MEMORANDUM September 20, 2017

TO: Michael Love
Assistant Superintendent, Career Readiness

FROM: Carla Stevens
Assistant Superintendent, Research and Accountability

SUBJECT: **DUAL CREDIT REPORT, 2016–2017**

The Houston Independent School District (HISD) offers full credit courses through which students can earn at least 12 semester hours of college credit while in high school in accordance with section 28.009 of the Texas Education Code (TEC). The purpose of this evaluation was to identify the number and attributes of HISD students enrolled in dual-credit courses during the 2016–2017 school year, evaluate their performance on state exams relative to their non-dually enrolled peers, determine the program effects, and identify students' perceptions and experiences with dual-credit courses.

Key findings include:

- Almost twice as many gifted and talented students (26.3%) were enrolled in dual-credit courses compared to their distribution in the HISD population (15.1%), while a considerably lower proportion of limited English proficiency (LEP) students (4.7%) were enrolled relative to their peers in the HISD student population (31.8%) in 2016–2017.
- A higher proportion of dually-enrolled students compared to non-dually-enrolled students met the Approaches Grade Level or Masters Grade Level standards on State of Texas Assessments of Academic Readiness (STAAR) Algebra I, Biology, English I and II, and U.S. History end-of-course (EOC) exams.
- The proportion of dually-enrolled Black and economically-disadvantaged students who met the Approaches Grade Level Standard on STAAR Algebra I, Biology, and U.S. History EOC exams were higher or comparable to those of their peers.
- Dual-credit enrollment had significant positive effects on students' 2017 STAAR EOC performance, except for Biology.
- Generally, students who were interviewed believed that the dual-credit courses were rigorous and prepared them adequately for college. However, students proposed more academic support.

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

Attachment

cc: Grenita Lathan
Rick Cruz

HOUSTON INDEPENDENT SCHOOL DISTRICT

RESEARCH

Educational Program Report

DUAL CREDIT: STUDENT ENROLLMENT, PERFORMANCE, PERCEPTIONS, AND EXPERIENCES IN THE HOUSTON INDEPENDENT SCHOOL DISTRICT, 2016-2017

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Dual-Credit Report: Student Enrollment, Performance, Perceptions, and Experiences in the Houston Independent School District, 2016–2017

Executive Summary

In accordance with Section 28.009 of the Texas Education Code (TEC), the Houston Independent School District (HISD) offers dual-credit courses through which students can earn at least 12 semester hours of college credit while in high school. Dual-credit courses are available to all HISD high school students regardless of grade level. There is no limit to the number of these courses students can take during a semester or school year (HISD, 2016). Dual credits can be earned through various instructional arrangements, that is, International Baccalaureate, advanced placement or dual-credit courses, articulated postsecondary courses for located credit, articulated postsecondary advanced technical credit courses for state credit, or any combinations of the courses described. The program is offered in collaboration with higher education institutions in the State of Texas through articulated agreements. Highly-qualified instructors approved by the partner colleges deliver the dual-credit courses in HISD (2016).

The purpose of this evaluation is to identify the number and attributes of HISD students enrolled in dual-credit courses during the 2016–2017 school year, evaluate their performance on state tests relative to their peers who were not enrolled, determine the effect of enrollment on their performance, and identify their perceptions and experiences with dual-credit courses.

Highlights

- Almost twice as many gifted and talented students (26.3%) were enrolled in dual-credit courses compared to their distribution in the HISD population (15.1%), while a considerably lower proportion of limited English proficiency (LEP) students (4.7%) were enrolled relative to their peers in the HISD student population (31.8%) in 2016–2017.

- A higher proportion of dually-enrolled students compared to non-dually-enrolled students met the Approaches Grade Level or Masters Grade Level standards on State of Texas Assessments of Academic Readiness (STAAR) Algebra I, Biology, English I and II, and U.S. History end-of-course (EOC) exams.

- The proportion of dually-enrolled Black and economically-disadvantaged students who met the Approaches Grade Level Standard on STAAR Algebra I, Biology, and U.S. History EOC exams were higher or comparable to those of their peers.

- Overall, students' G/T identification, at-risk status, special education designation, LEP, and economically-disadvantaged status were statistically significant predictors of student performance on STAAR EOC tests.

- Dual-credit enrollment had significant positive effects on students' 2017 STAAR EOC performance, except for Biology.

- Generally, students who were interviewed believed that the dual-credit courses were rigorous and prepared them adequately for college. However, students proposed more academic support.

Recommendations

- Given the positive gains for students who enroll in dual credit courses, HISD should continue to promote dual-credit enrollment as a viable option for students to obtain college credits and to prepare them for the rigorous academic experiences of college.

- In response to the varied and inchoate way students receive information on dual credit, College and Career Readiness department should develop and implement a systematic and sustained awareness and information strategy on dual-credit enrollment and benefits to better inform students as early as middle school on the dual-credit program, and where offered, in addition to the existing web resources.

- Schools should provide additional support through tutorials, peer groups or industry experts for dual-credit students in response to students' proposed recommendation for more academic support.

- Given the results and feedback from the focus group, continuous feedback should be solicited from dual-credit students to determine their perceptions and experience to develop and tailor support programs to meet their needs and those of future enrollees.

Introduction

Section 28.009 of the Texas Education Code (TEC) makes provision for the implementation of programs through which students can earn at least 12 semester hours of college credit while in high school. The programs are offered in collaboration with higher education institutions in the State of Texas through articulation agreements. Highly qualified instructors approved by partner colleges deliver the dual-credit courses (HISD, 2016). These instructors may be embedded, that is, they may be high school teachers who meet the criteria for delivering college courses or they may be college instructors who are assigned to deliver these courses. The program has the advantage of providing additional educational experiences for students before their high school graduation while providing both graduation and college credit at the same time.

