**MEMORANDUM**                                                    December 13, 2018

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

FROM:        Carla Stevens
             Assistant Superintendent, Research and Accountability

SUBJECT:     **DUAL-CREDIT REPORT: STUDENT ENROLLMENT, PERFORMANCE, AND
             PROGRAM EFFECTS, 2017–2018**

As mandated by law, (Section 28.009, Texas Education Code, (TEC)), the Houston
Independent School District (HISD) has offered dual-credit programs commencing in the 2013–
2014 school year.  Dual-credit programs provide the opportunity for high-school students to
obtain college credits, or industry-recognized credentials, or certificates, or associate degrees
while pursuing a high-school diploma. There is no limit to the number of credits students can
pursue during a semester.

The purpose of this evaluation was to identify the number and demographic and education
attributes of HISD dual-credit students during the 2017–2018 school year. The study also
evaluated the performance of a sample of dually-enrolled students relative to their non-dual-
credit peers, the program effects, and the key variables that predicted students' performance
based on the State of Texas Assessments of Academic Readiness (STAAR) End-of-Course
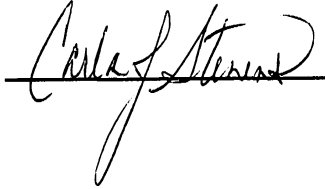(EOC) exam results.

Key findings include:
- A higher percentage of gifted and talented (G/T) students (30.4%) enrolled in dual-credit
  courses compared to their non-dual-credit peers (12.7%) comprised the study sample. The
  dual-credit sample also consisted of 81.3 percent economically disadvantaged, 57.5 percent
  female, and 71.2 percent Hispanic students, which were higher percentages compared to
  their non-dual-credit peers in the sample.

- A higher percentage of dual-credit students (84.4–98.8%) performed at or above the
  Approaches Grade Level standard, compared to their non-dual-credit peers (50.8–86.2%),
  on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams.

- A higher proportion of dual-credit students (10.6–56.1%) performed at the Masters Grade
  Level standard, compared to their non-dual-credit peers (6.0–33.4%), on the 2018 STAAR
  Algebra I, Biology, English I, English II, and U.S. History EOC exams.

- Enrollment in HISD dual-credit programs resulted in statistically-significant increases in
  students' mean scale scores (109.5–225.2 scale score points) on the 2018 STAAR Algebra
  I, Biology, English I, English II, and U.S. History EOC exams.

- G/T was the only statistically-significant positive predictor of dual-credit students'
  performance on the five 2018 STAAR EOC exams. Being designated as at-risk was a

statistically-significant negative predictor of performance on the five 2018 STAAR EOC exams.

- Special education was a negative predictor of performance on the 2018 STAAR Biology, English I, and English II EOC exams for dual-credit students.

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

CJS

Attachment

cc: Noelia Longoria
    Rick Cruz

HOUSTON INDEPENDENT SCHOOL DISTRICT

RESEARCH

Educational Program Report

DUAL-CREDIT REPORT: STUDENT ENROLLMENT, PERFORMANCE, AND PROGRAM EFFECTS, 2017-2018

HISD | Research and Accountability

ANALYZING DATA, MEASURING PERFORMANCE.

# Dual-Credit Report: Student Enrollment, Performance, and Program Effects, 2017–2018

## Executive Summary

Beginning with the 2013–2014 school year, the Houston Independent School District (HISD) has offered dual-credit programs, by law (Section 28.009, Texas Education Code, (TEC)), through which high-school students can obtain college credits or industry-recognized credentials, or certificates, or an associate degree while pursuing a high school diploma. Dual credits can be earned through various instructional arrangements including international baccalaureate, advanced placement or dual credit courses, articulated postsecondary courses for local credits, articulated postsecondary advanced technical credit courses for state credit, or any combination of the courses described (Texas Education Code, 1995).

The HISD dual credit program is offered in collaboration with the Houston Community College (HCC) through articulated agreements. HCC is responsible for the selection of course instructors who may be college instructors or high-school teachers who meet eligibility requirements. Students can earn at least 12 semester hours of college credits while in high school as there are no limits to the number of credits students can pursue (HISD, 2017a).

The purpose of this evaluation was to identify the number and demographic and educational attributes of HISD students enrolled in dual-credit courses during the 2017–2018 school year and to evaluate the performance of a representative sample of these students on state tests relative to their peers who were not enrolled in dual-credit courses. The evaluation also determined the effect of dual-credit enrollment on students' state test results and identified the demographic and educational predictors of dual-credit students' performance on the 2018 State of Texas Assessments of Academic Readiness (STAAR) Algebra I, Biology, English I, English II, and U.S. History End-of-Course (EOC) exams.

### Highlights

- A higher percentage of gifted and talented (G/T) students (30.4%) enrolled in dual-credit courses compared to their non-dual-credit peers (12.7%) comprised the study sample. The dual-credit sample also consisted of 81.3 percent economically disadvantaged, 57.5 percent female, and 71.2 percent Hispanic students, which were higher percentages compared to their non-dual-credit peers in the sample.

- A higher percentage of dual-credit students (84.4–98.8%) performed at or above the Approaches Grade Level standard, compared to their non-dual-credit peers (50.8–86.2%), on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams.

- A higher proportion of dual-credit students (10.6–56.1%) performed at the Masters Grade Level standard, compared to their non-dual-credit peers (6.0–33.4%), on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams.

- Enrollment in HISD dual-credit programs resulted in statistically-significant increases in students' mean scale scores (109.5–225.2 scale score points) on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams.

- G/T was the only statistically-significant positive predicator of dual-credit students' performance on the five 2018 STAAR EOC exams. Being designated as at risk was a statistically significant negative predictor of performance on the five 2018 STAAR EOC exams for dual-credit students.

- Special education was a negative predictor of performance on the 2018 STAAR Biology, English I, and English II EOC exams. Being limited English Proficient (LEP) was a negative predictor of performance on the 2018 STAAR English I, English II, and U.S. History EOC exams.

## Recommendations

- Given the positive gains for students enrolled in HISD dual-credit programs, the district should continue to promote dual-credit enrollment as a viable option for the attainment of college credits, industry-recognized credentials, or certificates, or associate degrees, and to the prepare them for the rigorous academic experiences of college.

- Because of the negative effect of special education and at-risk designations on the performance of dual-credit students, targeted interventions for these population sub-groups, or support may be required to improve their performance on the STAAR EOC exams.

