

EXECUTIVE SUMMARY: THE PATH TO GRADUATION

Prepared for Arlington Public Schools

October 2018



In the following report, Hanover Research explores the academic and demographic factors of Grade 1-12 students which predict on-time graduation and the attainment of advanced vs standard diplomas within Arlington Public Schools based on the data for three graduating cohorts – 2013/14 through 2015/16.

This study is limited to two primary research questions and was not expanded to other potential areas for inquiry identified during the course of the investigation. As such, this study should be considered a starting point for research into factors contributing to graduation at APS.

TABLE OF CONTENTS

Executive Summary and Key Findings	3
INTRODUCTION	3
RECOMMENDATIONS	3
KEY FINDINGS	4
Section I: Data and Methodology.....	7
DATA.....	7
Variables of Interest	7
Explanatory Variables	7
METHODOLOGY	8
Section II: Main Findings Across All School Levels.....	9
ADVANCED DIPLOMA COMPARED TO STANDARD DIPLOMA ATTAINMENT	9
Elementary School	9
Middle School	9
High School	11
ON-TIME GRADUATION.....	12
Appendix: Regression Results	15

EXECUTIVE SUMMARY AND KEY FINDINGS

INTRODUCTION



METHODOLOGY

This study relies on behavioral and academic data for three cohorts of Grade 1-12 students. Hanover uses **logistic regression models**, which allow us to calculate the marginal effects at means of explanatory variables on the outcomes of interest. That is, we can identify which variables—i.e. course grades, test scores, and attendance—are correlated with graduating on-time and earning advanced diplomas. We can also estimate the *degree* to which these outcomes change as a function of changes in predictor variables.

Beginning in early 2017, Hanover Research began a study to identify behavioral and academic factors that are correlated with successful outcomes for Arlington Public Schools (APS) students. This project addresses two primary research questions:¹



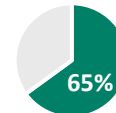
■ What factors correlate most strongly with **on-time graduation**?



■ What factors correlate most strongly with **earning advanced diplomas** (rather than standard diplomas)?

Currently, **65%** of APS graduates earn **advanced diplomas**.

Over **90%** of APS students **graduate on-time**.



ADVANCED
DIPLOMAS



ON-TIME
GRADUATION

RECOMMENDATIONS

- ✓ **Continue to emphasize reading and math skills in primary grades.** Students who pass core subjects—reading, writing, and math—in early grades are more likely to earn advanced diplomas when they graduate from high school. APS should continue to support student learning in early elementary grades and ensure that students are meeting learning standards and benchmarks.
- ✓ **Strengthen the early identification system for students who are at-risk of failing core subjects in middle and high school.** Because failing core subjects is associated with a decreased likelihood of earning an advanced diploma, Hanover recommends further developing the early warning system to identify and support students who are failing or at-risk of failing math, English/language arts, science, and social studies courses in middle and high school.
- ✓ **Provide additional supports for English learners who matriculated into APS at later grades.** EL students who matriculate into the district in middle school and high school are significantly more likely to take HILT in high school and have much lower on-time graduation rates.

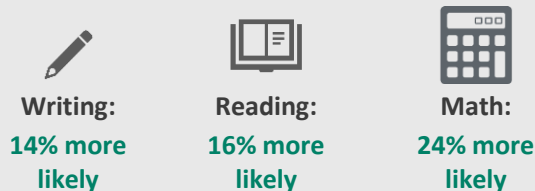
¹ This study is limited to the two primary research questions elaborated on this page, and was not expanded to other potential areas for inquiry identified during the course of the investigation. As such, this study should be considered a starting point for research into factors contributing to graduation at APS.

KEY FINDINGS

Students are more likely to earn advanced diplomas when they...²

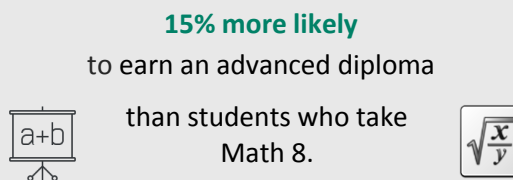
Pass classes in early grades.

Grade 2 students who **pass core subjects** are more likely to earn advanced diplomas.



Take Algebra I, Intensified in Grade 8.

Students who take **Algebra I, Intensified** in Grade 8 are



Have higher SOL scores, especially in math.



Students are around **1% more likely** to earn an advanced diploma for each **10-point increase** in math SOL scores in Grades 3-8.



Students are around **1% more likely** to earn an advanced diploma for each **30-point increase** in reading SOL scores in **Grade 7 only**.

Do *not* fail core classes in later grades.

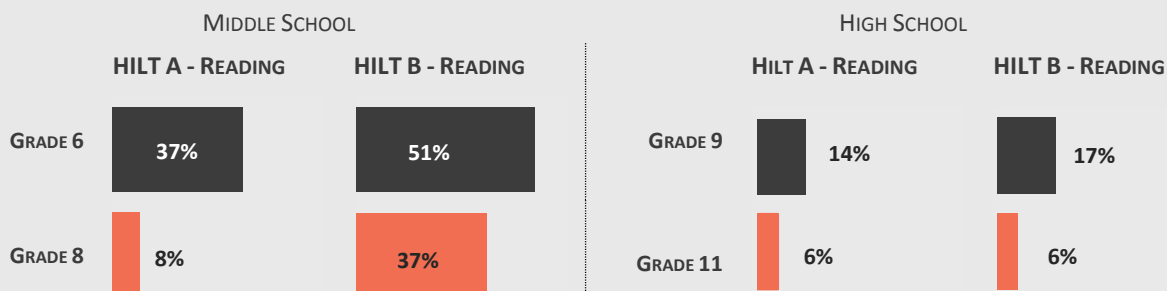
Students who **fail** the following subjects...

- **Math** in Grades 9 and 12
 - **ELA** in Grades 8 and 11
 - **Science** in Grade 7
 - **Social Studies** in Grades 7, 9, and 10
- ...are at least **10% less likely** to earn an advanced diploma.

Take HILT classes early.

In both middle and high school, students who take HILT classes in **later grades** are **less likely** to earn advanced diplomas.

EXAMPLE: STUDENTS WHO TAKE HILT READING CLASSES (BY GRADE) AND RECEIVE ADVANCED DIPLOMAS

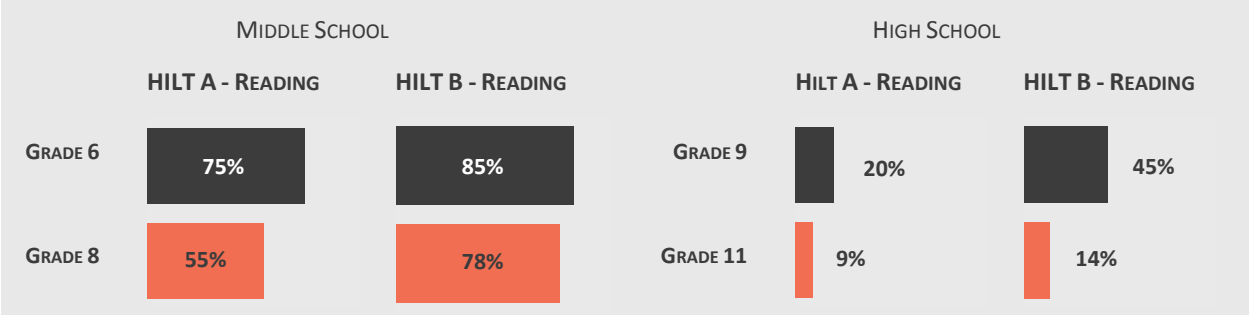


² All findings highlighted in this report are statistically significant at at least the 90 percent confidence interval.

Because APS has a relatively high on-time graduation rate, few factors—besides HILT participation—are associated with on-time graduation.