According to TEC, college credits could be earned through various instructional arrangements: (1) International Baccalaureate, advanced placement, or dual-credit courses; (2) articulated postsecondary courses provided for local credit; or articulated postsecondary advanced technical credit courses provided for state credit; or (3) any combination of the courses described above. Students can also earn credits for courses or activities related to an apprenticeship or training involving requirements essential to obtain industry recognized credentials, certificates, or associate degrees. Credits will be earned toward students' high school diplomas and postsecondary academic requirements (TEC, 28.009). HISD dual-credit courses are also offered as part of the Career and Technical Education (CTE) program. Dual-credit courses are opened to HISD high school students regardless of grade level, and there is no limit to the number of dual-credit courses that students can take during a semester or school year (HISD, 2016).

As a prerequisite for enrollment in the dual course core academic programs, high school students must demonstrate college readiness on one of the Texas Success Initiative (TSI) assessments. These are offered in reading, writing, and mathematics. Students enrolled in entry-level 1 certificate programs are not required to demonstrate TSI competence for CTE dual credits (HISD, 2016). High school credit is awarded to students who receive a grade of 70 or better on their respective courses, regardless of the college passing grades. TSI data imply that dual-credit courses were first offered in HISD during the 2013–2014 school year.

The purpose of this evaluation is to identify the number and characteristics of HISD students enrolled in dual-credit courses during the 2016–2017 school year, evaluate the performance of these students on state tests relative to their peers who were not enrolled in dual-credit courses, and determine the effect of enrollment on student performance. The evaluation also explored students' perceptions and experiences with dual-credit courses in HISD.

Literature Review

Extensive research had been conducted to determine the value associated with dual-credit corse enrollments. This section highlights the results of some of these research studies. These include studies on dual-credit enrollment and accessibility (Young, 2013); dual-credit and academic performance and remediation (An, 2013); academic motivation and engagement (An, 2015); college enrollment and completion (Taylor, 2015; Godfrey, Matos-Elefonte, Ewing, & Priyank, 2014); college success (Allen & Dadgar, 2012); content knowledge (White, Hopkins, & Shockley, 2014); dual-credit enrollment and performance among English language learners (ELL) (Hanson, Bisht & Motamedi, 2016); and the determinants of success for dual-credit enrollment (Speroni, 2011).

An (2015) studied the role of academic motivation and engagement in the relationship between dual enrollment and academic performance using data from the Wabash National Study on Liberal Arts Education. Results of this study indicated that students who participated in dual-credit enrollment were more academically motivated and engaged than nonparticipants. It also revealed a positive effect of dual enrollment on first-year college GPA which persisted despite controlling for pre-college variables. However, these indicators accounted for only 20% of the effect of dual enrollment on student performance. Simply enrollment in dual-credit course is insufficient to make academic progress or excel in college. Other support services are necessary. At issue then, is whether similar outcomes can be achieved without the extra expenditure on dual-credit if it accounts for only 20% of student performance. What the study did not reveal are the other indicators that contribute to academic performance of dual-credit students and the extent to which they do. An's (2013) study also showed that dual enrollment increased students' first-year college GPA, decreased the likelihood of remediation, and that low socioeconomic (SES) students benefit from dual enrollment as much as high SES students. The difference in program participation accounted for little of the SES gap in GPA and remediation.

While dual-credit policies affect all students, small effect sizes were detected for low-income students and students of color compared with average estimates suggesting that existing dual-credit policies are inequitable for college access and completion (Taylor, 2015). Taylor used propensity scores to match 41,727 Illinois students who completed high school in 2003 to determine the effect of college enrollment and completion based on community college dual-credit policies. The findings may require the assessment of state policies and the integration of non-cognitive and psychological support into dual-credit programs to support underserved students (Taylor, 2015).

In a non-experimental causal-comparative study of students who attended a large Texas community college from 2005–2006 through to 2011–2012, Young (2013) found statistically significant differences for all analyses with more females enrolling more often than males, whites more often than any other group, and with dual-credit students having higher semester and cumulative GPAs than their non-dual-credit peers. There were also statistically significant differences in the number of dual-credit courses completed for female and Hispanic students in one analysis and for White students in two analyses (Young, 2013).

When geographical location was considered, differences in dual-credit enrollment also emerged. Taylor and Lichtenberger (2013) studied 115,677 students from the 2013 Illinois high-school graduating class. Access to dual-credit varied considerably depending on high school location throughout Illinois. High schools located in town and rural areas had a larger proportion of students participating in dual-credit programs relative to high schools in Chicago, as were schools in other urban and suburban settings. Schools that met Federal Average Yearly Progress (AYP) Standards had a higher proportion of students in the top dual-credit participation quartiles and a higher proportion who did not meet AYP were in the bottom two quartiles (Taylor & Lichtenberger, 2013). High schools in the lowest dual-credit participation quartiles had the highest proportion of low-income students relative to high schools in the highest dual-credit participation quartile (Taylor & Lichtenberger, 2013).

English language learners (ELL) were less likely to enroll in or complete dual-credit courses. A Washington state study that analyzed the enrollment and performance of ELL students in advanced-course enrollment found that current, monitored, and former ELL students took .05–1 fewer advanced courses per school year than never-ELL students (Hanson, Bisht, & Motamedi, 2016). Current, monitored, and former ELL students were 40–50 percent less likely to complete Algebra I in middle school and those who passed Algebra I took twice as many math courses beyond Algebra II as students who passed in the ninth-grade do. However, the grades that current, monitored, and former ELLs earned in advanced courses were similar to those that never-ELL students earned in those courses after students' prior academic performance was considered

(Hanson, Bisht, & Motamedi, 2016). Schools with the lowest percentage of students classified as ELL offered more advanced courses than other schools did even after school characteristics such as average standardized test scores in math and reading were considered (Hanson, Bisht, & Motamedi, 2016).

Notwithstanding, enrollment and completion of dual-credit courses have positive implication for students' college experiences. Allen and Dadgar's (2012) quasi-experimental analysis of dual-credit in New York found that College Now dual enrollment reduced time to a degree as it increased the number of courses students take once they are enrolled in college. It also increased the students' academic performance as measured by higher college GPA. Students' content knowledge in specific dual-credit courses also increased. In a study of dual-credit Chemistry, statistical analysis of students' performance data indicated that high school students developed content knowledge that was equivalent to measured norms for college students (White, Hopkins, & Shockley, 2014). Students also had higher rates of completion, which suggested that this dual-credit initiative was a viable option for increasing accessibility to college Chemistry (White, Hopkins, & Shockley, 2014).