# Introduction

The Houston Independent School District's (HISD) dual-credit program provides opportunities for all high-school students, regardless of grade level, to earn college credits, industry-recognized credentials or certificates, or associate degrees while working toward a high school diploma. Legislatively, that are no limits to the number of dual-credit courses or hours for which high school students may enroll (HISD, 2017a). To be eligible for enrollment in core academic courses offering dual credit, students must demonstrate college readiness on the Texas Success Initiative (TSI) assessments in reading, writing, and mathematics. Students are not required to demonstrate TSI readiness for career and technical education (CTE) dual-credit courses that are part of an Entry Level or Level 1 postsecondary certificate (HISD, 2017a).

Under Texas Law, EDUC § 28.009, College Credit Program, college credits can be earned through (1) international baccalaureate, advanced placement or dual-credit courses, (2) articulated postsecondary courses provided for local credit or articulated postsecondary technical credit courses provided for state credit, or (3) a combination of (1) and (2) (Texas Education Code, 1995). Students may obtain college credits through apprenticeship programs that (1) satisfy the requirements necessary to obtain an industry-recognized credential, or certificate, or an associate degree (Texas Education Code, 1995). Dual-credit courses are offered in the core curriculum of partner colleges, a CTE course, or a foreign-language course (Texas Education Code, 1995). Dual-credit courses can be either academic or career and technical education-based.

Colleges work with high schools to deliver dual-credit courses. School district and colleges enter into documented agreements and must satisfy all Texas Administrative Code (TAC) requirements before offering dual-credit courses. The partner colleges approve and select highly-qualified instructors to deliver the dual-credit courses (HISD, 2017a). These highly-qualified instructors may be high-school or embedded teachers who met the necessary criteria to deliver the dual-credit course or they may be college instructors. Students who receive a grade of 70 or better will be awarded high-school credit, which supersedes the college passing grade.

The purpose of this evaluation was to determine the number and characteristics of students who were enrolled in HISD dual-credit programs during the 2017–2018 school year and analyze the performance of dual-credit students on the 2018 State of Texas Assessments of Academic Readiness (STAAR) End-of-Course (EOC) exams relative to their peers who were not enrolled in dual-credit courses. The evaluation also determined the effects of dual credit on students' STAAR EOC performance.

# Literature Review

Research on dual credit has focused heavily on its impacts on college enrollment (An, 2013); school and college outcomes (Radunzel, Noble, & Wheeler, 2014; Rodriguez, Hughes, & Belfield, 2012; Speroni, 2011a; Speroni, 2011b; Ganzert, 2012), student success and graduation rates (Karp, Calcagno, Hughes, Jeong, & Bailey, 2008), and the workforce (Hoffman, Vargas, & Santos, 2009). A total of 36,000 incoming freshmen from four Texas Act Success Research Consortium colleges who graduated from high school in 2005 and 2006 were compared in 2011 to determine their short-term and long-term college outcomes (Radunzel, Noble, & Wheeler, 2014). Using student course grades, Radunzel, et al. (2014) found that students entering college with dual credits are generally more successful in college, including completing a bachelor's degree in a timelier manner, and that they were more likely to get a B+ or higher in subsequent courses taken in college. Students with 12 or more credits were more likely than their non-dual-credit peers to complete college (Radunzel, et al., 2014).

In a quasi-experimental study using propensity score matching, least squares, and probit regression models, and controlling for background characteristics, test scores were used to determine the association between high school and college outcomes of students who took one or more coherent courses in 2008–2009 and 2009–2010 (Rodriguez, Hughes, & Belfield, 2012).  Dual-credit enrollees had higher high school graduation rates, a higher rate of persistence, and accrued more college credits (1.2 and 1.3 credits more for 2009 and 2010, respectively) than their district's non-participating peers. After two years in college, the class of 2009 had 20 percent more credit than their district peers (Rodriguez, Hughes, & Belfield, 2012).

Both Advanced Placement (AP) and dual enrollment (DE) are strongly associated with positive outcomes but enrollment outcomes are not the same for both programs (Speroni, 2011a). DE students were more likely than AP students to attend college after high school but were less likely to first enroll in a four-year college (Speroni, 2011a). Speroni (2011a) used two cohorts of high school students in Florida, while controlling for school and students' characteristics to determine the predictive effects of AP and DE using regression with covariates, school fixed effects, and course location on college access and success (Speroni, 2011a). Speroni (2011b) also used regression discontinuity to gauge the causal effect of DE on student outcomes based on the 2000–2001 and 2001–2002 cohorts of Floridian high school students traced to 2007. While the results showed no evidence that taking a DE course improved students' marginal graduation rate, college enrollment, or college degree attainment, marginal students taking Algebra through a DE program significantly increased students' likelihood of enrolling in college by 16 percent and for obtaining a degree by 23 percent (Speroni, 2011b).

The quality of dual credits students attained during high school did not predict their likelihood of enrolling at a credit-granting college in Wisconsin one semester after high-school graduation (Damrow, 2017). Damrow's (2017) study followed 257 of 1,498 dual-enrollment students and their transcripts one semester after they transitioned to a credit-granting technical college in Wisconsin. Students were asked in a survey to rank cost, financial assistance, academic reputation, and future career opportunities in their college-enrollment considerations. When compared to past surveys, only future career opportunities were ranked as high as it did in past surveys (Damrow, 2017). The study focused, however, on one college in one state and may not be externally valid beyond this college and the state.

A positive correlation was found between grades students earned in an online dual-credit program and grades earned in subsequent coursework (Childs, 2017).  A positive correlation was also found between online dual credit and ACT achievement. This South Dakota study used quantitative ex-post facto data to identify the relationship (Childs, 2017).

The U.S. Department of Education What Works Clearinghouse (WWC), (2017) conducted a review of 62 dual-credit research studies to determine the effectiveness of dual-credit programs on nine outcome domains[1]. Five studies involving 77,249 high schools in the U.S. met the WWC transition to college topic and the group design standards. Two groups met design standards and three met similar standards but with reservations. Dual-enrollment programs had medium to large positive effects on students' degree attainment (college) (+6 to +42)[2], college access and enrollment (+12 to +19), credit accumulation (+13 to +16), completing high school (+5 to +9), and general academic achievement (high school) (+3 to +13). (WWC, 2017). Staying in high school, college readiness, and attendance (high school) domains had positive but small effects.

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[1] WWC dual-credit outcome domains: degree attainment (college), college access and enrollment, credit accumulation, completing high school, general academic achievement (high school), staying in high school, college readiness, attendance (high school), and academic achievement (college).

[2] Figures in parenthesis are the Improvement Index range in percentile points.

