regional, and national professional organizations to allow school-level student organizations to participate fully in related activities of these organizations and to benefit from their professional memberships. Some of these organizations include the Business Professionals of America (BPA), Future Business Leaders of America (FBLA), Family, Career and Community Leaders of America (FCCLA), Health Occupations Students of America (HOSA), Skills USA, and the Technology Student Association (TSA). In the 2017–2018 school year, 2,966 students participated in district CTE student organization activities.

How did the performance of students enrolled in a coherent sequence of CTE courses compare with their Non-CTE peers on the 2018 STAAR EOC assessments?

Figure 3 and **Figure 4** display the performance of ninth through twelfth-grade CTE students on the 2018 STAAR Algebra I, Biology, English I, English II, and U. S. History EOC exams. **Table C1**, **Appendix C** (p. 23) shows the counts of test-takers for each of the EOC exams by evaluation group and **Table C2**, Appendix C (p. 24) shows CTE students' performance disaggregated by selected demographic and educational attributes for each of the EOC exams.

Figure 3. Comparative Percentage of HISD 9th- Through 12th-Grade Non-CTE and CTE Students Who Met or Surpassed Approaches Grade Level Standard on the 2018 STAAR EOC Exams

	Algebra I	Biology	English I	English II	U.S. History
Non CTE participation	73.5	83.4	67.9	67.7	87.8
Non-Coherent CTE	77.7	85.1	66.7	68.4	89.2
Coherent CTE	73.8	79.0	60.0	62.3	88.9

Source: HISD Student 2017–2018 PEIMS (Department of Research and Accountability Access database): STAAR EOC Spring Test Files, 2017–2018.
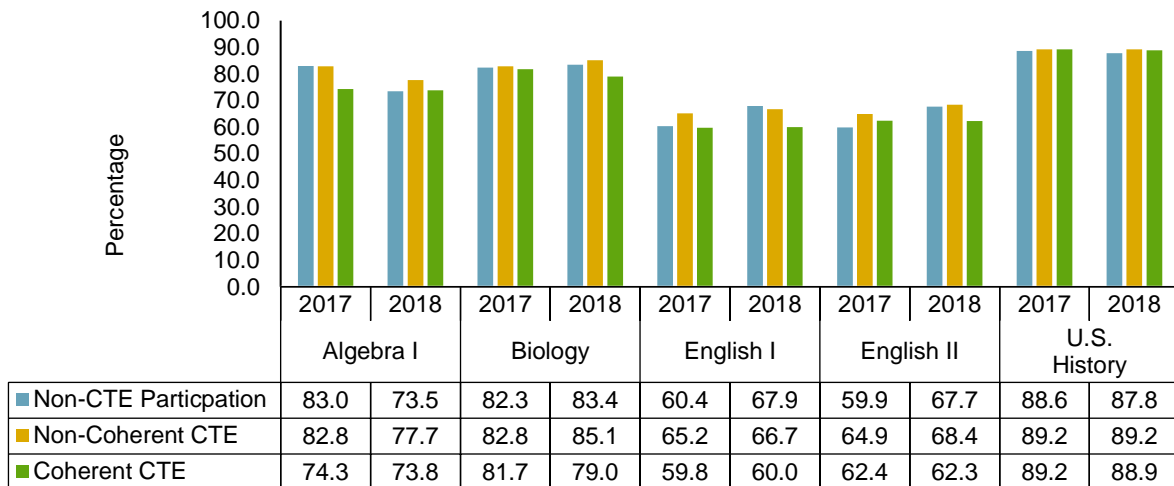
Note: Data are based on first-time testers. Only regular STAAR EOC testers was used.

- The highest percentage of students who performed at or above the Approaches Grade Level standard on the 2018 STAAR Algebra I (77.7%), Biology (85.1%), English II (68.4%), and U.S. History (89.2%) EOC exams were enrolled in a non-coherent sequence of CTE courses.

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- The percentage of students who were enrolled in a coherent sequence of CTE courses and who performed at or above the Approaches Grade Level standard on the 2018 STAAR EOC exams ranged from a high of 88.9 in U.S. History to a low of 60.0 in English I.

- Regardless of CTE enrollment status, the proportion of students who performed at or above Approaches Grade Level standard on the 2018 STAAR EOC exams was lowest for English I (60.0%) and English II (62.3%).

- A higher percentage of students who were enrolled in a coherent sequence of CTE courses compared to non-CTE students performed at or above the Approaches Grade Level standard on the 2018 STAAR Algebra I (73.8% v. 73.5%) and U.S. History (88.9 v. 87.8) EOC exams.

Figure 4. Comparative Percentage of HISD 9th- Through 12th-Grade Students by CTE Enrollments Status, who Performed at or Above the Approaches Grade Level Standards on the 2017 and 2018 STAAR EOC Assessments

	Algebra I 2017	Algebra I 2018	Biology 2017	Biology 2018	English I 2017	English I 2018	English II 2017	English II 2018	U.S. History 2017	U.S. History 2018
Non-CTE Particpation	83.0	73.5	82.3	83.4	60.4	67.9	59.9	67.7	88.6	87.8
Non-Coherent CTE	82.8	77.7	82.8	85.1	65.2	66.7	64.9	68.4	89.2	89.2
Coherent CTE	74.3	73.8	81.7	79.0	59.8	60.0	62.4	62.3	89.2	88.9

Source: HISD PEIMS (Department of Research and Accountability) Access Database, 2016 and 2017 and STAAR EOC assessment results data files, 2017 & 2018.
Note: Data include first-time testers and regular STAAR EOC testers only. Data was based on the 2017 and the 2018 Approaches Grade Level Standard.