While enrollment in dual-credit courses is associated with college enrollment, completion, and students' college performance, access to dual-credit courses appear to be uneven by race, gender, socioeconomics, and geography. This dual-credit report analyzed the enrollment, performance, and perception and experiences of students enrolled in dual-credit courses during the 2016–2017 school year. Specifically, the report answers six key questions:

1. What were the academic and demographic characteristics of students enrolled in HISD dual-credit courses?

2. How did HISD students enrolled in dual-credit courses perform on the 2017 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 2017 STAAR EOC exams?

4. What were the effects of the dual-credit program on the 2017 STAAR EOC performance of students enrolled in the program?

5. What were the perceptions and experiences of students who were enrolled in HISD dual-credit courses in 2016–2017?

Method

This is a comparative study involving HISD ninth- through twelfth-grade students enrolled in dual-credit courses and students who were not enrolled in dual credit courses. Students with State of Texas Assessments of Academic Readiness (STAAR) end-of-course (EOC) scores in Algebra I, Biology, English I, English II, and U.S. History were included in the sample. A total of 65,534 students made up the study sample. Of these, 4,199[1] students were dually-enrolled and 61,335 were non-dually enrolled students.

STAAR EOC data was download from IBM Cognos, a data querying platform linked to the HISD Chancery Ad hoc data warehouse. The study involved descriptive data of students enrolled in dual-credit courses by

[1] A total of 5,379 students were enrolled in dual-credit courses according to 2016 PEIMS Fall data. About 78.1 percent (4,199) had STAAR EOC scores and comprise the study sample.

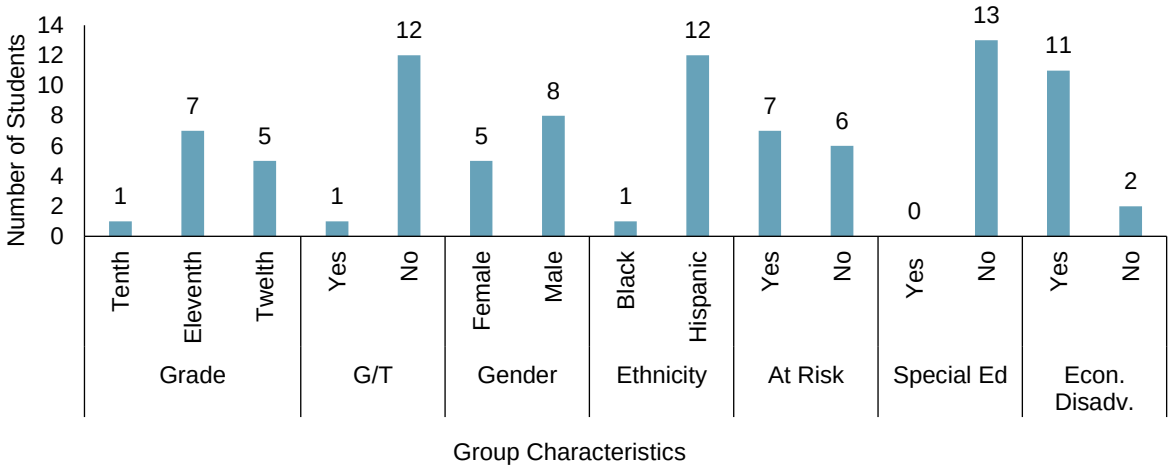
ethnicity, economic status, limited English proficiency (LEP), gifted and talented (G/T) identification status, gender, and special education designation using the STAAR EOC exams data file and the Public Education Information System database (PEIMS). STAAR EOC exams are administered during the spring term. PEIMS data are snapshots taken during the fall term, annually. It is likely, therefore, that the students may have enrolled in dual-credit courses after the snapshot was taken or students may have exited HISD before the STAAR EOC spring assessments. Consequently, students were matched on the STAAR EOC and PEIMS datasets using unique identifiers to correct for this anomaly and to ensure that students in the sample had a full year or close to a full year's enrollment in the dual-credit courses. Only STAAR regular test version for first-time testers and retesters was used for the analyses with all students satisfying the criteria. Students' scale scores and the percentage who met grade level standard were analyzed by STAAR Algebra I, Biology, English I, English II, and U.S. History EOC. The study also includes a predictive analysis of student performance by subjects using regression.

In addition, the evaluation assessed how students who were enrolled in dual credit course performed on STAAR using STATA's average treatment effect on the treated (ATET). The ATET is determined using "teffects" command with regression adjustment (ra) on each performance outcome (STAAR EOC) subject. The outcomes were regressed on students' G/T identification, gender, at-risk status, dual-credit indicator, special education designation, and economic status. Because students self-selected into the program, a treatment model was not included. The treatment was dual and non-dual enrollment.

The evaluation also analyzed students' perceptions and experiences with dual-credit course participation using focus groups. Focus groups are considered viable qualitative research methods that are supplements and/or follow-up to other data and information. They provide more detailed information on aspects of the research findings. The focus group interviews, however, were planned to precede the STAAR data analysis since students would not be available by the time STAAR EOC test results were released.

A random sample of 25 students was drawn from the population of students enrolled in dual-credit courses in one school for the focus group interview using Microsoft Excel. Three schools were targeted but only one confirmed their participation in the focus group interviews. Homogeneity in group member selection is considered essential for facilitating effective focus group interactions (Fitzpatrick, Sanders, & Worthen, 2011). Student were selected from a single school, rather than across schools, to ensure interaction as they would be familiar to each other. **Figure 1**, p. 7 shows the distribution of students in the focus groups by key demographic variables. The objective was "to obtain in-depth information" on the experiences and perceptions of dual-credit students. (Fitzpatrick, Sanders, & Worthen, 2011, p. 438). Thirteen of the 25 students were present for the interview. A group of 13 to 15 interviewees are considered ideal for a focus-group interview, although groups of six to ten people have also been recommended (Fitzpatrick, Sanders & Worthen, 2011).