Dual credit or dual enrollment programs appear to have positive effects on key school completion, graduation, and postsecondary measures, however, student and school factors result in differential program effects. An HISD evaluation of its dual-credit program showed that being gifted and talented (G/T) (21% to 37%) or at-risk (24 % to 33%) explained a substantial portion of student's performance on the State of Texas Assessments of Academics Readiness (STAAR) Algebra I, Biology, English I and II, and U.S. History End-of-Course (EOC) exams (HISD, 2017b). Students self-selected into the program with a higher proportion of G/T students (26%) compared to their proportion in the district. Limited English proficiency (LEP) students were less likely to enroll into the dual credit program (HISD, 2017b). The results also showed a substantially significant effect of the dual-credit program on Algebra I, English I, English II, and U.S. History ($p < .05$) (HISD, 2017b). This evaluation will analyze enrollment, performance, and the effect of dual-credit enrollment in HISD for the 2017–2018 school year. The evaluation will focus on the following questions:

1. What was the academic and demographic composition of dual-credit students in the study sample?

2. How did a sample of HISD students enrolled in dual-credit courses perform on the 2018 STAAR EOC exams relative to their peers who were not enrolled in dual-credit courses?

3. What factors predicted the performance of HISD dual-credit students on the 2018 STAAR EOC exams?

4. What were the effects of the dual-credit program on the 2018 STAAR EOC performance of student enrollees?

## Method

This is a comparative evaluation of HISD ninth- through twelfth-grade students who were either enrolled or not enrolled in dual-credit courses during the 2017–2018 school year. Public Education Information Management Systems (PEIMS) data from IBM Cognos show that 4,588 students were enrolled in the dual-credit program for the 2017–2018 academic year. Ninth to twelfth-grade students with Algebra I, Biology, English I, and II, and U.S. History scores on the 2018 STAAR EOC exams constituted the sample. Students in the sample were first-time testers or retesters who took the STAAR regular paper or online test formats and had ADA eligibility codes other than zero. When the PEIMS and STAAR EOC data sets were linked, a total of 74,202 students made up the evaluation sample. Of these, 2,042 (44.5% of all dual-credit students) and 72,160 (97.2% of non-dual-credit students) constituted the sample.

Students' demographic, educational, and STAAR EOC data were downloaded using IBM's Cognos, a data querying platform linked to HISD Chancery Ad Hoc data warehouse. Cognos has the unique feature of being able to seamlessly merge data from the Public Education Information Management System (PEIMS) and STAAR data files using unique qualifiers. PEIMS data are snapshots taken in fall 2017 and STAAR was administered in May and June 2018. Both data sets were uploaded into the warehouse. Students' STAAR scale scores and the percentage who met or exceeded grade level standards on Algebra I, Biology, English I, English II, and U.S. History EOC exams were included in the evaluation data as outcomes.

Descriptive analyses of the demographic and educational composition of students in the evaluation were conducted. The percentage of students who met grade level standards for each of the STAAR EOCs in the evaluation was also provided. The evaluation also included predictive analyses of students' performance using regression analysis, unstandardized coefficients, and standardized coefficient (Beta) for comparison.

Stata is a quantitative data statistical analyses software. Stata's treatment effect with regression adjustment (teffects ra) command was used to determine the effect of dual-credit program on the EOC exam performance of students who were enrolled in the program or the average treatment effect on the treated (ATET). The command used a robust standard error regressed on the outcome variable (scale scores) and students' gifted and talented (G/T) identification, gender, at-risk status, special education designation, limited English proficiency (LEP), and economic status by EOC exam to determine how dual credit students would perform if they were not dually-enrolled (Potential Outcome Mean (POM)) and how these same students performed because of being dually-enrolled. The mean difference constitutes the effect of the dual-credit program.

Data findings are presented using tables and figures. The data met normality, linearity, and homoscedasticity conditions as determined by normal probability plots (Normal Q-Q plots), Detrended Normal Q-Q plots, and Kolmogorov-Smirnov statistic disaggregated by STAAR EOC subject and the dual-credit indicator.

## Limitations

- Students self-selected in the dual-credit program, therefore a quasi-experimental study based on the observational data was used to determine the effect of the program on students' 2018 STAAR EOC performance. Further, the average treatment effect on the treated (ATET) was used to further control for the selection bias.

- This study could not confirm whether the dual-credit program was implemented with fidelity nor could it determine the effect of fidelity on student's EOC performance.

- STAAR EOC exam results were used as proxy measures of student outcomes but they were not specifically designed for assessing performance on dual-credit courses.

- There is a one-year lag in college-enrollment data reporting. This limits the extent to which analyses on the impact of HISD dual-credit programs on college enrollment of students in this study cohort.

## Results

### What was the academic and demographic composition of dually-credit students in the study sample?

Overall, 4,588 students were enrolled in the dual-credit program. Of these 2,042 had STAAR scores. Of these, 107 took Algebra I, 225 took Biology, 272 took English I, 540 did English II, and 898 took U.S. History.

**Figure 1** shows the academic and demographic composition of students in the study sample who were enrolled in dual and non-dual credit courses during the 2017–2018 school year in HISD. Districtwide data was included for representation purposes. **Table 1**, **Appendix A** (p. 13) shows the composition by STAAR EOC subject for all students in the sample and disaggregated by subgroups.