- There was a negligible increase in the percentage of students who were enrolled in a coherent sequence of CTE courses who performed at or above Approaches Grade Level standard between 2017 (59.8%) to 2018 (60.0%) on the STAAR EOC English I exam (Figure 4).

- The percentage of students who were not enrolled in a coherent sequence of CTE courses and who performed at or above Approaches Grade Level standard on the STAAR EOC exams either increased or remained unchanged between 2016–2017 and 2017–2018, except for Algebra I (82.8 v. 77.7%).

The following information refer to the disaggregated performance data in Table C2, Appendix C (p. 24) for students enrolled in a coherent sequence of CTE courses. The performance of their non-CTE peers was provided for comparative purposes.

- According to Table C2 (p. 24), at least 72.5 percent of students enrolled in a coherent sequence of CTE courses, regardless of demographic characteristics, performed at or above the Approaches Grade Level standard on the STAAR U.S. History exam. The only exception was among students receiving special education services.

- Except for at-risk students and students receiving special education, more than 57.0 percent of students in the demographic subgroups enrolled in a coherent sequence of CTE courses performed at or above the Approaches Grade Level standard on the 2018 STAAR Biology EOC exam.

- At least 50 percent of the subgroups, except males, at-risk students, students receiving special education, and African American students who were enrolled in a coherent sequence of CTE courses performed at or above the Approaches Grade Level standard on the 2018 STAAR Algebra I EOC exam.

- A consistently high percentage (at least 94.1%) of G/T students who were enrolled in a coherent sequence of CTE courses performed at or above the Approaches Grade Level standard on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams.

CTE Student Certification

Students could receive an industry certification, license, or Occupational Competency Assessment on successful completion of their CTE courses or programs. **Appendix D** (p. 25) describes the certifications. Students can also earn a performance acknowledgement on their high school diplomas for earning a nationally or internationally recognized business or industry certification or licensure (Houston ISD, 2017).

Data provided by the Career Readiness Department showed that 5,648 CTE certifications were earned among students in 34 HISD schools. **Table D1**, Appendix D (p. 26) shows the type and distribution of certificates by schools. Of these schools, 91.5 percent of students who took a certification exam passed the exam in 2017–2018. **Figure 5** shows the distribution of these certificates by school for students enrolled in the HISD CTE courses.

Figure 5. HISD CTE Certification Distributed by School, 2017–2018
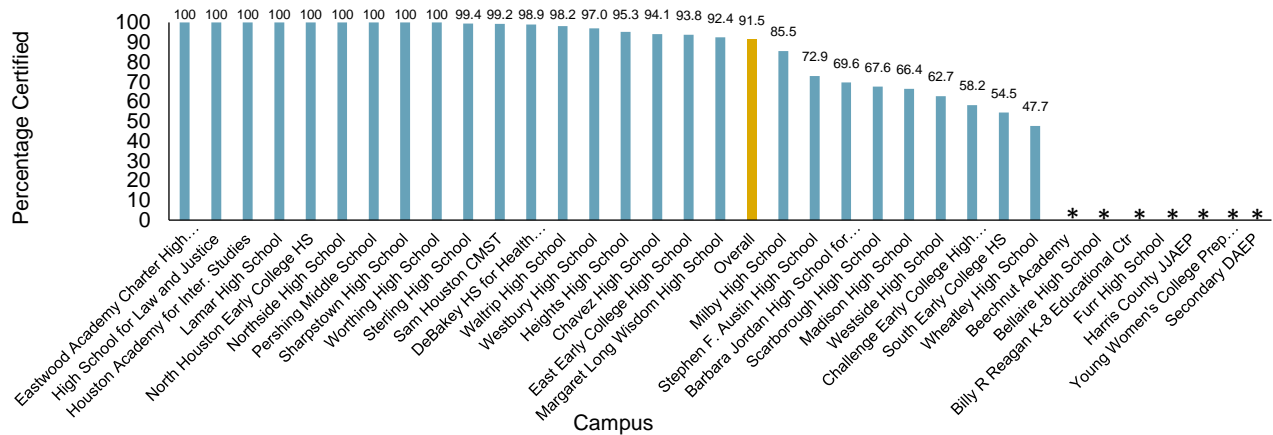
Source: Source: HISD Chancery Ad hoc Data Warehouse, retrieved using IBM Cognos on 5/25/2018.
Note: *Data for schools with less than five students.

- Overall, 91.5 percent of the CTE students who took an industry certification exam received an industry certification during the 2017–2018 school year, compared to 71.9 percent in 2016–2017 (Houston ISD, 2017). Nine schools had certification rates that were below the overall average of 91.5 percent. **Table DI**, Appendix D (p.26) provides details.

- At least 50 percent of students in each school, except for one school, passed CTE certification assessments for the 2017–2018 school year.

- One hundred percent of CTE students from nine schools who took an industry certification exam received an industry certification during the 2017–2018 school year. Seven schools had less than five students who were assessed for certifications.

What were the longitudinal graduation and annual dropout rates for students enrolled in a coherent sequence of CTE courses compared to HISD students districtwide, and students who graduated in the Class of 2016 and 2017?

Longitudinal Graduation Rates

Figure 6 displays the 2017 longitudinal four-year graduation count for CTE students in 9th through 12th grades in HISD along with the four-year graduation rate. The four-year rate included students who followed a coherent sequence of CTE courses that led to an industry certificate. These students would have graduated on time, that is, within four years.