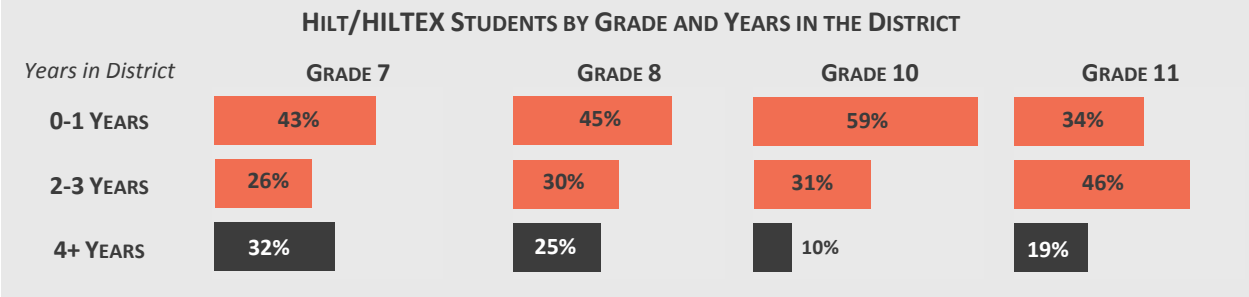
- **Course grades and SOL scores are associated with just small increases in the likelihood of graduating on-time.** For example, passing math in Grade 2 correlates with a 4 percent higher chance of graduating on-time, and receiving an “A” in English/Language Arts or science in Grade 10 is associated with a 2 percent higher chance. Higher math SOL scores are also positively associated with on-time graduation, but only for scores in Grades 4, 5, and 9.
- **Like earning advanced diplomas, the earlier students take HILT classes, the more likely they are to graduate on time.** Students **who take HILT A/B Reading and English classes** late in their high school career have particularly low on-time graduation rates.

EXAMPLE: STUDENTS WHO TAKE HILT READING CLASSES (BY GRADE) AND GRADUATE ON TIME



Most students who take HILT/HILTEX classes late in middle or high school have been in the district for a short amount of time, often less than 2 years.

- **In both middle and high school, a notable proportion of students who take HILT/HILTEX classes have been in the district for less than two years.** Over 40 percent of Grades 7 and 8 HILT/HILTEX students, over half of Grade 10 HILT/HILTEX students, and over one-third of Grade 11 HILT/HILTEX students have been in the district for under two years. Across these grades, a quarter to one-half of HILT/HILTEX students have been in the district for just two to three years.



Attendance has a small effect on both earning advanced diplomas and graduating on-time.

- **Students with more absences are less likely to graduate on-time and earn advanced diplomas, but the magnitude of this effect is quite small.** When controlling for other student characteristics, attendance in Grades 6-9 and 11-12 is significantly associated with earning an advanced diploma, while attendance in Grades 5-8 and 11-12 is significantly associated with graduating on-time. However, each absence is correlated with **less than a 0.5 percent decrease** in the likelihood of these outcomes. For example:

A student with just **1 unexcused absence**
in **Grade 6...**



...is **0.4% less likely** to earn an advanced diploma and **0.06% less likely** to graduate on-time (compared to having no unexcused absences).

vs

A student with **10 unexcused absences** in
Grade 6...



...is just **4% less likely** to earn an advanced diploma and **0.6% less likely** to graduate on-time (compared to having no unexcused absences).

SECTION I: DATA AND METHODOLOGY

In this section, Hanover briefly summarizes the available data and discusses the methodology used in the analysis.

DATA

APS has provided Hanover with the data that includes student ID, school, graduation cohort and status, type of diploma received, ethnicity/race, date of birth, gender, first and district entry dates, Standards of Learning (SOL) test date, name and subject, the level of proficiency achieved, score, and best score indicator, last school indicator, attendance-related variables, LEP, special education, free or reduced lunch (FRL), Gifted, Montessori, Language Immersion program, Title 1, and 504 Plan statuses, grade levels, course description and course mark.

VARIABLES OF INTEREST

ON-TIME GRADUATION

We construct the on-time graduation variable based on the information on whether each student who entered in a certain grade graduated with the same cohort. By graduation date these three cohorts are:

- 2014 Cohort (Grade 12 in 2013/14 academic year),
- 2015 Cohort (Grade 12 in 2014/15 academic year),
- 2016 Cohort (Grade 12 in 2015/16 academic year).

For example, a student entering the district as a Grade 6 student in the 2007/08 academic year is classified as an on-time graduate if he graduates in 2013/14. However, if he graduates in 2014/15, this student is not classified as an on-time graduate.

STANDARD VS ADVANCED DIPLOMA

We create this variable of interest based on the “Graduate Completer Type” variable. We retain values for advanced (Advanced Studies Diploma and IB Diploma) and standard diplomas (Standard Diploma and Modified Standard Diploma). Other completer types are not considered. The advantage of this variable is that, compared to the on-time graduation, it is more evenly distributed.

EXPLANATORY VARIABLES

COURSE MARKS

We only consider courses with sufficient enrollment (at least 200 students in at least one grade in Grades 6-8; at least 1,000 students overall in Grades 9-12, with the exception of AP Calculus and Pre-Calculus). We further recode the courses to include Special Education,

Montessori, Spanish Immersion, International Baccalaureate (IB), and Dual Enrollment versions of these classes.³

Out of these classes we only retain those that have letter marks A-F. We create a variable that divides students into three performance groups: those who received an “A,” those who received a “B/B+” or a “C/C+,” and those who received a “D/D+,” an “E,” or an “F” mark. In some instances, these courses have a “P” for Pass, or marks on the O/S/U scale (outstanding/satisfactory/unsuccessful). We ignore such observations.

METHODOLOGY

Since the variables of interest are binary (i.e., take on two values), we apply logistic regression models to the data. We use logistic regression models because these models are more useful when predicting students’ probability of graduating on time or receiving a particular type of diploma, since they produce predicted probabilities that are bounded by 0 and 100 percent. The disadvantage of these models is that they can be difficult to interpret. To mitigate this, we report the results of the regressions primarily as marginal effects at the mean (MEMs).⁴

For numeric variables, such as number of absences, the MEMs show the effect on the probability of on-time graduation of a one point increase in the variable in question,⁵ for a student who is near the average for both the variable in question and for all other variables. For categorical variables, such as letter grades, the MEMs show the difference in predicted probability of graduation when moving from a reference category to the category in question (for example, from B to A) for a student who is average in terms of all other variables.

In both models, we control for an indicator for the student participating in the Language Immersion program, and demographic variables such as gender, race/ethnicity, LEP, Gifted, free/reduced lunch, and special education statuses, as well as course performance, math and English SOL scores, and attendance in every grade. We also control for the graduation cohort to capture cohort-specific trends.

³ We control for special education status as described above, to make sure that we establish any differences between these courses and regular classes.

⁴ Regression tables can be found in the Appendix.

⁵ For SOL scores, we instead show the effect of a 10-point increase because one point represents such a small change on these tests.

SECTION II: MAIN FINDINGS ACROSS ALL SCHOOL LEVELS

ADVANCED DIPLOMA COMPARED TO STANDARD DIPLOMA ATTAINMENT

ELEMENTARY SCHOOL

- **Students with a Reading Level at or above their grade level in Grade 1** or who succeed in terms of Reading Level Achievement or Writing in Grade 2 are more likely to receive an advanced diploma.
- Students who perform at or above grade level in terms of their Mathematics Level in Grades 2 or 5 are more likely than those who perform below grade level to receive an advanced diploma rather than a standard diploma, by roughly 24 percent. The relationship is also positive, but not statistically significant, in other elementary school grade levels.
- When we break success down into three groups by letter marks, we find that, compared to students with a B or C mark, receiving an A mark in Science in Grades 4-5 or Writing in Grades 3-4 corresponds to a higher chance of a student receiving an advanced diploma. Similarly, **receiving an A in Reading Achievement in Grade 4 correlates with a higher chance of attaining an advanced diploma rather than a standard diploma** (an increase of 4 percent).
- SOL scores are also positively correlated with the likelihood of graduating with an advanced diploma. For instance, for every 10-point increase on the reading assessment in Grade 5, the chance of receiving an advanced diploma increases by roughly 1 percent.
- Students who participate in the Language Immersion program in Grade 5 are 10 percent more likely than other students to graduate with an advanced diploma rather than a standard diploma.

MIDDLE SCHOOL

- **Math SOL scores are positively correlated with the likelihood of attaining an advanced diploma** relative to the standard diploma. A 10-point increase in math SOL score in Grade 8 would increase the chance of graduating with an advanced diploma by roughly 1 percent for the average student. Reading SOL scores show a similar but weaker relationship, but only in Grade 7.
- For most classes considered, better performance leads to higher chances of attaining an advanced diploma relative to a standard diploma. Taking classes of a higher level (for example, Algebra I rather than Math 8 in Grade 8) also results in a higher chance of graduating with an advanced diploma. On average, course performance in later grades is more likely to be correlated with the likelihood of attaining an advanced diploma.