**Figure 1. Comparative Academic and Demographic Composition of Dual-Credit Students in the Study Sample, 2017–2018**

| | Gender | | G/T | At Risk | Special Ed. | LEP | Econ. Disadv. | Ethnicity | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Female | Male | | | | | | Asian | Black | Hispanic | White |
| Non-Dual Credit | 47.9 | 52.1 | 12.7 | 68.0 | 9.7 | 22.0 | 72.3 | 3.3 | 24.7 | 62.9 | 8.0 |
| Dual Credit | 57.5 | 42.5 | 30.4 | 35.1 | 2.6 | 4.8 | 81.3 | 3.4 | 21.4 | 71.2 | 3.3 |
| HISD | 50.7 | 49.3 | 15.7 | 71.6 | 7.2 | 31.5 | 74.9 | 4.1 | 24.0 | 61.8 | 8.7 |
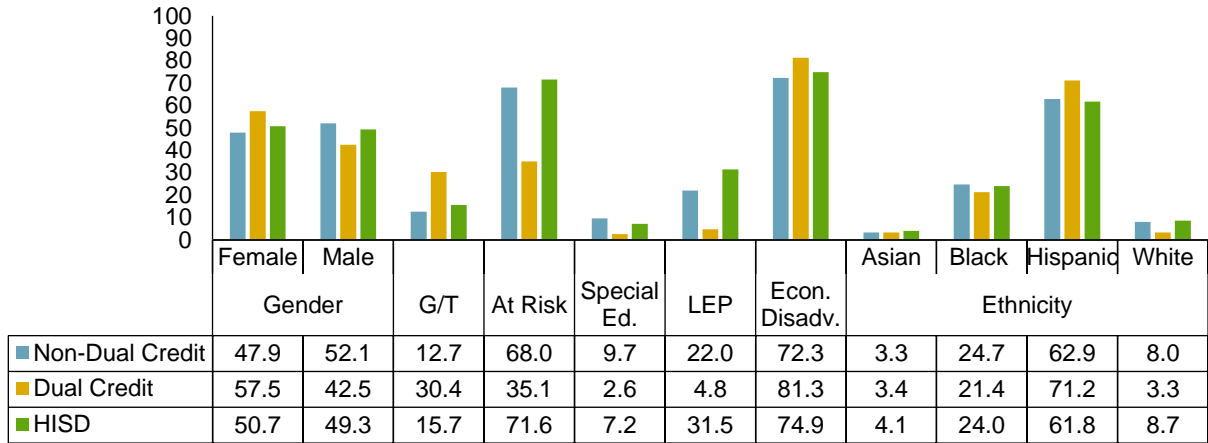
Source: HISD Chancery Ad Hoc, retrieved using IBM Cognos (dual and non-dual credit data)
TSDS PEIMS Disaggregation of PEIMS Students Data LEA-Level Data – PDM1-120-009, V18 1.1, 01/20/2018 (HISD data only).

- A higher proportion of Asian, female, economically-disadvantaged, and Hispanic dual-credit students compared to their non-dual-credit counterparts comprised the study sample.

- A substantially lower proportion of at-risk (35.1%), special education (2.6%), LEP (4.8%), and White (3.3%) dual-credit students compared to their non-dual-credit peers comprised the sample.

- More female (57.5%) than male (42.5%) students in the study sample were dually-enrolled.

**How did HISD students enrolled in dual-credit courses perform on the 2018 STAAR EOC exams relative to their peers who were not enrolled in dual-credit courses?**

**Figure 2** and **Figure 3** show the comparative performance of non-dual-credit and dual-credit students on the 2018 STAAR EOC exams.

**Figure 2. Comparative Percentage of Non-Dual Credit and Dual-Credit Students in the Sample Who Performed at or Above the Approaches Grade Level Standard on the 2018 STAAR EOC by Subject**

| | Algebra 1 | Biology | English I | English II | U.S. Hisotry |
|---|---|---|---|---|---|
| Non-Dual Credit | 65.8 | 75.3 | 50.8 | 52.6 | 86.2 |
| Dual Credit | 93.5 | 96.4 | 85.7 | 84.4 | 98.8 |
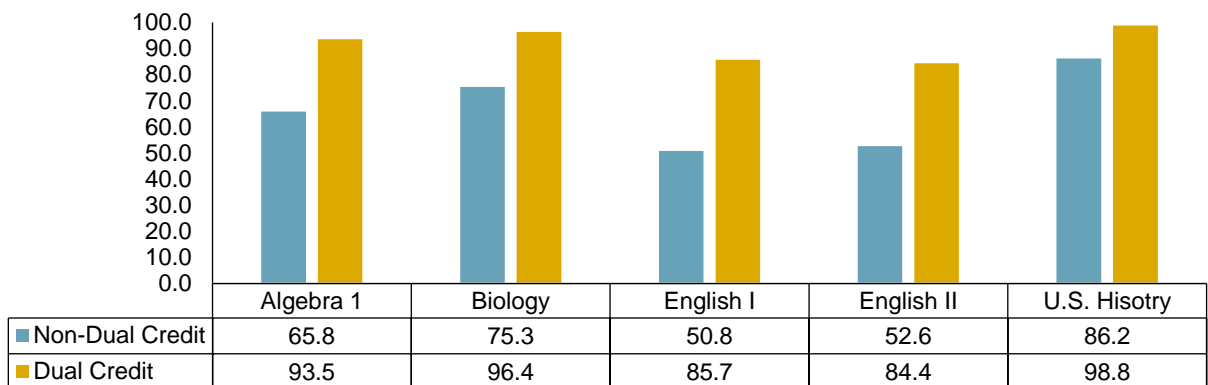
Source: 2018 STAAR EOC data retrieved from HISD Chancery Ad Hoc using IBM Cognos (data only). First time testers and retesters. STAAR regular, spring administration, online and paper modes.

- Dual-credit students in the study sample outperformed their non-dual credit counterparts on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams.

- Between 84.4 and 98.8 percent of dual-credit students compared to between 50.8 and 86.2 percent of non-dual-credit students performed at or above the Approaches Grade Level standard on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History exams.
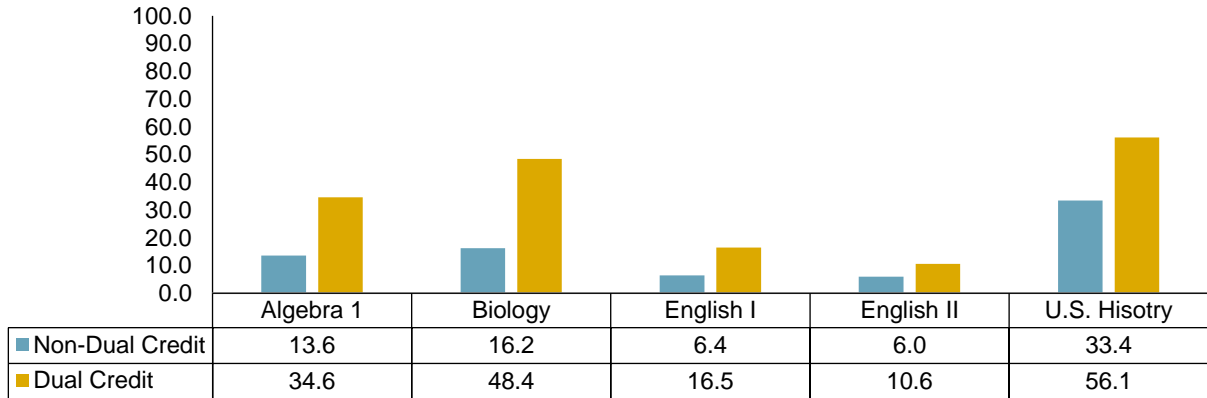
**Figure 3. The Comparative Percentage of Non-Dual Credit and Dual-Credit Students in the Sample Who Performed at the Masters Grade Level Standard on the 2018 STAAR EOC by Subject**

|  | Algebra 1 | Biology | English I | English II | U.S. Hisotry |
|---|---|---|---|---|---|
| Non-Dual Credit | 13.6 | 16.2 | 6.4 | 6.0 | 33.4 |
| Dual Credit | 34.6 | 48.4 | 16.5 | 10.6 | 56.1 |

Source: 2018 STAAR EOC data retrieved from HISD Chancery Ad Hoc using IBM Cognos (data only). First time testers and retesters. STAAR regular, spring administration, online and paper modes.