Figure 6. CTE and HISD Longitudinal Graduates Count Based on the Class of 2016 and Class of 2017
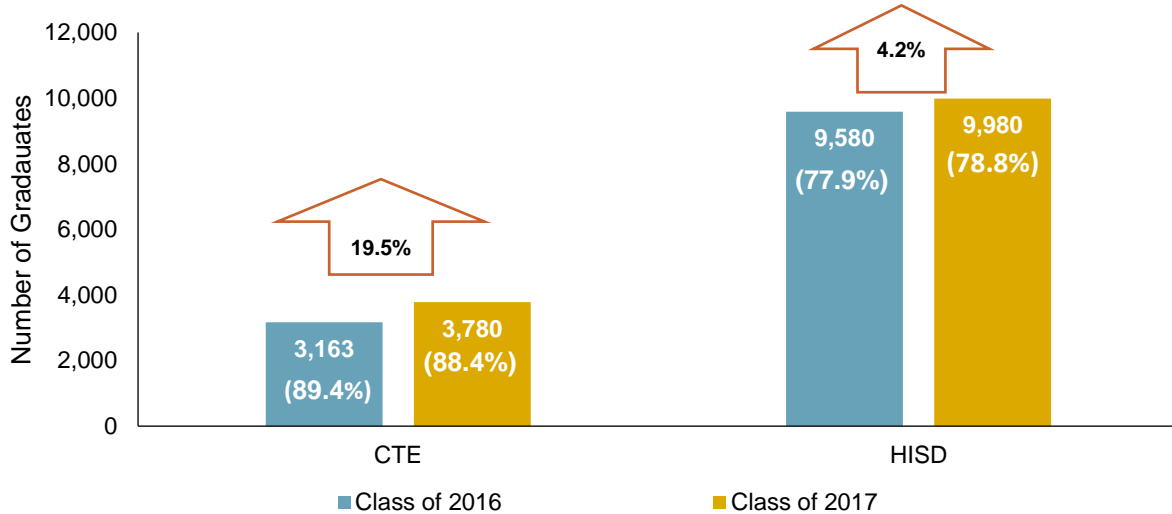
Source: TEA 2016 and Class of 2017 Four-Year Longitudinal Summary Report.
Note: No statutory exclusions were applied. Data align to State Performance Based Monitoring Analysis System. Graduation rates are in parentheses

- The number of CTE students who graduated increased by 19.5 percentage points, from 3,163 in 2015–2016 to 3,780 students in 2016–2017. This increase is nearly five times that of HISD districtwide, which increased by 4.2 percentage points.

- CTE graduation rate decreased from 89.4 percent for the Class of 2016 to 88.4 percent for the Class of 2017 but still exceeded the district graduation rate (federal calculation) by nearly 10 percentage points.

Annual Dropout

A dropout is a seventh- through twelfth-grade public school student, in a given year, who does not return the following fall, and who has not been expelled, has not graduated, has not received a General Educational Development (GED) certificate, has not continued school outside the public-school system, had not begun college, or died (see TEA, 2018, September). The annual dropout rate, therefore, is the percentage of students who dropped out of grades 7–8, grades 9–12, or grades 7–12 during a school year. **Figure 7** shows comparative dropout rates for students in grades 9–12 enrolled in CTE courses and for HISD, overall, for the 2015–2016 and 2016–2017 school years (TEA, 2016). Published dropout data have a one-year lag.

Figure 7. CTE and HISD Annual Dropout Rates Ninth Through Twelfth Grade, 2015–2016 and 2016– 2017
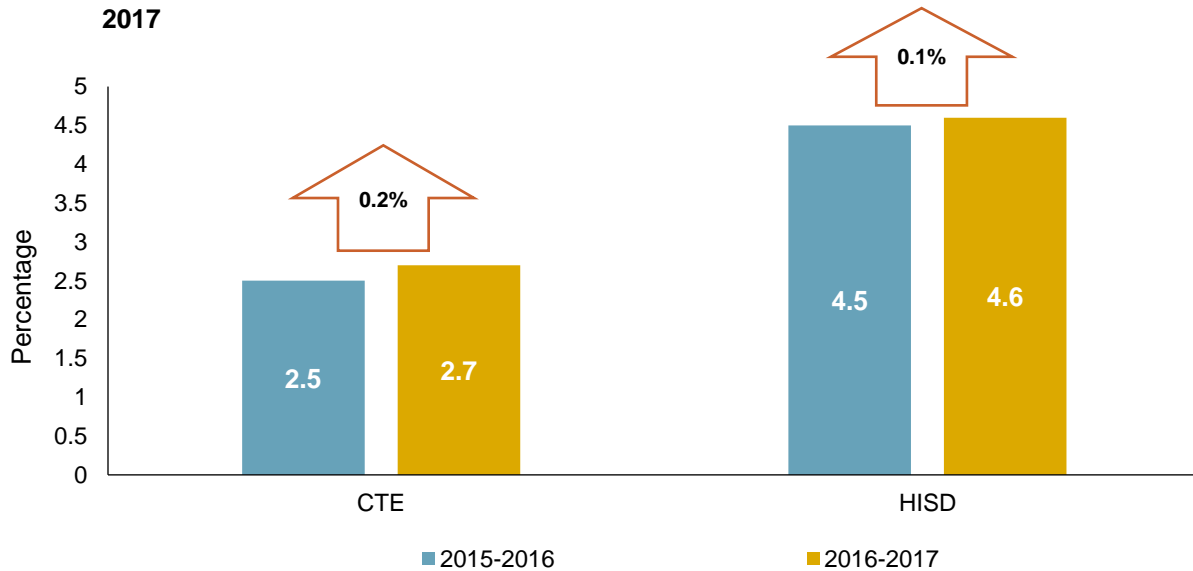
Source: TEA 2015–2016 and 2016–2017 Annual Dropout Summary Report

Note: No statutory exclusions were applied. Data align to PBMAS

- The annual dropout rate for CTE (2.5 and 2.7%) was substantially lower than the district's (4.5 and 4.6%) in 2015–2016 and 2016–2017, respectively.