- Students who take HILT classes in the 1st or 2nd levels (HILT A and B, respectively) become less likely to receive an advanced diploma the later they take these classes. For example, among students who graduated with a diploma, taking HILT A English in Grade 6 increases the likelihood of receiving an advanced diploma compared to taking this class in Grade 8.
 - It is important to note that only 37 percent of students have been at the district for 4 or more years by the time they took the recorded HILT/HILTEX classes (Figure 2). In Grades 7 and 8, 26 and 18 percent of HILT/HILTEX students, respectively, spent less than 1 year in the APS system. Hence, students taking HILT and HILTEX classes in later grades are more likely to have only recently started at APS.

Figure 1: Share of Students in HILT/HILTEX Classes Receiving Advanced Diploma (Grades 6-8)

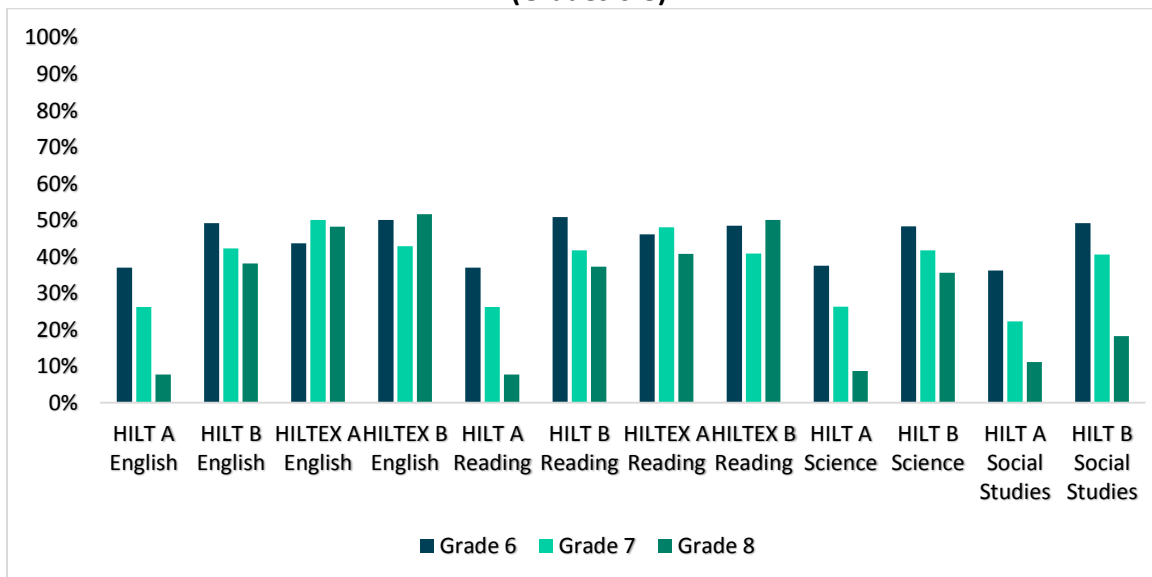


Figure 2: Shares of HILT/HILTEX Students by District Starting Grade (Grades 6-8)

YEARS IN THE DISTRICT	HILT GRADE							
	GRADE 6		GRADE 7		GRADE 8		TOTAL	
	N	Pct	N	Pct	N	Pct	N	Pct
0	43	16.54%	51	26.15%	29	17.68%	123	19.87%
1	33	12.69%	32	16.41%	45	27.44%	110	17.77%
2	38	14.62%	28	14.36%	27	16.46%	93	15.02%
3	19	7.31%	22	11.28%	22	13.41%	63	10.18%
4	19	7.31%	12	6.15%	11	6.71%	42	6.79%
5	20	7.69%	12	6.15%	4	2.44%	36	5.82%
6	88	33.85%	11	5.64%	6	3.66%	105	16.96%
7	0	0.00%	27	13.85%	3	1.83%	30	4.84%
8	0	0.00%	0	0.00%	17	10.37%	17	2.75%
Total	260	100.00%	195	100.00%	164	100.00%	619	100.00%

Note: These numbers are at student-year level, i.e. one student can take several HILT/HILTEX classes.

HIGH SCHOOL

- **Students with higher history SOL scores in Grades 9 and 11 are more likely than those with lower scores to earn an advanced diploma rather than a standard diploma.** An average student with a History SOL score that is 10 points higher in Grade 11 would be approximately 0.5 percent more likely to earn an advanced diploma. Math SOL scores show the same relationship for students in Grade 10.
- **For most classes considered, students who obtain higher grades are more likely to earn an advanced diploma.** Taking classes of a higher level (for example, Algebra II rather than Geometry in Grade 10) also results in a higher chance of graduating with an advanced diploma. However, the reverse (for example, taking Geometry rather than Algebra II in Grade 11) results in a lower chance of graduating with an advanced diploma. Marks in Social Studies classes are more important to the likelihood of earning an advanced diploma in Grades 9-10, and marks in math classes are relevant across all grades. Failing a World Language course in Grade 9 or 10 also has a negative impact on the likelihood of earning an advanced diploma.
- Similar to middle school findings, students who take HILT classes are less likely to receive an advanced diploma the later they take these classes. For example, among students who graduated with a diploma, those who take HILT A English in Grade 9 are more likely to receive an advanced diploma than those who take this class in Grade 11.
 - Roughly 12 percent of students have been at the district for 4 or more years by the time they took the recorded HILT/HILTEX classes (Figure 5). In Grades 10 and 11, 25 and 16 percent of HILT/HILTEX students, respectively, spent less than 1 year in the APS system. Hence, students taking HILT and HILTEX classes in later grades are more likely to have only recently started at APS.

Figure 3: Share of Students in HILT/HILTEX Classes Receiving Advanced Diploma (Grades 9-11)

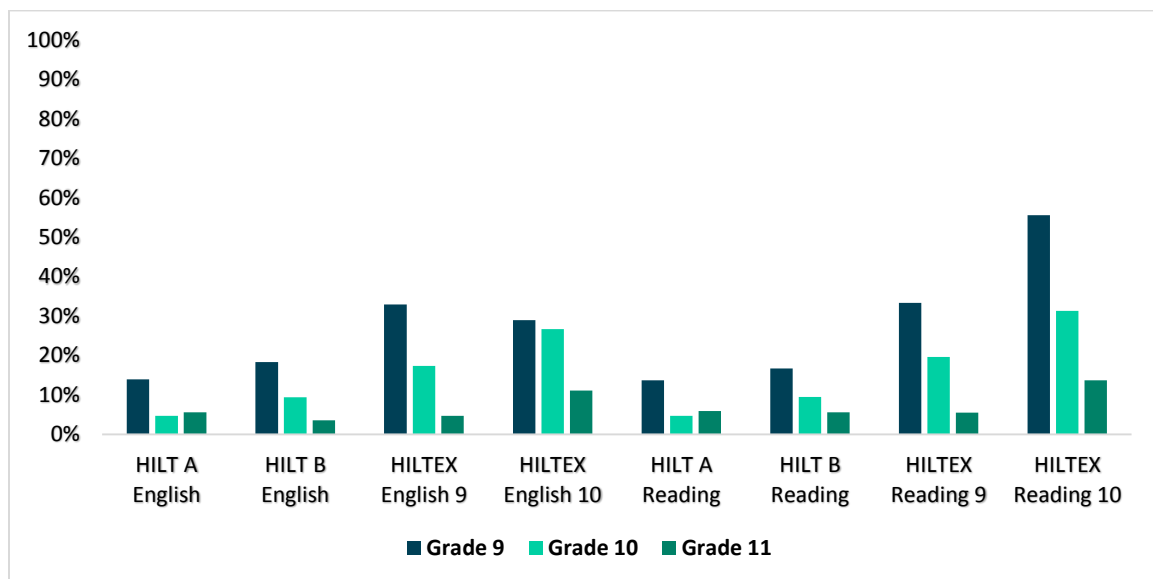


Figure 4: Share of Students in HILT English/Reading Classes Receiving Advanced Diploma