- A substantially higher percentage of dual-credit students performed at the Master Grade Level standard on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams than their non-dual credit counterparts.

- The performance gap between dual credit and non-dual credit students on the 2018 STAAR EOC exams' Masters Grade Level standard were 21.0 percentage points (pp) (Algebra I), 32.2 pp (Biology), 10.1 pp (English I), 4.6 (English II), and 22.7 pp (U.S. History) in favor of dual-credit students.

**Table 2,** Appendix A (p. 14) displays the proportion of dually-enrolled student groups who performed at or above the Approaches Grade Level standard on the 2018 STAAR EOC exams by subject.

- Except for special education, LEP, and eleventh- and twelfth-grade English I and II students, and tenth-grade Algebra I, Biology, and English I EOC students, most student groups in the study performed at or above the Approaches Grade Level standard on the 2018 STAAR exams.

- Between 88.5 (LEP) and 100 percent (G/T, twelfth grade, and Asian) of dual-credit student groups in the study performed at or above the Approaches Grade Level standard on the 2018 STAAR. U.S. History EOC exams.

- The percentage of students who scored at or above the Approaches Grade Level standard on the 2018 STAAR Algebra 1 EOC exam by student group in the study ranged from 40.0 (tenth grade) to 100 percent (G/T and non-economically disadvantaged) and between 66.7 and 100 percent when the lowest performing group was eliminated.

- The proportion of students who performed at or above the Approaches Grade Level standard on the 2018 STAAR Biology EOC exam by student group ranged from 40.0 percent (tenth grade) to 100 percent (G/T, Asian, White and non-at-risk) and between 60.0 (eleventh grade) and 100 percent when the lowest performing group was dropped.

- Except for English II (98.1%), all dual-credit G/T students (100%) in the study performed at or above the Approaches Grade Level standard on the 2018 STAAR Algebra I, Biology, English I, and U.S. History EOC exams.

### What factors predicted the performance of HISD dual-credit students on the 2018 STAAR EOC exams?

Regression analyses were used to predict the performance of dual-credit students on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exams. The scale scores were regressed on the following predictors: G/T identification, at risk, special education, LEP, economic status, and career and technical education (CTE). **Table 3**, Appendix A, p. 15, displays the regression table. The table provides standardized and unstandardized coefficients, confidence intervals, constant (mean), and indicates predictors that were statistically significant at the p. < .001 and p. < .05 levels by STAAR EOC exam.

### Algebra I

- The overall model predicted about 15 percent of the variance in the performance of dual-credit students on the 2018 STAAR Algebra I EOC exam.

- Only G/T identification (322.4 scale score points (ssp)) and at risk (-354.3 ssp) were statistically-significant predictors of dual-credit students' performance on the Algebra I EOC exam.

### Biology

- The overall model predicted about 30 percent of the variance in the performance of dual-credit students on the 2018 STAAR Biology EOC exam.

- G/T identification (323.5 ssp), at risk (-340.1 ssp), and special education (-538.0 ssp) were statistically-significant predictors of the dual-credit students' performance on the Biology EOC exam.

### English I

- Overall, the regression model predicted 47.4 percent of the variance in the performance of dual-credit students on the 2018 STAAR English I EOC exam.

- G/T identification (312.5 ssp), at risk (-302.7 ssp), special education (-568.6 ssp), and LEP (-286.7 ssp) were statistically-significant predictors of dual-credit students' performance on the English I EOC exam.

### English II

- Overall, the regression model predicted 38.1 percent of the variance in the performance of dual-credit students on the 2018 STAAR English II exam.

- G/T identification (273.7 ssp), at risk (-344.2 ssp), special education (-384.7 ssp), LEP (-158.8 ssp), and CTE (-164.4 ssp) were statistically-significant predictors of dual-credit students' performance on the English II exam.

### U.S. History

- The overall model predicted 20.4 percent variance in the performance of dual-credit students on the 2018 STAAR U.S. History EOC exam.

- G/T identification (376.7 ssp), at risk (-232.9 ssp), and LEP (-255.6) were statistically-significant predictors of dual-credit students' performance on the U.S. History EOC exam.

### What were the effects of the dual-credit program on the 2018 STAAR EOC performance of student enrollees?

Stata's treatment effect with regression adjustments (teffects ra) command was used to measure the average treatment effect of dual-credit enrollment on the 2018 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC exam of dual-credit students (ATET). Results of the effects are shown on **Table 4** to **Table 8**, Appendix A, (pp.16–17). The ATET uses the potential outcome mean (POM) (average scale score if students were not dual-credit) based on the counterfactual or missing data as a measure of students' performance. Teffects ra then calculates the enrollment effects for each test using the scale score regressed on key demographic and educational variables.

- Students in the study sample who were enrolled in a dual-credit program saw their STAAR Algebra I EOC scale score increase, on average, by 225.2 ssp. The increase was statistically significant with a statistically-significant potential outcome mean (POM) of 3980.4 (p. < .001) (Table 4, p. 16).

- Students in the study sample who were enrolled in the HISD dual-credit program had a statistically significant increase of 197.4 ssp, on average, on the STAAR Biology EOC exam. Their POM was of 4287.5 ssp was statistically significant (p. < .001) (**Table 5**, p. 16)

- Students in the study sample who were enrolled in the HISD dual-credit program had a statistically-significant increase of 172.2 ssp, on average, with a statistically significant POM of 4095.3 ssp, on the STAAR English I exams (p. < .001) (**Table 6**, p. 16).

- Students in the study sample who were enrolled in the HISD dual-credit program saw a statistically-significant increase of 109.5 ssp on the 2018 STAAR English II EOC exam. The POM of 4110.2 was statistically significant (p. < .001) (**Table 7**, p. 16).