- The dropout rate increased by 0.2 percentage points for CTE students and increased by 0.1 percentage points for the district from 2015–2016 to 2016–2017.

Graduation Diplomas

Based on the level and quality of credits acquired during high school, twelfth-grade students could have earned one of five types of diplomas for 2016 and 2017. These are completion of Individualized Education Plan (IEP) Regular/Minimum, Recommended, Distinguished Achievement, and Foundation High School Program (**Table E1**, **Appendix E**, p. 27). District data were included for comparative purposes.

- Based on Table E1, most students enrolled in CTE courses graduated with Recommended Diplomas (76.4%) in 2017. This was 0.3 percentage points higher than in 2016 (76.1%). There were increases as well from 2016 to 2017 for CTE students who graduated with a Completed Individualized Education Plan Diploma (1.08 percentage-points increase) (.02 to 1.1%, respectively), Foundation High School

Program Diploma (1.9 percentage-points increase) (5.5 to 7.4%, respectively). Comparative district data are provided.

- The percentage of CTE students who graduated with Distinguished Achievement Diploma decreased between 2016 and 2017 by 0.6 percentage points (7.5 to 6.9%, respectively). Similarly, there was a decrease in the percentage of CTE students who graduated with a Regular/Minimum Diploma (0.3 percentage points) (8.5 to 8.2%, respectively).

Performance Predictors

Multiple regression analyses were conducted on the five STAAR EOC exam results used in this study to predict the performance of students who were enrolled in a coherent sequence of CTE course. The results were regressed on five key demographic variables: English language learners, economic status, special education, at risk, and gifted and talented (G/T) identification. The results are presented in **Table F1**, **Appendix F**, p. 28.

- The regression model predicted 17 percent of the variance in students' scale scores for the 2018 STAAR Algebra I EOC exam, with a statistically significant (p<.001) constant or mean of 3958.8 scale score points (ssp) (Table F1, p. 28). Being identified as gifted and talented (G/T) explained 27.9 percent in the scale score variance for Algebra I, followed by special education (18.3%), at risk (15.8%), and economically disadvantaged (5.0%). All four predictors were statistically significant (p<.001), but only G/T was a positive predictor. G/T students would, on average, score above the mean or constant scale score.

- The overall regression model predicted 33.0 percent of the variance in the 2018 STAAR Biology EOC exam scale scores, with a statistically significant (p<.001) constant scale score of 4156.9. Being identified as G/T explained 42.9 percent of the variance in the Biology I scale score, followed by economically disadvantaged (15.6%), special education (14.6%), and at-risk (14.1%). The four predictors were statistically significant (p<.001). Only G/T was a positive predictor.

- The regression model for English I predicted 34.0 percent of the variance in students' scale scores for the 2018 STAAR English I EOC exams, with the statistically significant (p<.001) constant scale score of 4010.6. Being identified as G/T predicted 41.9 percent of the variance in the English I EOC exam results, followed by special education (18.2%), at-risk (17.3%), and economically disadvantaged (12.7%). The results were statistically significant (p<.001). Only G/T identification was a positive predictor.

- The overall regression model for English II predicted 34.0 percent of the variance in the 2018 English II EOC scale scores, with a statistically significant (p<.001) constant or mean scale score of 4024.7. Being identified as G/T predicted 41.3 percent of the variance in the English II exam result, followed by special education (19.1%), at-risk (16.8%), and economically disadvantaged (11.3%). All four predictors were statistically significant (p<.001). G/T was the only positive predictor.

- Overall, the regression model predicted 26.0 percent of the variance in the 2018 STAAR U.S. History Exam results, with a statistically significant (p<.001) constant or mean scale score of 4301.7. Being identified as G/T predicted 32.3 percent of the variance in the U.S. History scale score, followed by at-risk (22.0%), special education (13.9%), economically disadvantaged (10.6%), and an English language learner (2.9%). All predictors were statistically significant (p<.001). G/T was the only positive predictor.

Discussion

This evaluation sought to determine CTE enrollment trends, analyze STAAR EOC performance of students enrolled in CTE, and compare their performance relative to their peers who were not enrolled in CTE courses. The number of students enrolled in CTE course increased over the last school year. That increase was attributed to students who were enrolled in a coherent sequence of CTE courses. The number of students enrolled in a non-coherent sequence of CTE course declined. Unlike Dougherty's (2016a) findings in Arkansas, most students enrolled in a coherent sequence of CTE courses in HISD were male rather than female, and Blacks and Hispanic rather than White. Black and Hispanic students were represented in higher proportions in the evaluation sample who were enrolled in a coherent sequence of course as compared to their peers in the general HISD 6th–12th-grade population. The evaluation sample also had a higher proportion of at-risk, economically disadvantaged, and fewer students identified as G/T compared to the HISD 6th–12th-grade population for the 2017–2018 school year.