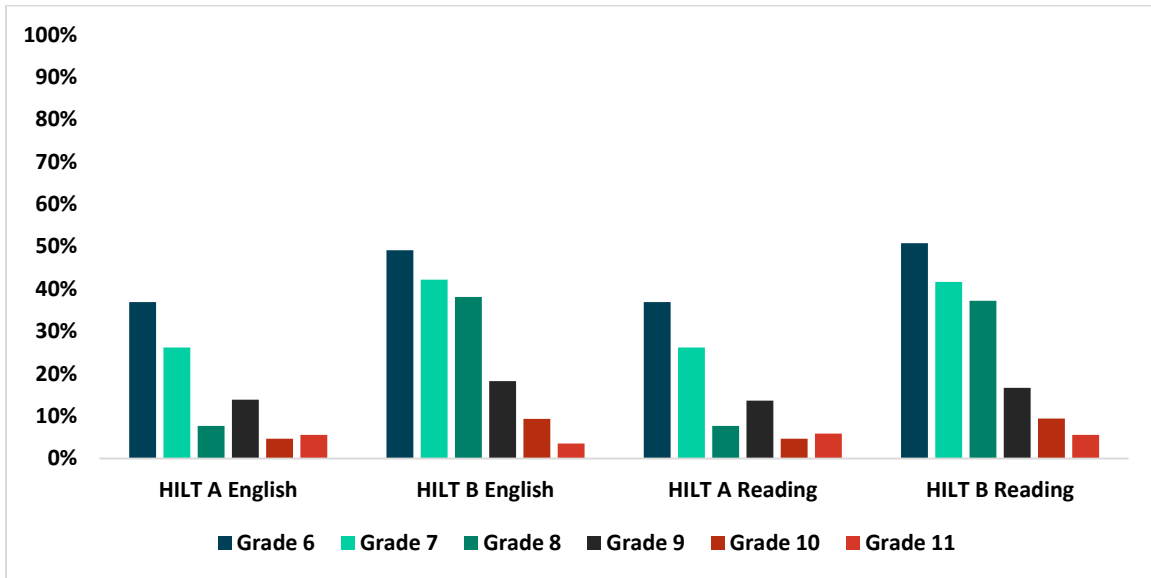


Figure 5: Shares of HILT/HILTEX Students by Years in the District (Grades 9-11)

YEARS IN THE DISTRICT	HILT GRADE							
	GRADE 9		GRADE 10		GRADE 11		TOTAL	
	N	Pct	N	Pct	N	Pct	N	Pct
0	198	55.00%	82	25.23%	38	16.45%	318	34.72%
1	73	20.28%	110	33.85%	41	17.75%	224	24.45%
2	38	10.56%	64	19.69%	59	25.54%	161	17.58%
3	21	5.83%	36	11.08%	48	20.78%	105	11.46%
4	16	4.44%	15	4.62%	29	12.55%	60	6.55%
5	6	1.67%	7	2.15%	10	4.33%	23	2.51%
6	4	1.11%	6	1.85%	2	0.87%	12	1.31%
7	1	0.28%	2	0.62%	2	0.87%	5	0.55%
8	1	0.28%	2	0.62%	2	0.87%	5	0.55%
9	2	0.56%	0	0.00%	0	0.00%	2	0.22%
10	0	0.00%	1	0.31%	0	0.00%	1	0.11%
Total	360	100.00%	325	100.00%	231	100.00%	916	100.00%

Note: These numbers are at student-year level, i.e. one student can take several HILT/HILTEX classes.

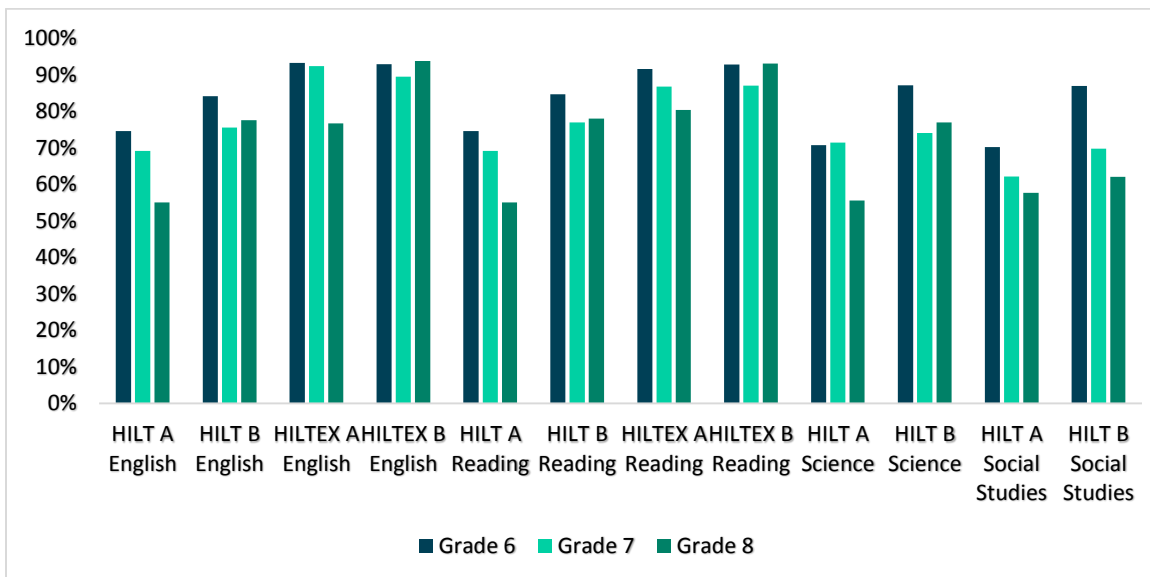
ON-TIME GRADUATION

Over 90 percent of students graduate on time in the three cohorts analyzed. Due to lower variation than we see with the advanced vs standard diploma attendance (65 percent of students who graduate with a diploma earn an advanced diploma) there are fewer student characteristics that strongly correlated with the on-time graduation.

- **Performing well on the Mathematics Level class in Grade 2 correlates with a higher chance of on-time graduation** (passing this class is associated with a 4 percent higher likelihood of graduating on time), as well as performing well in US History/Civ/Eco 1865-Present and Science 7 classes in Grade 7.

- **Students who do well in ELA and science classes in Grade 10 are more likely to graduate on time.** Getting an “A” in either of these subjects increases the chance of on-time graduation by roughly 2 percent. Performance in most other classes in Grades 9-12 does not appear to significantly impact on-time graduation.
- For every day a student is absent in Grade 5, the likelihood of graduating on time declines by 0.01 percent. In Grade 6 the likelihood declines by 0.06 percent per every day absent. The likelihood of on-time graduation declines to a lesser extent in Grades 7 and 8, indicating that attendance in earlier middle school grades has a more significant impact on on-time graduation. **The highest correlation between on-time graduation and attendance is found in Grade 12**, where every missed day results in a 0.1 percent lower chance of graduating on time.
- Students with higher math and science SOL scores are more likely to graduate on time. However, the relationship does not hold consistently over all grade levels, and the magnitude of effect is not meaningfully large.
- Students in HILT classes are less likely to graduate on time if they take these courses in later grades.⁶

Figure 6: Share of Students in HILT/HILTEX Classes Graduating on Time (Grades 6-8)



⁶ See Figure 2 and Figure 5 for a discussion of students’ residence time in the district and HILT/HILTEX enrollment in middle school.