- Students in the sample who were enrolled in the HISD dual-credit program had a statistically-significant increase of 120.4 ssp with a POM of 4384.8 ssp on the 2018 STAAR U.S. History exam. The POM was statistically significant (p.< .001) (Table 8, p. 17).

# Discussion

The dual-credit program in HISD, as mandated by law, provides opportunities for high-school students to attain college credit, among others, while pursuing a high-school diploma. The aim of this evaluation was to determine the effect of dual-credit enrollment on the STAAR EOC performance of enrollees. The study used teffects ra command in Stata to determine the program effects. In addition, the percentage of students who met state standards and the predictors of their performance on the STAAR EOC were presented. The study comprised a sample of dual-credit and non-dual-credit HISD students.

Although dual-credit students in the sample self-selected into the program, it was open and available to all other students. A higher proportion of Asian, female, economically-disadvantaged, and Hispanic students in the sample compared to their non-dually-credit counterparts were enrolled in the HISD dual-credit program. Students in the who were enrolled in the dual-credit program for the 2017–2018 school year and who had STAAR EOC scores outperformed their peers who were not enrolled in the program. Between 84.4 and 98.8 percent of dual-credit students 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. The data however, was based on first-time testers and re-testers. Students, therefore, had multiple exposure to the exams, although the content would have been different each time. Compared to their non-dual-credit peers, a higher percentage of students in the dual-credit program performed at or above the Masters Grade Level standard on all five STAAR EOC exams. The performance ranged from 10.6 to 56.1 percent. The best performance was in U.S. History and Biology at both the Approaches and Masters Grade Level standards. English I and English II had the lowest percentage of students who met the two standards.

When disaggregated by demographic and educational variables, more than 50 percent of dual-credit students met the Approaches Grade Level standard except for special education, LEP, and eleventh-grade students' performance in English I and II. Less than 50 percent of tenth-grade students met or exceeded the Approaches grade in STAAR Algebra I, Biology, and English I EOC exam. It should be noted that most students would have taken Algebra I, Biology, and English I in the ninth-grade, which means that most of the students in the tenth grade were retesters who previously failed the test and/or the course. Over 90 percent of these ninth and tenth-grade dually-enrolled students performed at or above the Approaches Grade Level standard in English I and II EOC, respectively.

G/T identification was the only statistically-significant positive predicator of student performance on the 2018 STAAR EOC exams for all five subjects. Over 30 percent of students in the dual-credit sample were identified as G/T, which may explain in part their higher mean scale scores and mostly all G/T students performing at or above the Approaches Grade Level standard. Being at risk was the other statistically significant but negative predictor for all five EOC subjects. Where special education was a statistically significant predictor, it was negative and accounted for the largest variance in the EOC scores for Biology, English, I and English II.  Subsequently, less than 50 percent of special education students performed at or above the Approaches Grade Level standard on English I and English II EOC exams. G/T accounted for the largest variance in the U.S. History EOC mean scale score and being at risk accounted for the largest variance on the Algebra I EOC mean scale score.

Academically, students benefitted significantly by being enrolled in the HISD dual-credit program. Being enrolled increased students' mean scale score by 109.5 to 225.2 ssp on all five EOC subjects. Algebra I had the highest increase of 225.2 ssp and English II had the lowest with 109.5 ssp. All increases were statistically significant.

## Recommendations

- Given the positive academic gains for students enrolled in HISD dual-credit programs, the district should continue to promote dual-credit enrollment as a viable option for the attainment of college credits and the preparation of students for the rigorous academic experiences of college.

- Because of the negative effect of special education and being designated as at-risk on the dual-credit performance of these students, targeted interventions or support may be required to improve their performance on the STAAR EOC exams.

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# Appendix A

| Table 1. Academic and Demographic Composition of the Study Sample by the 2018 STAAR EOC Exams | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Algebra I | | | | Biology | | | | English I | | | | English II | | | | U.S. History | | | |
| Academic and Demographic Characteristics | | Non-Dual Credit | | Dual Credit | | Non-Dual Credit | | Dual Credit | | Non-Dual Credit | | Dual Credit | | Non-Dual Credit | | Dual Credit | | Non-Dual Credit | | Dual Credit | |
| | | n= 12,434 | % | n= 107 | % | n= 14,666 | % | n= 225 | % | n= 17,728 | % | n= 272 | % | n= 16275 | % | n= 540 | % | n= 11057 | % | n= 898 | % |
| Ethnicity | Asian | 233 | 1.9 | 3 | * | 549 | 3.7 | 7 | 3.1 | 552 | 3.1 | 10 | 3.7 | 576 | 3.5 | 22 | 4.1 | 506 | 4.6 | 27 | 3 |
| | Blacks | 3,281 | 26.4 | 25 | 23.4 | 3,393 | 23.1 | 43 | 19.1 | 4,518 | 25.5 | 57 | 21 | 3,979 | 24.4 | 116 | 21.5 | 2,638 | 23.9 | 195 | 21.7 |
| | Hispanic | 8,040 | 64.7 | 77 | 72.0 | 9,330 | 63.6 | 168 | 74.7 | 11,155 | 62.9 | 197 | 72.4 | 10,226 | 62.8 | 379 | 70.2 | 6,642 | 60.1 | 632 | 70.4 |
| | White | 760 | 6.1 | 2 | * | 1,227 | 8.4 | 5 | 2.2 | 1,305 | 7.4 | 6 | 2.2 | 1,320 | 8.1 | 15 | 2.8 | 1,127 | 10.2 | 39 | 4.3 |
| Gender | Female | 5,815 | 46.8 | 74 | 69.2 | 7,123 | 48.6 | 141 | 62.7 | 8,309 | 46.9 | 160 | 58.8 | 7,763 | 47.7 | 293 | 54.3 | 5,574 | 50.4 | 507 | 56.5 |
| | Male | 6,619 | 53.2 | 33 | 30.8 | 7,543 | 53.1 | 84 | 37.3 | 9,419 | 53.1 | 112 | 41.2 | 8,512 | 52.3 | 247 | 45.7 | 5,483 | 49.6 | 391 | 43.5 |
| G/T | No | 11,722 | 94.3 | 90 | 84.1 | 12,519 | 85.4 | 137 | 60.9 | 15,387 | 86.8 | 174 | 64 | 14,130 | 86.8 | 385 | 71.3 | 9,212 | 83.3 | 636 | 70.8 |
| | Yes | 712 | 5.5 | 17 | 15.9 | 2,147 | 14.6 | 88 | 39.1 | 2,341 | 13.2 | 98 | 36.0 | 2,145 | 13.2 | 155 | 28.7 | 1,845 | 16.7 | 262 | 29.2 |
| At-Risk | No | 2,883 | 23.2 | 53 | 49.5 | 4,915 | 33.5 | 136 | 60.4 | 5,236 | 29.5 | 151 | 55.5 | 5,226 | 32.1 | 337 | 62.4 | 4,821 | 43.6 | 649 | 72.3 |
| | Yes | 9,551 | 76.8 | 54 | 50.5 | 9,751 | 66.5 | 89 | 39.6 | 12,492 | 70.5 | 121 | 44.5 | 11,049 | 67.9 | 203 | 37.6 | 6,236 | 56.4 | 249 | 27.7 |
| Special Ed. | No | 10,945 | 88.0 | 105 | 98.1 | 13,329 | 90.9 | 217 | 97 | 15,754 | 88.9 | 260 | 95.6 | 14,833 | 91.1 | 524 | 97 | 10,277 | 92.9 | 882 | 98.2 |
| | Yes | 1,489 | 12.0 | 2 | * | 1,337 | 9.1 | 7 | 3.1 | 1,974 | 11.1 | 12 | 4.4 | 1,442 | 8.9 | 16 | 3.0 | 780 | 7.1 | 16 | 1.9 |
| Econ. Disadv. | No | 3,080 | 24.8 | 20 | 18.1 | 4,056 | 27.7 | 45 | 20.0 | 4,773 | 26.9 | 53 | 19.5 | 4,648 | 28.6 | 102 | 18.9 | 3,456 | 31.3 | 161 | 17.9 |
| | Yes | 9,354 | 75.2 | 87 | 81.3 | 10,610 | 72.3 | 180 | 80.0 | 12,955 | 73.1 | 219 | 80.5 | 11,627 | 71.4 | 438 | 81.1 | 7,601 | 68.7 | 737 | 82.1 |
| LEP | No | 9,232 | 74.2 | 99 | 92.5 | 11,270 | 76.8 | 213 | 94.7 | 13,777 | 77.7 | 253 | 93.0 | 12,607 | 77.5 | 507 | 93.9 | 9,427 | 85.3 | 872 | 97.1 |
| | Yes | 3,202 | 25.8 | 8 | 7.5 | 3,396 | 23.2 | 12 | 5.3 | 3,951 | 22.3 | 19 | 7.0 | 3,668 | 22.5 | 33 | 6.1 | 1,630 | 14.7 | 26 | 2.9 |