Compared to their non-CTE counterparts, a higher percentage of HISD students enrolled in a coherent-sequence of CTE courses met the Approaches Grade Level standard on the 2018 STAAR Algebra I and U.S. History EOC exams. There was a slight increase in the percentage of students enrolled in a coherent-sequence of CTE courses who met the Approaches Grade Level standard between 2017 and 2018 on the STAAR English I EOC exam. Bozick and Dalton (2013) found that taking more occupational and less academic courses in the last two years of high school limits students' acquisition of advanced academic skills and concepts. Using STAAR EOC exams, which are purely academic, to measure CTE students' performance may be masking students' real performance in a coherent sequence of CTE courses. CTE certification may be a more useful measure.

Overall, 91.5 percent of 6,170 CTE students who took an industry certification exam were successfully certified during the 2017–2018 school year, with nine schools performing below the overall average and one school performing below the 50 percent mark. Based on the longitudinal four-year graduation rate for 9th–12th-grade students, there was a higher percentage increase in the number of HISD CTE students who graduated compared to the number who graduated across the district. Additionally, the graduation rate for CTE students exceeded that of the district by nearly 10 percentage points. According to Dougherty (2016b), high-school graduation increased by 3.2 percent for every additional CTE course a student took. A higher percentage of CTE students compared to the district were awarded Recommended graduation diplomas. The percentage of CTE students who graduated with Distinguished Achievement Diploma decreased by 0.6 percent. There was a slight increase of 0.2 percent in the percentage of CTE high school students in grades 9–12 who dropped out compared to an increase of 0.1 percent for the district, although the annual dropout rate for CTE students (2.7%) was less than the district's rate (4.6%). CTE specific high schools were shown to have higher graduation rates compared to comprehensive high schools in New Jersey (Hart, 2017).

G/T identification was the only positive predictor of students' performance on the STAAR Algebra I, Biology, English I and II, and U.S. History EOC exams. Students who were identified as G/T were predicted to perform above average on these EOC tests. On the other hand, students who were identified as economically disadvantaged, at-risk for school dropout, who were English language learners (only for U.S. History) or enrolled in special education were predicted to perform below average on the STAAR EOC exams.

Analysis of the performance of CTE demographic subgroups found that fewer than 50 percent of students enrolled in a coherent sequence of CTE course receiving special education services met Approaches Grade Level standard on all five EOC exams in the study. Similar trends were observed for at-risk students in four of the EOC exams and in three of the EOC exams for males and African American students. Dougherty

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(2016b) determined that males and low-income students experienced the largest benefits of concentrating or enrolling in CTE coherent-sequence courses. HISD data does not fully support this trend. As mentioned earlier, STAAR EOC results may not be an appropriate measure of CTE students' performance. Disaggregated certification data may be more appropriate for measuring CTE students' performance.

Additionally, Betts, Zou, McAdams, and Dotter, (2014) found that the effects of taking an additional CTE course was equivalent to about 0.12 years increase in postsecondary attendance during the first four years after high school graduation. This study did not analyze the link between CTE graduation and postsecondary enrollment, but nationally, the research literature (Neild & Brynes, 2014) supports the link. This may require additional research in the HISD to determine the extent to which CTE students enroll in postsecondary education.

Recommendations

- Since HISD data on graduates beyond high school follow a one-year lag, further studies should focus on CTE graduates' enrollment in higher education or the extent to which graduates are able to find employment in their related coherent sequence of courses or certification and to better determine the longer-term outcomes of CTE.

- Based on the results of this study, the CTE Department and schools should build on relevant instructional strategies and support services that address the adverse performance of at-risk CTE students.

- STAAR EOC exams may be designed to get a valid measure of students' CTE performance. It may be necessary to identify more appropriate ways to measure students' CTE performance that are compatible with the nature of program.

- Given the impact that CTE workload can have on the acquisition of academic skills and the CTE students' performance on the 2018 STAAR EOC exams relative to their peers, the CTE Department should review CTE enrollment to ensure that there are no adverse effects between students' CTE workload and the acquisition of academic skills required to meet standards on STAAR or in preparation for postsecondary education.

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Appendix A: CTE Pathways

Table A1. CTE Pathways, Career Opportunities, Certification and Licensures Available to HISD Students, 2017–2018			
CTE Pathways	**High School Where Offered**	**Fast-Growing Career Opportunities**	**Certifications and Licensures**
Agriculture, food and natural resources	Austin Bellaire Booker T. Washington Chavez Harper Alternative School Lamar Madison North Forest Worthing	Veterinary Technicians Agricultural Inspectors Forest and Conservation Workers	Certified Veterinary Assistant (CVA Level 1) Texas Floral Design- Level 1 Certification
Architecture and Construction	Barbara Jordan Booker T. Washington Furr Houston MTSC Jones Futures Jordan Lamar Milby Scarborough Waltrip Wisdom	Construction management Civil Engineers Heating and Cooling Technicians	NCCER - Construction Technology NCCER – HVAC NCCER- Plumbing AutoCAD - Certified Associate Certified SOLIDWORKS Associate (CSWA)
Arts, A/V Technology & Communication	Chavez Furr Heights Jordan Kashmere Lamar Milby Northside Sharpstown Waltrip Westside Yates	Audio/Visual Technicians Multimedia Artist and Animators Technical Writers	Adobe Certified Associate (ACA) Video communication Adobe Certified Associate (ACA)- Visual Communication Apple Final Cut Pro
Business Management & Administration	Austin Bellaire Heights Houston Academy of International Studies Lamar Liberty North Houston Early College Sterling Westside Wisdom	Human Resource Specialist Sales Agents and Managers Market Research Analyst	Microsoft Officer Certified Master A*S*K Business Fundamental NOCTI-Business Sales Force
Education and Training Services	Austin	Teacher Coaches and Recreation Instructors Social Workers	Early Childhood Education Assessment and Certification Pre-professional Certification in Education Fundamental