Figure 7: Share of Students in HILT/HILTEX Classes Graduating on Time (Grades 9-11)

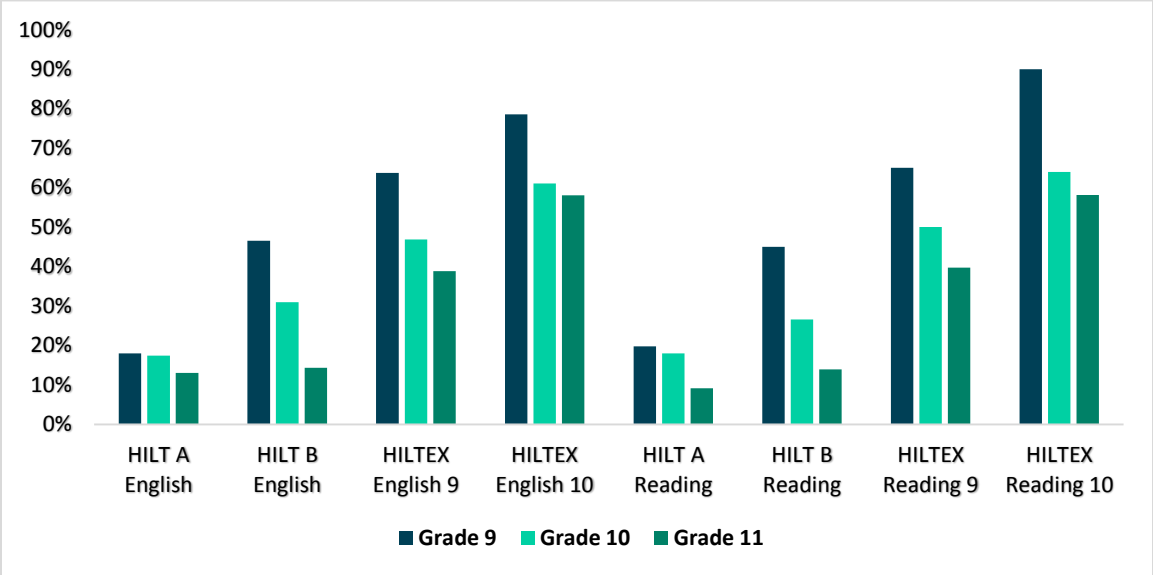
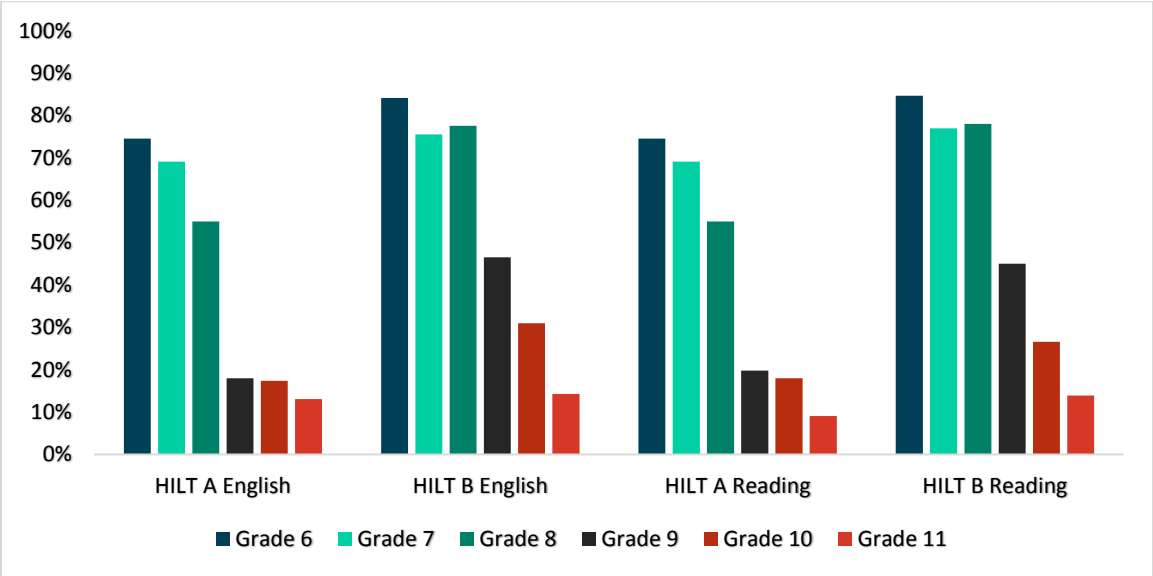


Figure 8: Share of Students in HILT English/Reading Classes Graduating on Time



APPENDIX: REGRESSION RESULTS

Figures A.1-A.4 display the course part of regression analyses across three school levels, while Figures A.5-A.6 show the remainder of the analyses, including demographic variables and SOL scores. Some courses and demographic variables have been omitted from the figures as they are not statistically significant predictors of the two outcomes. Under each figure, we list variables that are omitted.

For courses where students are separated into three groups, the reference group is those students who received a B or a C mark, and the MEMs represent the effect of earning the given grade (e.g., an A or a D/E) instead of a B or C.

In addition to the letter grades in each subject, Hanover controls for the specific courses that each student takes, using the most enrolled-in course in a particular department in a particular grade as the reference course (for example, English 9 would be the “reference” class for Grade 9 in ELA) and including indicators for whether the student opted for a different class in that semester using dummy variables such as “Algebra I Taken.” Only one class per student/grade/department combination is possible.⁷ The reference class in the brackets denotes the comparison. For example, the AP Calculus coefficient shows the likelihood of attaining the outcome of interest if the student takes AP Calculus instead of Algebra II in Grade 11 (holding the student’s mark in the course and other characteristics constant).

Figures A.7-10 show the descriptive analysis for the English for Speakers of Other Languages/High Intensity Language Training (ESOL/HILT) program. As the courses for this program are scored on a different scale than regular courses (O/S/U rather than A-F letter grades), we are not able to include them in the regression analysis used for other courses.

⁷ A small share of students has multiple classes per department. We retain the highest-level class in those cases (for example, Algebra II over Algebra I).

Figure A. 1: Advanced vs Standard Diploma Analysis: Courses in Grades 1-5 (MEM)

VARIABLES	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5
Courses					
Mathematics Level	0.0764	0.2399**	0.1278	0.0953	0.2385**
	(0.0746)	(0.1043)	(0.1312)	(0.0705)	(0.1195)
Reading Level	0.1137*	-0.0173	-0.0064	-0.0024	0.0305
	(0.0594)	(0.0419)	(0.0469)	(0.0310)	(0.0421)
Reading Achievement (A in Grades 3-5; Pass in Grades 1-2)	0.0548	0.1554***	0.0400	0.0404*	0.0277
	(0.0439)	(0.0558)	(0.0346)	(0.0219)	(0.0238)
Reading Achievement (D or E)			0.0593	-0.0964	-0.1113
			(0.0935)	(0.1134)	(0.1070)
Science (A in Grades 3-5; Pass in Grade 2)		0.0431	-0.0119	0.0414*	0.0773***
		(0.1273)	(0.0325)	(0.0220)	(0.0234)
Science (D or E)			-0.0784	-0.0307	-0.1566
			(0.1218)	(0.0771)	(0.1020)
Social Studies (A in Grades 3-5; Pass in Grade 2)		0.0514	0.0273	0.0135	0.0200
		(0.0885)	(0.0313)	(0.0219)	(0.0231)
Social Studies (D or E)			-0.0839	-0.0225	0.0639
			(0.1738)	(0.0451)	(0.0390)
Writing (A in Grades 3-5; Pass in Grades 1-2)	0.0822	0.1413***	0.0746**	0.0394*	0.0354
	(0.0550)	(0.0534)	(0.0350)	(0.0230)	(0.0233)
Writing (D or E)			-0.2296	-0.0652	-0.0727
			(0.2562)	(0.1026)	(0.1063)
Oral Communication	-0.0766*	-0.0625			
	(0.0426)	(0.0405)			
Observations	2,194	2,312	694	1,606	1,631

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure A. 2: On-Time Graduation Analysis: Courses in Grades 1-5 (MEM)

VARIABLES	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5
Courses					
Mathematics Level	0.0280	0.0398*		0.0035	0.0014
	(0.0177)	(0.0240)		(0.0056)	(0.0022)
Oral Communication	-0.0015	-0.0010			
	(0.0075)	(0.0054)			
Reading Level	0.0010	0.0067	-0.0056	-0.0008	-0.0045***
	(0.0091)	(0.0090)	(0.0037)	(0.0013)	(0.0017)
Science (A in Grades 3-5; Pass in Grade 2)		0.0062	-0.0012	-0.0001	-0.0008
		(0.0133)	(0.0042)	(0.0016)	(0.0017)
Science (D or E)			0.0040	-0.0020	-0.0028
			(0.0039)	(0.0038)	(0.0042)
Social Studies (A in Grades 3-5; Pass in Grade 2)		0.0278	0.0015	0.0071**	0.0006
		(0.0273)	(0.0036)	(0.0035)	(0.0017)
Social Studies (D or E)			-0.1306	-0.0021	-0.0158
			(0.0956)	(0.0055)	(0.0149)
Reading Achievement (A in Grades 3-5; Pass in Grades 1-2)	0.0150	-0.0024		0.0014	
	(0.0128)	(0.0047)		(0.0023)	
Reading Achievement (D or E)				-0.0009	
				(0.0047)	
Writing (A in Grades 3-5; Pass in Grades 1-2)	0.0019	0.0090		-0.0016	0.0025
	(0.0084)	(0.0091)		(0.0027)	(0.0022)
Writing (D or E)				0.0008	-0.0029
				(0.0018)	(0.0074)
Observations	2,224	2,339	696	1,624	2,488