Figure 1. Academic and Demographic Composition of Dually-Enrolled Focus Group at a Select High School, HISD, 2016–2017 (n = 13)



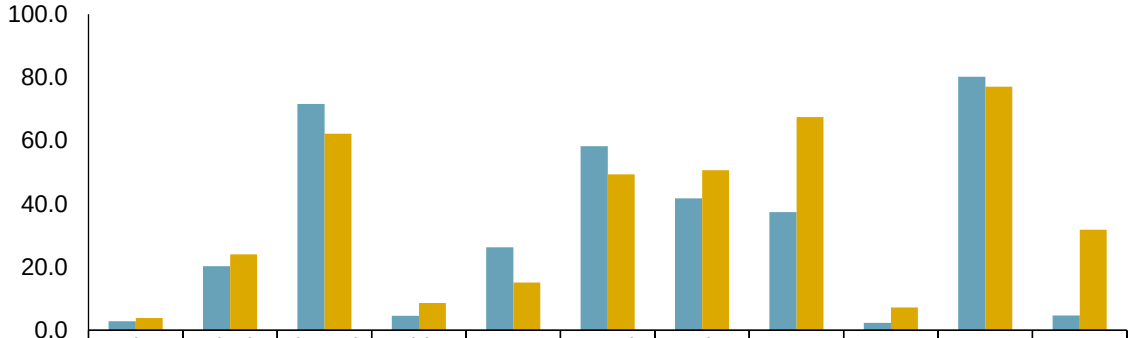
- Most students in the focus group sample were Hispanic (12), non-G/T (12), non-special education (13), and economically disadvantaged (11).

Results

What were the academic and demographic characteristics of students enrolled in HISD dual-credit courses?

Figure 2 displays the academic and demographic composition of students who were enrolled in dual-credit courses in HISD for the 2016–2017 school year. The composition for the general HISD student population is provided for comparative purposes. **Table 1**, **Appendix A** (p. 15) shows the composition by STAAR EOC subject of all dually-enrolled students in the sample.

Figure 2. Comparative Academic and Demographic Composition of Dually-Enrolled Students in HISD, 2016–2017



	Asian	Black	Hispanic	White	G/T	Female	Male	At-Risk	Special Ed.	Econ. Disdv.	LEP
Dual Credit	2.8	20.3	71.6	4.6	26.3	58.3	41.7	37.3	2.4	80.2	4.7
HISD	3.9	24.0	62.2	8.6	15.1	49.4	50.6	67.4	7.2	77.1	31.8

Source: 2016 PEIMS fall data snapshot and TSDS PEIMS Data Review, 2016–2017 Fall Resubmission (Data only)

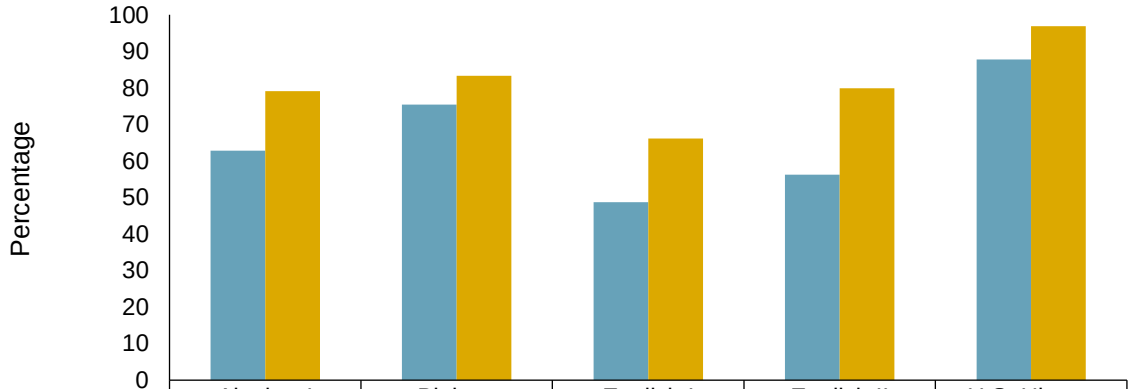
- A higher proportion of Hispanic (71.6% v. 62.2%), G/T (26.3% v. 15.1%), female (58.3% v. 49.4%) and economically-disadvantaged (80.2% v. 77.1%) students were enrolled in dual-credit courses compared to their representation in the larger 2016–2017 HISD enrollment.

- A considerably lower proportion of LEP (4.7% v. 31.8%) and male (41.7% v. 50.6%) students were enrolled in dual-credit courses compared to their representation in the general 2016–2017 HISD student population.

How did HISD students enrolled in dual-credit courses perform on the 2017 STAAR EOC exams relative to their peers who were not enrolled in dual credit courses?

Figure 3 and **Figure 4** display the percentage of dually-enrolled students who met the Approaches Grade Level and Masters Grade Level standards, respectively, on the 2017 STAAR EOC tests. The performance of dually-enrolled students was compared to that of their peers who were not enrolled in dual-credit courses for the 2016–2017 school year in HISD**.**

Figure 3. The Comparative Percentage of Non- and Dually-Enrolled HISD Students Who Met Approaches Grade Level Standard on the 2017 STAAR EOC by Subject