Note: * Less than five students;
Source: 2018 STAAR EOC data retrieved from HISD Chancery Ad Hoc using IBM Cognos (data only). First time testers and retesters. STAAR regular, spring administration, online and paper modes.

| | Variable | Algebra I | Biology | English I | English II | U.S. History |
|---|---|---|---|---|---|---|
| | n | n = 107 | n = 225 | n = 272 | n = 540 | n = 898 |
| **Grade** | Ninth | 97.9 | 99.1 | 97.8 | 85.7 | * |
| | Tenth | 40.0 | 40.0 | 35.3 | 90.3 | 98.4 |
| | Eleventh | 66.7 | 60.0 | 18.2 | 27.5 | 98.8 |
| | Twelfth | * | * | 0 | 16.7 | 100 |
| **G/T** | No | 92.2 | 94.2 | 77.6 | 79.0 | 98.3 |
| | Yes | 100 | 100 | 100 | 98.1 | 100 |
| **Gender** | Female | 93.2 | 97.9 | 92.5 | 86.7 | 99.2 |
| | Male | 93.9 | 94.1 | 75.9 | 81.8 | 98.2 |
| **Ethnicity** | Asian | * | 100 | 80.0 | 95.5 | 100 |
| | Black | 88.0 | 95.3 | 77.2 | 76.7 | 98.0 |
| | Hispanic | 94.8 | 97.0 | 88.3 | 85.8 | 99.0 |
| | White | * | 100 | 100 | 93.3 | 100 |
| **At Risk** | No | 96.2 | 100 | 98.0 | 98.5 | 99.9 |
| | Yes | 90.7 | 91.0 | 70.3 | 61.1 | 96.0 |
| **Special Ed** | No | 93.3 | 97.7 | 87.7 | 85.7 | 98.9 |
| | Yes | * | 57.7 | 41.7 | 43.8 | 93.8 |
| **Economically Disadvantaged** | No | 100.0 | 91.1 | 90.6 | 89.2 | 98.1 |
| | Yes | 92.0 | 97.8 | 84.5 | 83.3 | 98.9 |
| **LEP** | No | 93.4 | 97.7 | 89.3 | 87.0 | 99.1 |
| | Yes | 87.5 | 75.0 | 36.8 | 45.5 | 88.5 |

Table 2. Disaggregated Percentage of Dual-Credit Enrolled Students Who Performed at or Above the Approaches Grade Level Standard on the 2018 STAAR EOC Exams, HISD

Note: * Less than five students; Only five twelfth-grade students tested for English I
Source: 2018 STAAR EOC data retrieved from HISD Chancery Ad Hoc using IBM Cognos (data only). First time testers and retesters. STAAR regular, spring administration, online and paper modes. Green highlights denote at least 50 percent performing at or above the Approaches Grade Level standard.