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure A. 3: Regression Analysis: Courses in Grades 6-8 (MEM)

VARIABLES	DIPLOMA			ON-TIME GRADUATION		
	Grade 6	Grade 7	Grade 8	Grade 6	Grade 7	Grade 8
Subjects						
Social Studies (A)	0.0603***	0.0721***	0.0248	0.0015	0.0050*	-0.0021
	(0.0204)	(0.0177)	(0.0167)	(0.0045)	(0.0027)	(0.0032)
Social Studies (D/E)	-0.1045*	-0.1302**	-0.0450	-0.0089	-0.0142*	-0.0068
	(0.0633)	(0.0541)	(0.0371)	(0.0091)	(0.0083)	(0.0045)
ELA (A)	0.0110	0.0288	0.0802***	0.0056	-0.0007	0.0013
	(0.0196)	(0.0181)	(0.0192)	(0.0037)	(0.0022)	(0.0029)
ELA (D/F)	-0.0152	-0.0377	-0.1586***	-0.0111	-0.0015	-0.0125*
	(0.0431)	(0.0347)	(0.0468)	(0.0123)	(0.0022)	(0.0070)
Math (A)	0.0193	0.0706***	0.0434**	-0.0026	0.0012	0.0009
	(0.0223)	(0.0164)	(0.0193)	(0.0040)	(0.0025)	(0.0036)
Math (D/E)	-0.0220	-0.0623	-0.0949**	-0.0068	-0.0069	-0.0058
	(0.0272)	(0.0411)	(0.0389)	(0.0079)	(0.0043)	(0.0039)
Science (A)	0.0151	0.0085	0.0202	0.0035	0.0035	0.0002
	(0.0222)	(0.0182)	(0.0241)	(0.0037)	(0.0030)	(0.0036)
Science (D/E)	-0.0203	-0.1114***	-0.0671**	-0.0059	-0.0020	-0.0053
	(0.0289)	(0.0415)	(0.0269)	(0.0080)	(0.0032)	(0.0038)
Reading (A)	0.0686***			-0.0035		
	(0.0215)			(0.0037)		
Reading (D/E)	-0.1167*			0.0023		
	(0.0615)			(0.0016)		
Individual Courses						
Math 7 Taken [Ref=Math 6]	0.0580***			-0.0004		
	(0.0174)			(0.0030)		
Math 8 Taken [Ref Grade 6=Math 6, Ref Grade 7=Math 7]	0.0432	0.0463**		-0.0122	-0.0045	
	(0.0394)	(0.0183)		(0.0154)	(0.0041)	
Algebra I Taken [Ref=Math 8]			0.0892***			0.0017
			(0.0145)			(0.0028)
Algebra I, Intensified Taken [Ref Grade 7=Math 7, Ref Grade 8=Math 8]		0.0645***	0.1528***		-0.0024	0.0032
		(0.0248)	(0.0178)		(0.0069)	(0.0044)
Geometry, Intensified Taken [Ref=Math 8]			0.0950***			0.0029
			(0.0227)			(0.0043)
Science 7 Taken [Ref=Life Science]		0.0693			0.0039**	
		(0.0570)			(0.0018)	
Observations						
	2,309	2,816	3,041	2,325	2,853	3,083

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Also controlled for: Grade 6 - American Studies 6 [Ref=History 6], Grade 7 - American Studies 7 [History 7]. None of these courses are statistically significant predictors of outcomes of interest.

Figure A. 4: Regression Analysis: Courses in Grades 9-12 (MEM)

VARIABLES	DIPLOMA				ON-TIME GRADUATION			
	Grade 9	Grade 10	Grade 11	Grade 12	Grade 9	Grade 10	Grade 11	Grade 12
Subjects								
Social Studies (A)	0.0610***	0.0472***	0.0239*	0.0284			-0.0045*	-0.0020
	(0.0213)	(0.0174)	(0.0131)	(0.0183)			(0.0026)	(0.0048)
Social Studies (D/E)	-0.1051**	-0.1460**	-0.0696**	-0.0638**			-0.0040	0.0010
	(0.0436)	(0.0592)	(0.0330)	(0.0314)			(0.0033)	(0.0046)
ELA (A)	0.0325	0.0340**	0.0200	0.0127		0.0023*	-0.0001	-0.0061
	(0.0235)	(0.0171)	(0.0129)	(0.0199)		(0.0013)	(0.0021)	(0.0054)
ELA (D/E)	-0.0201	-0.0307	-0.1107***	-0.0619**		0.0005	0.0016	0.0004
	(0.0333)	(0.0280)	(0.0344)	(0.0280)		(0.0015)	(0.0016)	(0.0043)
Math (A)	0.0198	0.0049	-0.0353**	0.0191	-0.0004	0.0006	-0.0014	0.0021
	(0.0187)	(0.0203)	(0.0168)	(0.0203)	(0.0016)	(0.0020)	(0.0020)	(0.0037)
Math (D/E)	-0.1009**	-0.0490*	-0.0590***	-0.1045***	-0.0076	-0.0005	-0.0052	0.0012
	(0.0424)	(0.0298)	(0.0215)	(0.0237)	(0.0054)	(0.0014)	(0.0041)	(0.0042)
Science (A)	0.0358*	0.0364**			-0.0057	0.0024*		
	(0.0200)	(0.0181)			(0.0035)	(0.0013)		
Science (D/E)	-0.0144	-0.0530			0.0001	-0.0004		
	(0.0267)	(0.0395)			(0.0011)	(0.0018)		
World Languages (A)	-0.0113	-0.0161			0.0027	-0.0008		
	(0.0173)	(0.0189)			(0.0017)	(0.0020)		
World Languages (D/E)	-0.1463***	-0.0703**			0.0006	-0.0015		
	(0.0442)	(0.0310)			(0.0029)	(0.0020)		
Math Courses [Ref Groups: Grade 9=Algebra I, Grade 10=Geometry, Grade 11=Algebra II, Grade 12=AP Calculus]								
Geometry Taken	0.0749***		-0.2815***					
	(0.0162)		(0.0885)					
Algebra II Taken		0.0761***		-0.4786***				
		(0.0171)		(0.0647)				
Algebra II/Trig, Intensified Taken	0.0672***	0.0876***						
	(0.0243)	(0.0231)						
Pre-Calculus Taken			0.0758***	-0.1026**				
			(0.0136)	(0.0440)				
AP Calculus Taken			0.0454***					
			(0.0174)					
Mathematics Analysis/Trig Taken			0.0599***	-0.1130**				
			(0.0112)	(0.0463)				
Statistics Taken				-0.1453***				
				(0.0393)				

VARIABLES	DIPLOMA				ON-TIME GRADUATION			
ELA Courses [Ref Groups: Grade 9=English 9, Grade 10=English 10, Grade 11= English 11, Grade 12=English 12]								
English 11 Taken				-0.1657*				
				(0.0921)				
AP English or English, Intensified	-0.0268	0.0123	0.0264**	0.0695***				
	(0.0356)	(0.0187)	(0.0133)	(0.0179)				
Science Courses [Ref Groups: Grade 9=Biology, Grade 10=Chemistry, Grades 11-12=Physics]								
Earth Space Taken		-0.0624**	-0.0360	-0.0134				
		(0.0267)	(0.0338)	(0.0387)				
Social Studies Courses [Ref Groups: Grade 9=World History, Intensified, Grade 10=Economics and Personal Finance, Grade 11=US & VA History, Grade 12=US & VA Government]								
World History Taken	-0.0936**	0.0229						
	(0.0423)	(0.0168)						
World History, Intensified Taken		0.0669***						
		(0.0178)						
AP US & VA History Taken			0.0884***					
			(0.0164)					
AP US & VA Government Taken		0.0377		0.0522***				
		(0.0257)		(0.0153)				
Observations	1,799	1,349	2,423	2,235	2,141	2,158	2,434	2,164

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Also controlled for: Grade 9 -Biology Intensified, Grade 10 - Algebra I, Grade 12 - AP Statistics, Economics and Personal Finance, Grades 10-12 - Chemistry, Intensified. None of these courses are statistically significant predictors of diploma attainment.