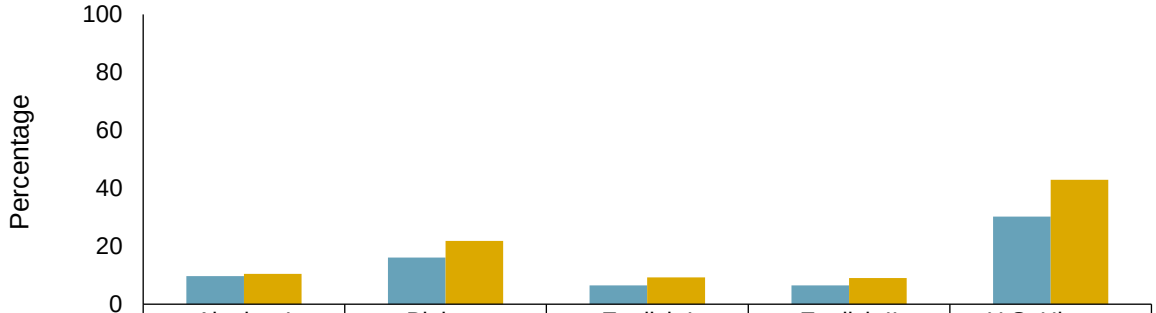
	Algebra I	Biology	English I	English II	U.S. History
Non-Dual Credit	62.8	75.4	48.7	56.2	87.8
Dual Credit	79.1	83.3	66.1	79.9	96.9

Source: 2017 STAAR EOC data retrieved from the HISD Chancery Ad Hoc using IBM Cognos (data only). First time testers and retesters.

- A higher proportion of HISD dually-enrolled students compared to their non-dually-enrolled peers met the Approaches Grade Level standard on all the 2017 STAAR EOC tests.

- The largest gap in achievement between the two groups, dually-enrolled and non-dually enrolled, was observed for English II (23.7 percentage points), followed by English I (17.4 percentage points), and Algebra I (16.3 percentage points). Biology had the smallest achievement gap at 7.9 percentage points.

Figure 4. Percentage of Dually-Enrolled HISD Students Who Met Masters Grade Level Standard on the 2017 STAAR EOC by Subject



	Algebra I	Biology	English I	English II	U.S. History
Non-Dual Credit	9.7	16.1	6.5	6.5	30.2
Dual Credit	10.5	21.8	9.2	9.0	42.9

Source: 2017 STAAR EOC data retrieved from the HISD Chancery Ad Hoc using IBM Cognos (data only). First-time testers and Retesters.

- A higher proportion on HISD dually-enrolled students compared to their non-dually enrolled peers met the Masters Grade Level standard on all the 2017 STAAR EOC tests.

- U.S. History (42.9%) and Biology (21.8%) had the highest percentage of dually-enrolled students who met the Masters Grade Level standard on the 2017 STAAR EOC tests.

- The largest gap in achievement for the dually and non-dually enrolled HISD students who met the Masters Grade Level standard was on the 2017 STAAR U.S. History EOC (42.9% and 30.2%, respectively).

Table 2 in Appendix A (p. 15) shows the percentage of dually-enrolled students who met the 2017 STAAR EOC Approaches Grade Level standard disaggregated by subject and demographic and educational characteristics. Two findings stand out:

- The proportion of Black dual-credit students who met the Approaches Grade Level standard on the 2017 STAAR EOC tests was higher than or comparable to that of their ethnic peers in Algebra I (80.9%), Biology (83.5%), and U.S. History (95.9%). Asians, Hispanic, and White students were 66.7 percent, 78.4 percent, and 75.0 percent, respectively for Algebra I, 80.0 percent, 83.5 percent, and 90.9 percent, respectively for Biology, and 97.1 percent, 98.2 percent, and 99.9 percent, respectively for U.S. History.

- The proportions of economically-disadvantaged students who met the Approaches Grade Level standard on the 2017 STAAR EOC tests were comparable to that of their non-economically-disadvantaged peers for Algebra 1 (79.0% v. 79.4%) and U.S. History (98.0% v. 96.6%).

What factors predicted the performance of HISD dual-credit students on the 2017 STAAR EOC exams?

Regression analysis was used to predict the performance of dually-enrolled students on the 2017 STAAR Algebra I, Biology, English I, English II, and U.S. History EOC assessments. The scale score outcomes were regressed on the following predictors: G/T identification, gender, at-risk status, special education designation, economically-disadvantaged status, and LEP. **Table 3** in Appendix A, p. 16 displays the

regression table. The table provides unstandardized and standardized coefficients, standard errors, and indicates which predictors were statistically significant at the p.<.001 and p.<.05 levels.

Algebra I

- The overall model predicted about 29 percent of the variance in the performance of dually-enrolled students on the 2017 STAAR Algebra I EOC test.

- G/T identification (385.5 scale score points (ssp)), at-risk status (-211.7 ssp), and special education designation (-295.3 ssp) were statistically significant (p.< .001) predictors of dually-enrolled student performance on Algebra 1, with a statistically significant constant of 3950.2 scale score points (ssp).

Biology

- The overall model predicated about 49 percent of the variance in the performance of dually-enrolled students on the 2017 STAAR Biology EOC test.

- G/T identification (477.4 ssp), at-risk status (-282.2 ssp), special education designation (-425.2 ssp), and LEP (-297.0 ssp) were statistically significant (p.<.001) predictors of the dually-enrolled student performance on the 2017 STAAR Biology EOC with a statistically significant (p.<.001) constant or mean of 4229.6 ssp.

English I

- The overall model predicated about 54 percent of the variance in the performance of dually-enrolled students on the 2017 STAAR English I EOC test.

- G/T identification (401.7 ssp), at-risk status (-362.8 ssp), special education designation (-462.9 ssp), economically disadvantaged (-172.9 ssp), and LEP (-235.7 ssp) were statistically significant (p.<.001) predictors of the dually-enrolled student performance on the 2017 STAAR English I EOC, with a statistically significant (p.<.001) constant or mean of 4289.3 ssp.

English II

- The overall model predicated about 54 percent of the variance in the performance of dually-enrolled students on the 2017 STAAR English II EOC test.

- G/T identification (337.1 ssp), at-risk status (-323.6 ssp), special education designation (-555.7 ssp), economically disadvantaged (-151.6 ssp), and LEP (-415.9 ssp) were statistically significant (p.<.001) predictors of the dually-enrolled student performance on the 2017 STAAR English II EOC, with a statistically significant (p.<.001) constant or mean of 4417.4 ssp.