Table A1. CTE Pathways, Career Opportunities, Certification and Licensures Available to HISD Students, 2017–2018 (continued)			
CTE Pathways	**High School Where Offered**	**Fast-Growing Career Opportunities**	**Certifications and Licensures**
Finance	Bellaire Heights High School for Law and Justice Lamar Liberty Sharpstown Westbury Westside	Accountants and Financial Analyst Loan Clerks and Bank Officers Financial Advisors	QuickBooks Certified Use A*S*K Finance
Government and Public Administration	High School for Law and Justice	Foreign Service Officer Political Science Teacher Paralegal	
Health Science	Chavez DeBakey Jones Futures Heights Long Futures Madison Milby Sharpstown Waltrip Westbury Westside	Dental Assistant Biomedical Technician Registered Nurse	Certified Clinical Medical Assistant (CCMA) Phlebotomy Technician Certification (CPT) Certified patient Care Technician/Assistant (CPCT/A) Pharmacy Technician Trainee Nursing Assisting Assessment (CNA) National Entry Level Dental Assistant (NELDA)
Hospitality and Tourism	Harper Alternative Jordan Lamar Milby Northside Westside Wheatley Worthing	Hotel manager Chef and Head Cook Food and Beverage Service Worker	ServSafe Food Handlers
Human Services	Jordan Houston MTSC Milby	Massage Therapist Spa Manager	Texas Cosmetology Operator License
Information Technology	Austin Bellaire Booker T Washington Eastwood Academy Heights High School for Law and Justice High School for the Performing and Visual Arts Houston MTSC Lamar Madison Mickey Leland Milby North Forest Northside Scarborough Sharpstown South Early Waltrip Westbury Westside Wisdom Wheatley Worthing	Computer Programmers Computer Engineers Database Administrators	BISCI- Cabling Installation CompTIA – Strata, A+, Network+ Security+ Adobe Certified Associate–Web Authoring, Interactive Media CIW–Web Design Specialist, Web Security Associate, Internet Business Associate STARS Certification SPACE Certification ESRI technical Certification– Desktop MOS Word< Excel, PowerPoint, Access

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Table A1. CTE Pathways, Career Opportunities, Certification and Licensures Available to HISD Students, 2017–2018 (continued)			
CTE Pathways	**High School Where Offered**	**Fast-Growing Career Opportunities**	**Certifications and Licensures**
Law, Public Safety, Corrections and Security	Chavez High School for Law and Justice North Forest Sterling Waltrip Westbury Wisdom	Emergency Medical Technician Police Officer Paralegal	Texas Commission on Fire Prevention Certificate State Emergency Medication (EMT) Certification
Manufacturing	Houston MTSC Jordan Madison Milby Wisdom	Welder Machinist Technician	Autodesk Certified User Certified SOLIDWORKS Associate (CSWA) NCCER–Welding AWS Certification
Marketing Sales and Service	Bellaire Jordan Heights Scarborough Westbury	Sales Agents and Managers Merchandisers Retail Salespeople	A*S*K–Marketing Fundamentals A*S*K Entrepreneurship National Retail Federation Customer Service and Sales
S.T.E.M.	Austin Chavez Booker T. Washington Eastwood Academy Energy Institute Furr Heights Houston MTSC Kashmere Lamar Madison Mickey Leland Milby Reagan South East Early College Waltrip Westbury Westside Young Women's College Prep Academy	Geological Technician Geoscientist Engineer	Certified Clinical Medical Assistant (CCMA) Autodesk Certified User Certified SOLIDWORKS Associate (CSWA)
Transportation, Distribution & Logistics	Austin Heights Houston MTSC Jordan Madison North Forest Sterling Waltrip Westbury Wheatley Yates	Merchant Mariner Auto/Diesel Technician Airline Pilot	ASE-Brakes, Electronic/Electrical Systems, Heating and A/C, Engine Repair CLA CLT GLA

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Appendix B: CTE Codes

Table B1. Description of Career and Technical Education Codes, Texas Education Data Standards, 2017–2018				
Code Table ID	Name	XML Name	Date Issued	Date Updated
C142	CAREER-AND-TECHNICAL-ED-INFO-CD	TX-CareerAnd TechnologyEdType	3/3/1993	3/1/2016
Code	Translation			
	When assigning the Career and Technical Indicator Code, include enrollment in all Career and Technical Education (CTE) courses, regardless of course funding weight			
0	Not Enrolled in a CTE Course			
1	Enrolled in A CTE Course A student in grades 6-8 who is taking a CTE course as of the fall snapshot date or completed a CTE course by the end of the school year. A student in grades 9-12 who is taking a CTE course as of the fall snapshot date or completed a CTE course by the end of the school year, and the student's 4-year plan of study does not outline a coherent sequence of courses in CTE			
	The following code is for students who on the fall snapshot date: (a) have a 4-year plan to take a coherent sequence (2 or more CTE courses for 3 or more credits) of courses in CTE, and (b) are enrolled in or have completed a semester of CTE course(s), which are part of their CTE coherent sequence of courses. If a student's 4-year plan changes, then the student could go from a code 2 to a 0 or 1 in a subsequent school year			
2	Participant in A Coherent Sequence of Courses A student in grades 9-12 who is enrolled in a sequential course of study, which develops occupational knowledge, skills, and competencies relating to a CTE program of study. The student must have a 4-year plan of study to take 2 or more CTE courses for 3 or more credits			