Figure A. 5: Advanced vs Standard Diploma: SOL Scores and Demographic Variables

VARIABLES	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6	GRADE 7	GRADE 8	GRADE 9	GRADE 10	GRADE 11	GRADE 12
SOL Scores												
Math score			0.0110***	0.0100***	0.0100***	0.0087***	0.0084***	0.0095***	0.0018	0.0020**		
			(0.0021)	(0.0021)	(0.0022)	(0.0013)	(0.0016)	(0.0020)	(0.0014)	(0.0008)		
Reading score			0.0050**	0.0050***	0.0080***	0.0021	0.0036**	0.0025			0.0030	
			(0.0022)	(0.0023)	(0.0024)	(0.0013)	(0.0015)	(0.0016)			(0.0036)	
Writing score					0.0030**			0.0025			0.0013	
					(0.0011)			(0.0016)			(0.0017)	
Science score								0.0010	0.0034	0.0017		
								(0.0022)	(0.0027)	(0.0017)		
History score							0.0025	0.0040	0.0056**		0.0050**	
							(0.0016)	(0.0032)	(0.0024)		(0.0020)	
Other Variables												
Gifted						-0.0264	-0.0183	-0.0467**	-0.0332*	0.0016	0.0139	0.0385**
						(0.0191)	(0.0179)	(0.0200)	(0.0189)	(0.0172)	(0.0135)	(0.0172)
Free/Reduced Lunch						-0.0574**	-0.0686***	-0.0599***	-0.0204	-0.0811***	-0.0300*	-0.0278
						(0.0243)	(0.0227)	(0.0216)	(0.0190)	(0.0263)	(0.0166)	(0.0192)
Language Immersion					0.1032***	-0.0301	0.0078	0.0620***	-0.0174	0.0203		
					(0.0214)	(0.1994)	(0.0944)	(0.0189)	(0.0318)	(0.0359)		
Limited English Proficiency	-0.1365***	-0.1324***	0.0030	-0.0251	-0.0376	0.0159	0.0142	0.0108	0.0118	-0.0048	-0.0233	-0.1619***
	(0.0304)	(0.0306)	(0.0400)	(0.0268)	(0.0284)	(0.0201)	(0.0187)	(0.0195)	(0.0171)	(0.0176)	(0.0192)	(0.0525)
Special Education	-0.3257***	-0.3354***	-0.1449**	-0.1468***	-0.1132***	-0.0732	-0.1435***	-0.2336***	-0.0856	-0.0474	-0.1143**	-0.1753***
	(0.0346)	(0.0353)	(0.0613)	(0.0382)	(0.0373)	(0.0522)	(0.0403)	(0.0475)	(0.0548)	(0.0439)	(0.0574)	(0.0613)
Special Education, No Classes						-0.0878***	-0.1099***	-0.0891***	-0.1125**	-0.0721*	-0.0246	-0.0860**
						(0.0336)	(0.0405)	(0.0327)	(0.0506)	(0.0426)	(0.0255)	(0.0431)
Unexcused Absence Count					-0.0009	-0.0036*	-0.0032*	-0.0033**	-0.0033**	-0.0016	-0.0034***	-0.0035*
					(0.0010)	(0.0020)	(0.0019)	(0.0015)	(0.0013)	(0.0011)	(0.0011)	(0.0021)
Observations												
	2,194	2,312	694	1,606	1,631	2,309	2,816	3,041	1,799	1,349	2,423	2,235

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Also controlled for gender, race/ethnicity, and graduation cohort.

Figure A. 6: On-Time Graduation: SOL Scores and Demographic Variables

VARIABLES	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6	GRADE 7	GRADE 8	GRADE 9	GRADE 10	GRADE 11	GRADE 12
SOL Scores												
Math score			0.0001	0.0000*	0.0000*	-0.0000	0.0002	0.0000	0.0003**	-0.0000		
			(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0000)		
Science score								0.0002	-0.0001	0.0004*		
								(0.0002)	(0.0002)	(0.0002)		
History score							0.0001	-0.0000	0.0003		0.0004	
							(0.0001)	(0.0003)	(0.0003)		(0.0004)	
Reading score			-0.0000	-0.0000	-0.0000	-0.0001	-0.0001	-0.0001			-0.0003	
			(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0001)	(0.0002)			(0.0006)	
Writing score					0.0000			0.0007			0.0002	
					(0.0000)			(0.0005)			(0.0003)	
Other Variables												
Gifted						-0.0034	-0.0016	-0.0051	-0.0031	-0.0003	0.0010	0.0042
						(0.0038)	(0.0024)	(0.0036)	(0.0025)	(0.0014)	(0.0021)	(0.0042)
Free/Reduced Lunch						-0.0011	-0.0005	0.0002	-0.0038	0.0010	0.0023	0.0001
						(0.0040)	(0.0020)	(0.0021)	(0.0030)	(0.0010)	(0.0015)	(0.0040)
Language Immersion					0.0015			-0.0024				
					(0.0019)			(0.0049)				
Limited English Proficiency	-0.0065	-0.0073	-0.0149	-0.0024	-0.0048	-0.0040	-0.0029	-0.0018	-0.0048	-0.0031	-0.0229*	-0.0567***
	(0.0065)	(0.0064)	(0.0175)	(0.0030)	(0.0043)	(0.0066)	(0.0030)	(0.0029)	(0.0042)	(0.0033)	(0.0123)	(0.0198)
Special Education	-0.0138	-0.0090	0.0017	-0.0015	-0.0077*	-0.0101	-0.0030	-0.0124	-0.0011	-0.0057	0.0023	
	(0.0085)	(0.0074)	(0.0053)	(0.0031)	(0.0045)	(0.0105)	(0.0040)	(0.0083)	(0.0039)	(0.0055)	(0.0019)	
Special Education, No Classes						-0.0081	-0.0018	0.0004	-0.0118	-0.0046	-0.0089	0.0012
						(0.0070)	(0.0043)	(0.0029)	(0.0089)	(0.0072)	(0.0102)	(0.0084)
Unexcused Absence Count					-0.0001**	-0.0006**	-0.0003**	-0.0002**	-0.0001	-0.0001	-0.0003**	-0.0010***
					(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0003)
Observations												
Observations	2,224	2,339	696	1,624	2,488	2,325	2,853	3,083	2,141	2,158	2,434	2,164

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Also controlled for gender, race/ethnicity, and graduation cohort.

Figure A. 7: Standard vs Advanced Diploma Attainment for HILT Students in Grades 6-8

HILT COURSE	GRADE 6				GRADE 7				GRADE 8			
	Standard Diploma		Advanced Diploma		Standard Diploma		Advanced Diploma		Standard Diploma		Advanced Diploma	
	N	Pct	N	Pct	N	Pct	N	Pct	N	Pct	N	Pct
English												
HILT A English	29	63.04%	17	36.96%	31	73.81%	11	26.19%	24	92.31%	2	7.69%
HILT B English	30	50.85%	29	49.15%	26	57.78%	19	42.22%	26	61.90%	16	38.10%
HILTEX A English	40	56.34%	31	43.66%	18	50.00%	18	50.00%	14	51.85%	13	48.15%
HILTEX B English	27	50.00%	27	50.00%	20	57.14%	15	42.86%	15	48.39%	16	51.61%
Reading												
HILT A Reading	29	63.04%	17	36.96%	31	73.81%	11	26.19%	24	92.31%	2	7.69%
HILT B Reading	30	49.18%	31	50.82%	28	58.33%	20	41.67%	27	62.79%	16	37.21%
HILTEX A Reading	55	53.92%	47	46.08%	40	51.95%	37	48.05%	32	59.26%	22	40.74%
HILTEX B Reading	34	51.52%	32	48.48%	29	59.18%	20	40.82%	21	50.00%	21	50.00%
Science, Social Studies, Math												
HILT A Science	30	62.50%	18	37.50%	28	73.68%	10	26.32%	21	91.30%	2	8.70%
HILT B Science	30	51.72%	28	48.28%	28	58.33%	20	41.67%	29	64.44%	16	35.56%
HILT A Social Studies	30	63.83%	17	36.17%	21	77.78%	6	22.22%	16	88.89%	2	11.11%
HILT B Social Studies	29	50.88%	28	49.12%	22	59.46%	15	40.54%	18	81.82%	4	18.18%
HILT Math Level I	21	77.78%	6	22.22%	19	73.08%	7	26.92%	13	100.00%	0	0.00%
HILT Math Level II	27	69.23%	12	30.77%	21	72.41%	8	27.59%	13	81.25%	3	18.75%
Total	441	56.47%	340	43.53%	362	62.52%	217	37.48%	293	68.46%	135	31.54%