U.S. History

- The overall model predicated about 38 percent of the variance in the performance of dually-enrolled students on the 2017 STAAR U.S. History EOC test.

- G/T identification (256.0 ssp), males (139.4) at-risk status (-231.4 ssp), special education designation (-448.1 ssp), economically disadvantaged (-111.2 ssp), gender (139.4 ssp), and LEP (-312.8 ssp) were

statistically significant (p.<.001) predictors of the dually-enrolled student performance on the 2017 STAAR U.S. History EOC, with a statistically significant (p.<.001) constant or mean of 4443.0 ssp.

What were the effects of the dual-credit program on the 2017 STAAR EOC exam performance of students enrolled in the program?

Stata uses a "teffects" with regression adjustment (ra) command to measure the average effect of dual-credit enrollment on the STAAR EOC performance of dually-enrolled students. Results of the effects are found in **Table 4** through **Table 8** in Appendix A. The average treatment effect on the treated uses the potential outcome based on the counterfactual or missing data and robust standard error as a measure of student performance if they were not enrolled in dual-credit courses and then provides the enrollment effects regressed on the STAAR scale score for each test using key educational and demographic variables.

- Students who were enrolled in the HISD dual-credit program saw their Algebra I scale score increased by 48.9 ssp. The increase was statistically significant (p.<.05) (Table 4, p. 17).

- There was no statistically significant effect of dual-credit enrollment on the Biology EOC scale scores of dually-enrolled students (p.<.001) (**Table 5**, p.17).

- Students who were enrolled in the HISD dual-credit program saw their English I scale score increased by 55.3 ssp. The increase was statistically significant (p.<.001) (**Table 6**, p. 17).

- Students who were enrolled in the HISD dual-credit program saw their English II scale score increased by 113.4 ssp. The increase was statistically significant (p.<.001) (**Table 7**, p. 17).

- Students who were enrolled in the HISD dual-credit program saw their U.S. History scale score increased by 101.9 ssp. The increase was statistically significant (p.<.001) (**Table 8**, p. 18).

What were the perceptions and experiences of students who were enrolled in HISD dual-credit courses in 2016–2017?

A random sample of 13 students made up the focus group. Of these three, each were enrolled in Practicum in (a) Transportation, Distribution, and Logistics, and (b) Instructional Practices in Education and training; two students each were enrolled in (a) Advanced Engineering Design and Presentation, and (b) Practicum in Education and Training; and one each was enrolled in (a) Logistics, Planning and Management Systems, and (b) Practicum in Transportation, Distribution, and Logistics.

The conversation focused on students' perceptions and experiences with enrollment in the dual-credit courses. A conversation guide was prepared to ensure that the essential aspects of the program were included in the discussion. The guide focused on key areas of program awareness and intent, college preparedness, and academic support.

Program Awareness

For students who were zoned outside of the school, they appeared to exert an active effort to inquire about the opportunities available to them. They found out about the dual-credit courses during those inquiries. School teachers appear to be another source of information on dual-credit, "*My middle school teacher told me about the opportunities available to me since I was taking AP* (Advanced Placement) *History and I was*

very good at it." When asked whether they intended to pursue these dual-credit areas in college, a student responded, *"I am taking them so, I do not have to take them in college."* Other teachers acting in personal advisory capacities also informed students about the dual-credit program. *"Ms…told me about it,"* one student remarked. A male student indicated that it just happened that the classes he selected were dual-credit. In his words, *"I think the classes chose me,"* he said.

Program Intent

Students understood clearly the intent of the program was to gain both high school and college credits. When asked, all the students in the group intended to attend four-year colleges. However, they were not as clear as to what was expected until well into the program. According to one student, supported by several others, it was not until their grade point average (GPA) fell did they realized the demands of the dual-credit program and recognized the need to be more serious. Many, however, indicated that they continue to need help.

College Preparation

Students described the program as rigorous and were confident that it was preparing them for college based on the level of course difficulty and the large volume of work involved compared to their assessment of their peer's work who were not dually enrolled and because they were enrolled in multiple Advanced Placement (AP) courses. Similarly, they expressed that their peers, who were not dually enrolled in courses, felt the same way. "*AP classes are significantly more difficult than regular classes,*" one student assured when asked whether the dual-credit courses were preparing them for college. They also felt that strict deadlines for submitting assignments with consequences reduced the tendency to forget, served as catalyst for better organization and planning, and mimicked the kind of experience they believed they would have in college.

Academic Support

Most of the students in the focus group appeared to need academic support which does not appear to be available outside of school. Many laughed when the evaluator suggested they get help from parents. One student indicated that his father had dropped out of school in the eighth grade. Another said, he was in engineering and there was no way his parent could even understand what he was doing. Many felt that teachers could be a useful resource beyond just instruction and can provide additional assistance when requested. A few of the students felt that some of their teachers did not understand how they learned and did not differentiate their instructions to meet their preferred learning style. When probed about their knowledge of learning styles, several students indicated that they were enrolled in the Education and Training courses learning how to teach and had become familiar with the concept. Some felt that their requests for academic help or assistance was not treated seriously enough.

Discussion

Compared to the general HISD enrollment, a higher proportion of Hispanic, G/T, female, and economically-disadvantaged students and a considerably lower proportion of LEP students were enrolled in dual-credit courses in 2017. Young's (2013) analysis of students in a Texas community college found females outnumber males and White outnumbered all other ethnic groups in dual-credit enrollments. This study finds that Hispanic students outnumbered all other groups. Hispanic students, however, make up about two-thirds of HISD's student population. Consistent with the literature on dual-credit performance (Young,

2013), HISD students who were enrolled in dual-credit courses outperformed their non-dual-credit peers on all five EOC exams offered on the 2017 STAAR. A higher percentage of dually-enrolled students compared to their non-dually-enrolled peers met the Approaches Grade Level and Masters Grade Level standards on Algebra I, Biology, English I, English II, and U.S. History. Findings from the report concur with previous literature that LEP students tended not to enroll in dual-credit courses (Hanson, Bisht, & Motamedi, 2016).