Source. 2017–2018 Texas Education Data Standards, Section 4 Description of Codes, p. 4.118

Appendix C: STAAR Performance

Table C1. Number of STAAR Students Tested by EOC Subject and Evaluation Groups, HISD, Spring 2017 and 2018						
Subject	**Non-CTE**		**CTE Non-Sequenced Courses**		**CTE Sequenced Courses**	
	2017	**2018**	**2017**	**2018**	**2017**	**2018**
Algebra I	5,310	4,882	2,932	2,858	4,687	5,837
Biology	3,845	3,295	2,838	2,735	5,866	7,460
English I	4,120	3,161	2,881	2,687	6,006	7,384
English II	2,824	2,921	2,701	2,588	6,888	7,444
U.S. History	2,766	2,471	2,451	1,862	6,004	7,069

Source: HISD Student 2017–2018 PEIMS; STAAR EOC Spring Test Files, 2016–2017.
Note: Data are based on first-time testers. The data exclude STAAR Alternative 2.

Table C2. Percentage of HISD Non-CTE and CTE Coherent-Sequenced Students Who Met Approaches Grade Level Standard on the 2018 STAAR EOC Exams, Disaggregated by Demographic and Educational Attributes

Demographic and Educational Attribute		NON-CTE					CTE-Coherent Sequenced				
		Algebra I	Biology	English I	English II	U.S. History	Algebra I	Biology	English I	English II	U.S. History
Female		76.8	75.8	54.8	54.3	81.9	59.4	68.5	44.3	47.7	85.4
Male		67.2	64.6	35.6	40.3	77.6	46.7	57.0	30.3	35.7	82.4
Economically Disadvantaged	No	80.0	80.8	63.7	64.3	85.6	53.7	72.5	48.7	50.8	88.1
	Yes	68.8	65.2	38.0	40.7	77.0	51.8	60.3	34.2	38.9	83.8
At-Risk	No	79.4	78.0	54.6	57.1	86.2	60.5	70.3	47.7	52.7	89.2
	Yes	46.2	50.1	25.5	28.2	64.5	35.3	40.8	17.4	22.3	72.5
Special Education	No	75.7	73.9	40.1	50.3	82.3	57.0	67.1	40.9	44.8	86.3
	Yes	29.8	38.4	12.4	14.9	40.1	24.0	27.3	9.2	8.9	48.8
Gifted and Talented	No	62.4	64.8	38.2	40.0	74.6	50.1	58.0	31.5	35.8	80.9
	Yes	99.1	99.2	97.6	98.1	100	96.1	98.6	94.5	94.1	99.8
Ethnicity	African American	62.5	66.1	35.5	39.0	75.7	49.3	65.9	33.9	39.3	82.2
	Asian	96.2	92.0	83.7	76.8	92.7	70.3	76.0	68.5	61.8	90.1
	Hispanic	69.8	64.0	38.4	40.0	75.4	51.8	60.1	34.5	38.7	83.1
	White	81.5	89.7	77.0	79.7	94.5	72.7	80.1	69.1	74.0	95.2

Note: The shaded green highlights subgroups where 50 percent or more students performed at or above the Approaches Grade Level standard.

Appendix D: CTE Certifications

Industry Certification

An industry certification is a credential that validates the ability to perform certain basic tasks essential to a specific industry. These certifications are usually created by a specific company such as ACA (Adobe Certified Associate).

License

A license is a Texas government issued certificate which indicates completion of a training program with a minimum number of hours and successful acquisition of basic skills essential for specific trades or professions. Examples would be a state issued Cosmetology license or a Licensed Pharmacy Technician Trainee.

Occupational Competency Assessment

An occupational competency assessment is a technical skills assessment created by groups such as the A*S*K Business Institute, which contends that the student has mastered job-ready technical knowledge. Examples include the A*S*K Business Fundamentals test (basic skills in Human Resources) and NCCER Welding.

Note: *Other Houston ISD approved program specific certifications, which are administered early for safety reasons or are needed to advance to end of program certifications, are also available such as: ServSafe; NCCER-Core; CPR- infant and adult; OSHA; MOS and so on.*

Table D1. HISD CTE Certification Results Distributed by School, 2017–2018

Campus	Failed	Passed	Total	Passed
	n	n	n	%
Eastwood Academy Charter High School	0	483	483	100
High School for Law and Justice	0	95	95	100
Houston Academy for International Studies	0	5	5	100
Lamar High School	0	7	7	100
North Houston Early College HS	0	33	33	100
Northside High School	0	17	17	100
Pershing Middle School	0	30	30	100
Sharpstown High School	0	10	10	100
Worthing High School	0	38	38	100
Sterling High School	5	769	774	99.4
Sam Houston CMST	8	1,044	1,052	99.2
Michael E. DeBakey HS for Health Profess.	7	642	649	98.9
Waltrip High School	4	214	218	98.2
Westbury High School	18	581	599	97.0
Heights High School	6	121	127	95.3
Chavez High School	3	48	51	94.1
East Early College High School	9	136	145	93.8
Margaret Long Wisdom High School	31	375	406	92.4
Milby High School	43	253	296	85.5
Stephen F. Austin High School	64	172	236	72.9
Barbara Jordan High School for Careers	14	32	46	69.6
Scarborough High School	79	165	244	67.6
Madison High School	113	223	336	66.4
Westside High School	28	47	75	62.7
Challenge Early College High School	38	53	91	58.2
South Early College HS	5	6	11	54.5
Wheatley High School	46	42	88	47.7
Beechnut Academy	*	*	1	*
Bellaire High School	*	*	1	*
Billy R Reagan K-8 Educational Center	*	*	1	*
Furr High School	*	*	1	*
Harris County JJAEP	*	*	1	*
Young Women's College Prep Academy	*	*	1	*
Secondary DAEP	*	*	2	*
Overall	**522**	**5,648**	**6,170**	**91.5**