| Table 3. STAAR EOC Performance for Dual-Credit HISD Students in the Sample by Test, 2017–2018 | | | | | |
|---|---|---|---|---|---|
| **Regressor** | | **Unstandardized Coefficients** | **Standardized Coefficients** | **95.0% Confidence Interval for B** | |
| | | **B** | **Beta** | **Lower Bound** | **Upper Bound** |
| Algebra I | (Constant) | 4270.1** | | 3998.3 | 4541.9 |
| | G/T | 322.4* | .23 | 69.7 | 575.1 |
| | At Risk | -354.3** | -.35 | -547.2 | -161.4 |
| | Special Ed. | -2.2 | .00 | -679.0 | 674.5 |
| | LEP | -29.4 | -.02 | -391.6 | 332.8 |
| | Econ. Disadv. | 54.1 | .04 | -180.8 | 288.9 |
| | CTE | 35.2 | .03 | -155.4 | 225.8 |
| | $R^2$ | **15.1** | | | |
| | F | **4.1*** | | | |
| Biology | (Constant) | 4462.9** | | 4300.6 | 4625.3 |
| | G/T | 323.5** | .31 | 207.4 | 439.5 |
| | At Risk | -340.1** | -.33 | -463.7 | -216.5 |
| | Special Ed. | -538.0* | -.18 | -864.0 | -211.9 |
| | LEP | -176.5 | -.08 | -442.1 | 89.1 |
| | Econ. Disadv. | 93.7 | .07 | -47.9 | 235.2 |
| | CTE | -34.1 | -.03 | -151.8 | 83.7 |
| | $R^2$ | **30.1** | | | |
| | F | **17.1**** | | | |
| English I | (Constant) | 4333.3** | | 4219.5 | 4447.1 |
| | G/T | 312.5** | .34 | 230.0 | 395.1 |
| | At Risk | -302.7** | -.34 | -387.0 | -218.5 |
| | Special Ed. | -568.6** | -.27 | -757.1 | -380.2 |
| | LEP | -286.7** | -.17 | -446.4 | -126.9 |
| | Econ. Disadv. | -0.5 | .00 | -97.7 | 96.8 |
| | CTE | 3.1 | .00 | -77.2 | 83.4 |
| | $R^2$ | **47.4** | | | |
| | F | **41.7**** | | | |
| English II | (Constant) | 4405.0** | | 4323.6 | 4486.5 |
| | G/T | 273.7** | .27 | 203.3 | 344.1 |
| | At Risk | -344.2** | -.36 | -413.6 | -274.9 |
| | Special Ed. | -384.7** | -.14 | -568.2 | -201.3 |
| | LEP | -158.8* | -.08 | -294.2 | -23.4 |
| | Econ. Disadv. | -56.8 | -.05 | -135.7 | 22.0 |
| | CTE | -164.4** | -.18 | -227.7 | -101.0 |
| | $R^2$ | **38.1** | | | |
| | F | **56.4**** | | | |
| U.S. History | (Constant) | 4465.0** | | 4387.0 | 4543.0 |
| | G/T | 376.7** | .34 | 309.8 | 443.5 |
| | At Risk | -232.9** | -.21 | -303.4 | -162.4 |
| | Special Ed. | -70.5 | -.02 | -296.9 | 155.8 |
| | LEP | -255.6* | -.08 | -439.3 | -72.0 |
| | Econ. Disadv. | 10.6 | .01 | -67.0 | 88.2 |
| | CTE | -16.8 | -.02 | -81.5 | 47.8 |
| | $R^2$ | **20.4** | | | |
| | F | **39.4**** | | | |

[a] Dependent variable; Scale Score; *$p < .05$, **$p < .001$

| Table 4. Effects of Dual-Credit Enrollment on the 2018 STAAR Algebra I EOC Student Performance | | | | | | |
|---|---|---|---|---|---|---|
| **Algebra I** (n= 12,541) | Coefficient | Robust Standard Error | z | P>z | [95% Confidence Interval] | |
| **ATET** | | | | | | |
| **Dual Credit** | | | | | | |
| **(1 vs 0)** | 225.2 | 44.8 | 5.0 | 0.0 | 137.4 | 312.9 |
| **Potential Outcome Mean** | | | | | | |
| **0** | 3980.4 | 27.7 | 143.5 | 0.0 | 3926.0 | 4034.8 |

p. < .001; p. <.05; Standards: Approaches 2012-2015 standard: 3500; Approaches (after 12/2015) 3550–3972; Meet 4000–4302; Masters 4333–6119

| Table 5. Effects of Dual-Credit Enrollment on the 2018 STAAR Biology EOC Student Performance | | | | | | |
|---|---|---|---|---|---|---|
| **Biology** (n= 14,891) | Coefficient | Robust Standard Error | z | P>z | [95% Conference Internal] | |
| **ATET** | | | | | | |
| **Dual Credit** | | | | | | |
| **(1 vs 0)** | 197.4 | 30.0 | 6.6 | 0.0 | 138.6 | 256.2 |
| **Potential Outcome Mean** | | | | | | |
| **0** | 4287.5 | 26.4 | 162.7 | 0.0 | 4235.9 | 4339.2 |

p. < .001; p. <.05; Standards: Approaches 2012-2015 standard: 3500; Approaches (after 12/2015) 3550–3958; Meet 4000–4495; Masters 4576–6201

| Table 6. Effects of Dual-Credit Enrollment on the 2018 STAAR English I EOC Student Performance | | | | | | |
|---|---|---|---|---|---|---|
| **English I** (n = 18,000) | Coefficient | Robust Standard Error | z | P>z | [95% Confidence Interval] | |
| **ATET** | | | | | | |
| **Dual Credit** | | | | | | |
| **(1 vs 0)** | 172.2 | 21.1 | 8.2 | 0.0 | 130.9 | 213.5 |
| **Potential Outcome Mean** | | | | | | |
| **0** | 4095.3 | 25.2 | 162.3 | 0.0 | 4045.9 | 4144.8 |

p. < .001; p. <.05; Standards: Approaches 2012-2015 standard: 3750; Approaches (after 12/2015) 3775–3976; Meet 4000–4644; Masters 4691–6357

| Table 7. Effects of Dual-Credit Enrollment on the 2018 STAAR English II EOC Student Performance | | | | | | |
|---|---|---|---|---|---|---|
| **English II** (n = 16,815) | Coefficient | Robust Standard Error | z | P>z | [95% Confidence Interval] | |
| **ATET** | | | | | | |
| **Dual Credit** | | | | | | |
| **(1 vs 0)** | 109.5 | 17.4 | 6.3 | 0.001 | 75.4 | 143.7 |
| **Potential Outcome Mean** | | | | | | |
| **0** | 4110.2 | 17.7 | 232.1 | 0.000 | 4075.5 | 4144.9 |

p. < .001; p. <.05; Standards: Approaches 2012-2015 standard: 3775–3869; Approaches (after 12/2015) 3795–3946; Meet 4000–4698; Masters 4831–6382

| Table 8. Effects of Dual-Credit Enrollment on the 2018 STAAR U.S. History EOC Student Performance | | | | | | |
|---|---|---|---|---|---|---|
| **U.S. History** (n = 11,955) | Coefficient | Robust Standard Error | z | P>z | [95% Confidence Interval] | |
| **ATET** | | | | | | |
| **Dual Credit** | | | | | | |
| **(1 vs 0)** | 120.4 | 16.3 | 7.41 | 0.000 | 88.5 | 152.3 |
| **Potential Outcome Mean** | | | | | | |
| **0** | 4384.8 | 11.6 | 376.66 | 0.000 | 4362.0 | 4407.6 |

p. < .001; p. <.05; Standards: Approaches 2012-2015 standard: 3500; Approaches (after 12/2015) 3550–3978; Meet 4000–4386; Masters 4440–6467