Figure A. 8: Standard vs Advanced Diploma Attainment for HILT Students in Grades 9-11

HILT COURSE	GRADE 9				GRADE 10				GRADE 11			
	Standard Diploma		Advanced Diploma		Standard Diploma		Advanced Diploma		Standard Diploma		Advanced Diploma	
	N	Pct	N	Pct	N	Pct	N	Pct	N	Pct	N	Pct
English												
HILT A English	62	86.11%	10	13.89%	41	95.35%	2	4.65%	17	94.44%	1	5.56%
HILT B English	58	81.69%	13	18.31%	68	90.67%	7	9.33%	27	96.43%	1	3.57%
HILTEX English 9	53	67.09%	26	32.91%	67	82.72%	14	17.28%	61	95.31%	3	4.69%
HILTEX English 10	27	71.05%	11	28.95%	55	73.33%	20	26.67%	88	88.89%	11	11.11%
Reading												
HILT A Reading	63	86.30%	10	13.70%	41	95.35%	2	4.65%	16	94.12%	1	5.88%
HILT B Reading	40	83.33%	8	16.67%	48	90.57%	5	9.43%	17	94.44%	1	5.56%
HILTEX Reading 9	32	66.67%	16	33.33%	41	80.39%	10	19.61%	52	94.55%	3	5.45%
HILTEX Reading 10	4	44.44%	5	55.56%	33	68.75%	15	31.25%	57	86.36%	9	13.64%
Science, Social Studies												
HILT A Science	56	84.85%	10	15.15%	37	97.37%	1	2.63%	14	93.33%	1	6.67%
HILT B Science	35	85.37%	6	14.63%	42	87.50%	6	12.50%	15	93.75%	1	6.25%
HILT A Social Studies	54	87.10%	8	12.90%	34	97.14%	1	2.86%	14	93.33%	1	6.67%
HILT B Social Studies	15	93.75%	1	6.25%	27	87.10%	4	12.90%	14	93.33%	1	6.67%
HILTEX Biology	33	63.46%	19	36.54%	45	67.16%	22	32.84%	48	94.12%	3	5.88%
Total	532	78.81%	143	21.19%	579	84.16%	109	15.84%	440	92.24%	37	7.76%

Figure A. 9: On-Time Graduation for HILT Students in Grades 6-8

HILT COURSE	GRADE 6				GRADE 7				GRADE 8			
	Did not Graduate on Time		Graduated on Time		Did not Graduate on Time		Graduated on Time		Did not Graduate on Time		Graduated on Time	
	N	Pct	N	Pct	N	Pct	N	Pct	N	Pct	N	Pct
English												
HILT A English	14	25.45%	41	74.55%	17	30.91%	38	69.09%	18	45.00%	22	55.00%
HILT B English	10	15.87%	53	84.13%	12	24.49%	37	75.51%	11	22.45%	38	77.55%
HILTEX A English	5	6.76%	69	93.24%	3	7.69%	36	92.31%	7	23.33%	23	76.67%
HILTEX B English	4	7.14%	52	92.86%	4	10.53%	34	89.47%	2	6.25%	30	93.75%
Reading												
HILT A Reading	14	25.45%	41	74.55%	17	30.91%	38	69.09%	18	45.00%	22	55.00%
HILT B Reading	10	15.38%	55	84.62%	12	23.08%	40	76.92%	11	22.00%	39	78.00%
HILTEX A Reading	9	8.41%	98	91.59%	11	13.25%	72	86.75%	12	19.67%	49	80.33%
HILTEX B Reading	5	7.25%	64	92.75%	7	12.96%	47	87.04%	3	6.98%	40	93.02%
Science, Social Studies, Math												
HILT A Science	17	29.31%	41	70.69%	14	28.57%	35	71.43%	16	44.44%	20	55.56%
HILT B Science	8	12.90%	54	87.10%	14	25.93%	40	74.07%	12	23.08%	40	76.92%
HILT A Social Studies	17	29.82%	40	70.18%	14	37.84%	23	62.16%	11	42.31%	15	57.69%
HILT B Social Studies	8	13.11%	53	86.89%	13	30.23%	30	69.77%	11	37.93%	18	62.07%
HILT Math Level I	14	41.18%	20	58.82%	11	32.35%	23	67.65%	11	52.38%	10	47.62%
HILT Math Level II	17	36.96%	29	63.04%	14	35.90%	25	64.10%	10	40.00%	15	60.00%
Total	152	17.63%	710	82.37%	163	23.94%	518	76.06%	153	28.65%	381	71.35%

Figure A. 10: On-Time Graduation for HILT Students in Grades 9-11

HILT COURSE	GRADE 9				GRADE 10				GRADE 11			
	Did not Graduate on Time		Graduated on Time		Did not Graduate on Time		Graduated on Time		Did not Graduate on Time		Graduated on Time	
	N	Pct	N	Pct	N	Pct	N	Pct	N	Pct	N	Pct
English												
HILT A English	164	82.00%	36	18.00%	76	82.61%	16	17.39%	20	86.96%	3	13.04%
HILT B English	62	53.45%	54	46.55%	87	69.05%	39	30.95%	42	85.71%	7	14.29%
HILTEX English 9	37	36.27%	65	63.73%	59	53.15%	52	46.85%	52	61.18%	33	38.82%
HILTEX English 10	9	21.43%	33	78.57%	37	38.95%	58	61.05%	52	41.94%	72	58.06%
Reading												
HILT A Reading	146	80.22%	36	19.78%	73	82.02%	16	17.98%	20	90.91%	2	9.09%
HILT B Reading	44	55.00%	36	45.00%	69	73.40%	25	26.60%	31	86.11%	5	13.89%
HILTEX Reading 9	21	35.00%	39	65.00%	36	50.00%	36	50.00%	44	60.27%	29	39.73%
HILTEX Reading 10	1	10.00%	9	90.00%	22	36.07%	39	63.93%	36	41.86%	50	58.14%
Science, Social Studies												
HILT A Science	134	80.72%	32	19.28%	53	79.10%	14	20.90%	17	94.44%	1	5.56%
HILT B Science	26	42.62%	35	57.38%	61	74.39%	21	25.61%	19	79.17%	5	20.83%
HILT A Social Studies	131	81.37%	30	18.63%	53	77.94%	15	22.06%	19	100.00%	0	0.00%
HILT B Social Studies	15	51.72%	14	48.28%	34	69.39%	15	30.61%	16	72.73%	6	27.27%
HILTEX Biology	20	31.75%	43	68.25%	32	36.36%	56	63.64%	43	64.18%	24	35.82%
Total	810	63.68%	462	36.32%	692	63.25%	402	36.75%	411	63.43%	237	36.57%

PROJECT EVALUATION FORM

Hanover Research is committed to providing a work product that meets or exceeds client expectations. In keeping with that goal, we would like to hear your opinions regarding our reports. Feedback is critically important and serves as the strongest mechanism by which we tailor our research to your organization. When you have had a chance to evaluate this report, please take a moment to fill out the following questionnaire.

<http://www.hanoverresearch.com/evaluation/index.php>

CAVEAT

The publisher and authors have used their best efforts in preparing this brief. The publisher and authors make no representations or warranties with respect to the accuracy or completeness of the contents of this brief and specifically disclaim any implied warranties of fitness for a particular purpose. There are no warranties that extend beyond the descriptions contained in this paragraph. No warranty may be created or extended by representatives of Hanover Research or its marketing materials. The accuracy and completeness of the information provided herein and the opinions stated herein are not guaranteed or warranted to produce any particular results, and the advice and strategies contained herein may not be suitable for every client. Neither the publisher nor the authors shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages. Moreover, Hanover Research is not engaged in rendering legal, accounting, or other professional services. Clients requiring such services are advised to consult an appropriate professional.



4401 Wilson Boulevard, Suite 400
Arlington, VA 22203

P 202.559.0500 F 866.808.6585

www.hanoverresearch.com