When disaggregated, the performance of dual-credit students showed two distinct features. First, a higher proportion of students identified as G/T met the Approaches Grade Level standard on all five STAAR EOC exams. In addition, Black students outperformed their Asian, Hispanic, and White peers on 2017 STAAR Algebra I and Asian and Hispanic students on the Biology EOC exam. The performance of Black and economically- disadvantaged students was comparable to that of their peers on the 2017 STAAR Algebra I, Biology I, and U.S. History EOCs. G/T identification was the strongest positive predictor of performance on all five tests for students who were dually-enrolled. Special education designation, at-risk status, and LEP were all strong, but negative predictors of student performance on all five STAAR EOC exams. Economically-disadvantaged status also had strong negative effects on STAAR English I, English II, and U.S. History EOC tests.

Student enrollment in dual-credit courses resulted in statistically significant higher scale scores on the 2017 STAAR Algebra I ($p<.05$), English I and II and U.S. History ($p<.001$) because they were dually enrolled. English II had the largest effects at 113.4 ssp followed by U.S. History at 101.9 ssp. These findings indicate that had the students not been enrolled in dual-credit course, their average scale scores for English I and U.S. History would have been at the potential outcome mean of 4062.0 and 4239.4, respectively.

Students interviewed for this report were confident that their dual-credit courses were rigorous and prepared them for college when they compared their work to that of their non-dually enrolled peers. Students felt that they were prepared academically and that the courses were designed to provide the attitude and personal responsibility required for college success. Students, however, believed they could have received more school-based academic support in a timely manner, and that the link between how they were taught and their learning styles was stronger. Student revealed several ways in which they came to know about the dual-credit – by chance, personal inquiry, and the work of middle school counselors. The absence of a systematic approach to the dual-credit program awareness meant that students by their own admission were unprepared for enrollment and the subsequent depressing effect it had on their grade point average (GPA).

Recommendations

- Given the positive gains for students who enroll in dual credit courses, HISD should continue to promote dual-credit enrollment as a viable option for students to obtain college credits and to prepare them for the rigorous academic experiences of college.

- In response to the varied and inchoate way students receive information on dual credit, College and Career Readiness should develop and implement a systematic and sustained awareness and information strategy on dual-credit enrollment and benefits to better inform students as early as middle school on the dual-credit program, and where offered, in addition to the existing web resources.

- Schools should provide additional support through tutorials, peer groups or industry experts for dual-credit students in response to students' proposed recommendation for more academic support.

- Given the results and feedback from the focus group, continuous feedback should be solicited from dual-credit students to determine their perceptions and experience to develop and tailor support programs to meet their needs and those of future enrollees.

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Appendix A

Table 1. Percentage Distribution of Study Sample by STAAR EOC Test, HISD, 2016–2017

Demographic Characteristics		Algebra I		Biology		English I		English II		U.S. History	
		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	**10,780**	**354**	**11,973**	**522**	**14,709**	**629**	**14,098**	**1,098**	**9,775**	**1,596**
Ethnicity	Asian	2.0	0.8	3.6	1.0	3.2	2.4	4.0	2.8	4.2	2.2
	Blacks	26.3	26.6	23.8	23.2	24.9	24.2	24.4	20.1	24.6	21.6
	Hispanic	64.1	69.2	62.9	72.8	63.6	70.1	61.4	73.1	59.4	71.9
	White	6.5	2.3	8.6	2.1	7.3	2.7	8.9	3.2	10.5	3.5
Gender	Female	46.7	55..1	49	56.1	46.5	53.1	48.9	59.7	50.9	57.8
	Male	53.3	44.9	51	43.9	53.5	46.9	51.1	40.3	49.1	42.2
G/T	No	94.7	93.5	85.1	77.0	87.2	77.9	83.9	71.9	85.0	80.3
	Yes	5.3	6.5	14.9	23.0	12.8	22.1	16.1	28.1	15.0	19.7
At-Risk	No	35.1	46.6	47.8	60.3	40.4	54.5	38.5	58.1	42.4	60.2
	Yes	64.9	53.4	52.2	39.7	59.6	45.5	61.5	41.9	39.8	39.8
Special Ed	No	88.1	90.4	90.8	96	89.3	93.6	92.3	95.2	63.2	96.8
	Yes	11.9	9.6	9.2	4.0	10.7	6.4	7.7	4.8	6.8	3.2
Economically Disadvantaged	No	20.4	19.2	23.7	18.0	22.3	17.6	26.7	15.1	30.2	18.4
	Yes	79.6	80.8	76.3	82.0	77.7	82.4	73.3	84.9	69.8	81.6
LEP	No	72.3	80.8	77.7	84.7	75.8	84.4	81.8	93.0	88.0	95.7
	Yes	27.7	19.2	27.4	15.3	24.2	15.6	18.2	7.0	12.0	4.3

Source: IBM Cognos, HISD Chancery Ad-Hoc data warehouse, 2016–2017; First time testers and retesters.

Table 2. Disaggregated Percentage of Dually-Enrolled Students Who Met Approaches Grade Level Student Standard on the 2017 STAAR EOC Exams, HISD

Variable		Algebra I	Biology	English I	English II	U.S. History
Grade	Ninth	83.7	86.3	77.5	33.3	100.0
	Tenth	53.3	35.0	20.5	85.6	91.5
	Eleventh	47.1	41.7	21.7	23	97.5
	Twelfth	*	*	33.3	*	75.0
G/T	No	77.6	78.4	56.7	73	96.1
	Yes	100.0	100.0	99.3	97.4	100.0
Gender	Female	81.0	75.4	68.9	83.2	97.3
	Male	76.7	80.8	63.1	74.9	96.3
Ethnicity	Asian	66.7	80.0	80.0	80.6	97.1
	Black	80.9	83.5	61.8	73.8	95.9
	Hispanic	78.4	82.9	66.2	80.8	97.0
	White	75.0	90.9	82.4	91.4	98.2
At Risk	No	90.3	95.2	87.8	94.4	99.6
	Yes	69.3	65.2	40.2	59.8	92.8
Special Ed	No	83.4	84.8	69.4	82.9	98.0
	Yes	32.8	47.6	17.5	20.8	62.7
Economically Disadvantaged	No	79.4	87.2	74.8	88.6	98.0
	Yes	79.0	82.5	64.3	78.3	96.6
LEP	No	83.2	88.7	88.7	84.1	97.8
	Yes	61.8	53.8	53.8	23.4	76.8

Source: IBM Cognos, HISD Chancery Ad-Hoc data warehouse, 2016–2017; *Less than five students tested. First time testers and retesters.