Source: HISD Chancery Ad hoc Data Warehouse, downloaded using IBM Cognos on 5/28/2018
Note: * Denotes less than five students

Appendix E: Graduation Diplomas

CTE Code 2	Type of Diploma	PEIMS Code	2016		2017	
			N	%	N	%
	Completion of individualized Education Plan[1]	04, 05, 06, 07	80	.02	71	1.1
	Regular/Minimum[1]	18, 19, 20, 21, 24, 27, 30	281	8.5	541	8.2
	Recommended	22, 25, 28, 31	2,504	76.1	5,021	76.4
	Distinguished Achievement	23, 26, 29, 32,	247	7.5	451	6.9
	Foundation High School Program	34, 35, 54, 55, 56, 57	180	5.5	488	7.4
HISD	Completion of individualized Education Plan	04, 05, 06, 07	322	3.1	210	2.0
	Regular/Minimum	18, 19, 20, 21, 24, 27, 30	1,272	10.5	1,169	11.0
	Recommended	22, 25, 28, 31	7,310	71.5	7,497	70.6
	Distinguished Achievement	23, 26, 29, 32,	809	7.9	758	7.1
	Foundation High School Program	34, 35, 54, 55, 56, 57	512	5.0	979	9.2

Table E1. Percent of CTE Graduates by Diploma Type, Spring, 2016 and 2017

Source: District and School Profiles, 2015–2016 and 2016–2017; HISD 2016–2017 Graduate File (Access); PEIMS 2015–2016 and 2016–20167(Access).

Note: [1]Applies only to students receiving special education services. These students graduated in a minimum high school program under TAC Chapter 74 with curriculum content modifications through the student's individualized education program (IEP).

No statutory exclusions for state accountability were applied.

Appendix F: Multiple Regression

Subject	Predictors	Unstandardized Coefficients[a]	Standardized Coefficients	95.0% Confidence Interval for B	
		B	Beta	Lower Bound	Upper Bound
Algebra I	Constant	3958.8**		3928.8	3988.7
	English language Learner	31.8	.001	-818.1	881.8
	Economically Disadvantaged	-71.9**	-.054	-103.5	-40.3
	At-Risk	-180.7**	-.158	-207.9	-153.4
	Special Education	-300.8**	-.183	-339.6	-262.0
	Gifted and Talented	513.5**	.279	469.9	557.1
	R^2		.17		
	F		241.1**		
	n = 5,831; Approached Grade Level = 3550–3951; Meets = 4000–4267; Masters = 4333–6123				
Biology I	Constant	4156.9**		4129.6	4184.2
	English language Learner	-38.1	-.001	-678.0	601.7
	Economically Disadvantaged	-231.8**	-.156	-260.1	-203.5
	At-Risk	-205.0**	-.141	-232.9	-177.0
	Special Education	-314.8**	-.146	-355.6	-274.0
	Gifted and Talented	673.5**	.429	643.1	703.8
	R^2		.33		
	F		721.0**		
	n = 7,459; Approached Grade Level = 3500–3958; Meets = 4000–4495; Masters = 4576–6201				
English I	Constant	4010.6**		3983.8	4037.5
	English language Learner	286.3	.006	-602.8	1175.4
	Economically Disadvantaged	-184.4**	-.127	-212.1	-156.6
	At-Risk	-249.6**	-.173	-277.2	-222.0
	Special Education	-388.9**	-.182	-429.1	-348.8
	Gifted and Talented	627.9**	.419	598.8	656.9
	R^2		.34		
	F		759.9*8		
	n = 7,378; Approached Grade Level = 3750–3976; Meets = 4000–4644; Masters = 4691–6357				
English II	Constant	4024.7**		3999.2	4050.3
	Economically Disadvantaged	-157.1**	-.113	-183.5	-130.7
	At-Risk	-212.3**	-.168	-236.9	-187.7
	Special Education	-407.0**	-.191	-447.7	-366.3
	Gifted and Talented	624.9**	.413	595.6	654.2
	R^2		.34		
	F		939.1**		
	n = 7,439; Approached Grade Level = 3775–3946; Meets = 4000–4698; Masters = 7831–6382				
U.S. History	Constant	4301.7**		4276.1	4327.3
	English language Learner	-939.4**	-.029	-1589.7	-289.2
	Economically Disadvantaged	-136.9**	-.106	-163.3	-110.4
	At-Risk	-260.9**	-.220	-286.1	-235.7
	Special Education	-327.3**	-.139	-376.0	-278.6
	Gifted and Talented	466.9**	.323	436.6	497.2
	R^2		.26		
	F		939.1		
	n = 7,063; Approached Grade Level = 3500–3978; Meets = 4000–4386; Masters = 4440–6467				

Table F1. Selected Predictors of HISD CTE – Coherent-Sequenced Course Students' Performance on the 2018 STAAR EOC Exams Results

a. Dependent Variable: Scale Score **p<.001;