Table 3. STAAR EOC Performance Predictors for Dually-Enrolled HISD Students by Test, 2016–2017

	STAAR EOC Subject	Unstandardized Coefficients	Std. Error	Standardized Coefficients
		B		Beta
Algebra	**R^2**	**.292**		
	(Constant)	3950.2**	51.4	
	G/T Identification	385.5**	74.5	.242
	Gender	-7.0	36.9	-.009
	At Risk Status	-211.7**	39.8	-.269
	Special Ed designation	-295.3**	63.2	-.222
	Economically Disadvantaged	27.2	46.5	.027
	LEP	-90.8	49.4	-.091
Biology	**R^2**	**.485**		
	(Constant)	4229.6**	51.0	
	G/T Identification	477.4**	45.7	.372
	Gender	21.0	37.1	.019
	At Risk Status	-282.2**	42.5	-.255
	Special Ed designation	-425.2**	94.4	-.155
	Economically Disadvantaged	-80.0	47.7	-.057
	LEP	-297.0**	56.1	-.198
English I	**R^2**	**.537**		
	(Constant)	4289.3**	44.5	
	G/T Identification	401.7**	40.3	.312
	Gender	-48.0	31.3	-.045
	At Risk Status	-362.8**	36.3	-.338
	Special Ed designation	-426.9**	65.5	-.195
	Economically Disadvantaged	-172.9**	40.9	-.123
	LEP	-235.7**	46.5	-.160
English II	**R^2**	**.540**		
	(Constant)	4417.4**	36.1	
	G/T Identification	337.1**	28.7	.284
	Gender	-39.5	25.5	-.036
	At Risk Status	-323.6**	27.1	-.299
	Special Ed designation	-555.7**	59.0	-.223
	Economically Disadvantaged	-151.6**	34.6	-.102
	LEP	-415.9**	50.7	-.199
U.S. History	**R^2**	**.379**		
	(Constant)	4443.0**	27.5	
	G/T Identification	256.0**	26.7	.216
	Gender	139.4**	21.1	.146
	At Risk Status	-231.4**	22.6	-.241
	Special Ed designation	-448.1**	59.6	-.167
	Economically Disadvantaged	-111.2**	26.7	-.091
	LEP	-312.8**	52.4	-.135

** $p < .001$; *$p < .05$

Table 4. Effects of Dual-credit Enrollment on the 2017 STAAR Algebra I EOC Student Performance, HISD

Algebra I **(n = 11,134)**	Coefficient	Robust Standard Error	z	p	95% Confidence Level
ATET					
Dual-credit					
(1 vs 0)	48.9	18.6	2.6	0.008	12.5 - 85.3
Potential Outcome mean					
0	3786.3	13.6	279.4	0.000	3759.8 - 3812.9

p. < .001; p <.05; Standards: Approaches 2012-2015 Standard: 3500; Approaches (after 12/2015): 3550–3970; Meet: 4000–4294; Masters: 4333–6100

Table 5. Effects of Dual-credit Enrollment on the 2017 STAAR Biology EOC Student Performance, HISD

Biology **(n = 12,495)**	Coefficient	Robust Standard Error	z	p	95% Confidence Level
ATET					
Dual-credit					
(1 vs 0)	14.4	18.7	0.77	0.442	-22.3 - 51-.0
Potential Outcome mean					
0	4094.0	17.3	236.3	0.000	4060.1 - 4128.0

p. < .001; p <.05 Standards: Approaches 2012-2015 Standard: 3500–3523; Approaches (after 12/2015): 3599–3967; Meet: 4000–4500; Masters: 4576–6203

Table 6. Effects of Dual-credit Enrollment on the 2017 STAAR English I EOC Student Performance, HISD

English I **(n = 15,338)**	Coefficient	Robust Standard Error	z	p	95% Confidence Level
ATET					
Dual-credit					
(1 vs 0)	55.3	16.1	3.44	0.001	23.7 - 86.7
Potential Outcome mean					
0	3929.1	16.7	234.6	0.000	3896.3 - 3961.9

p. < .001; p <.05; Standards: Approaches 2012-2015 Standard: 3750; Approaches (after 12/2015): 3775–3969; Meet: 4000–4647; Masters: 4691–6314

Table 7. Effects of Dual-credit Enrollment on the 2017 STAAR English II EOC Student Performance, HISD

English II **(n = 15,196)**	Coefficient	Robust Standard Error	z	p	95% Confidence Level
ATET					
Dual-credit					
(1 vs 0)	113.4	13.3	8.5	0.000	87.2 - 139.5
Potential Outcome mean					
0	4062.0	13.1	309.7	0.000	4036.7 - 4088.1

p. < .001; p <.05 Standards: Approaches 2012-2015 Standard: 3750; Approaches (after 12/2015): 3775–3961; Meet: 4000–4769; Masters: 4831–6341

Table 8. Effects of Dual-credit Enrollment on the 2017 STAAR U.S. History EOC Student Performance, HISD

U.S. History **(n = 11,371)**	Coefficient	Robust Standard Error	z	p	95% Confidence Level
ATET					
Dual-credit					
(1 vs 0)	101.9	11.7	8.72	0.000	79.0 - 124.8
Potential Outcome mean					
0	4239.4	9.14	463.8	0.000	4221.5 - 4257.3

p. < .001; p <.05 Standards: Approaches 2012-2015 Standard: 3500; Approaches (after 12/2015): 3550–3966; Meet: 4000–4381; Masters: 4440–6476