A Study of the Impact of Apex Learning Tutorials on Middle School Student Achievement

Pasco County Schools, FL

September 2018

Use of Apex Learning increases FSA achievement and grade promotion for struggling students

96%

With Tutorials were promoted to high school on time

Executive Summary

This study examined the impact of using Apex Learning middle school English language arts (ELA) and mathematics Tutorials, during the 2016-2017 school year, on student outcomes including academic achievement and proficiency on Florida Standards Assessments (FSA), grade level promotion, and on-time high school entry. The achievement of students using Tutorials leading to an FSA ELA or Mathematics assessment for course recovery was compared to similar students not using Tutorials or participating in course recovery.

The results indicate that Apex Learning made a positive impact on Pasco County Schools middle school students' achievement:

- On all FSA ELA grade-level assessments, students using Apex Learning Tutorials achieved significantly greater average scores than comparable students not using Tutorials.
- Students who were able to recover middle school course credit with Tutorials avoided retention and were promoted to the 7th and 8th grades at a similar rate as students not participating in course recovery.
- Ninety-six percent of students recovering courses with Tutorials were promoted to high school on time.

Introduction

To help students recover grades for failed coursework, Pasco County Schools (PCS) uses Apex Learning Tutorials in a district-wide middle school course recovery program. Students complete Tutorials modules assigned by the teacher that align with specific content previously failed.

Students served by the course recovery program are at risk of not being promoted to the next grade with their classmates. The goal of the course recovery program is to give students at risk of course failure the opportunity to master course content at their own pace, successfully promote to the next grade level, and enter high school on time.

The program is implemented in the school computer lab and is facilitated by a certified teacher. Students complete Tutorial modules during their lunch hour and before or after school by appointment. Upon completing the assigned modules, the subject-area teacher replaces the grade of the failed assignment, quarter, or semester with the computer-generated quality of work score corresponding to the assigned modules.

This study examined the impact of using Apex Learning middle school English language arts (ELA) and mathematics Tutorials, during the 2016-2017 school year, on student outcomes including academic achievement and proficiency on Florida Standards Assessments (FSA), grade level promotion, and on-time high school entry. The achievement of students using Tutorials leading to an FSA ELA or Mathematics assessment was compared to similar students not using Tutorials.

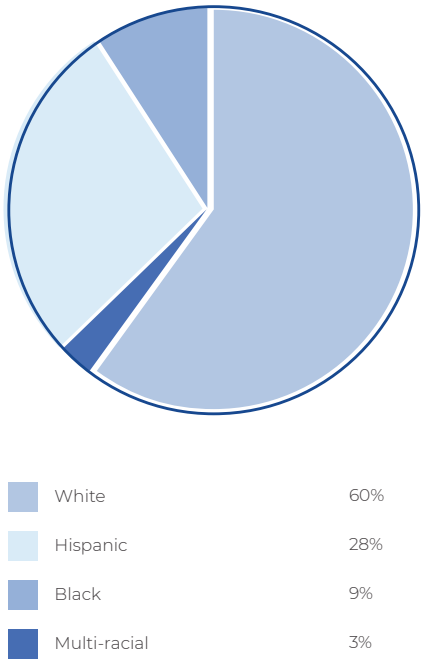
One thousand two hundred ninety-nine (1,299) middle school ELA and mathematics Tutorials enrollments used by 1,003 students were included in the study. In addition to the characteristics displayed in Figure 2, students in the study sample using Apex Learning Tutorials:

- Were eligible for free and/or reduced lunch (81%)
- Include students who have a learning disability (33%)
- Have an average pretest ability equivalent to the 15th percentile in relation to the district student population

Figure 1:
2016–2017 District Demographic Characteristics

District PK-12 Enrollment	72,493
Urban Locale	Suburb, Large City
American Indian/AK Native	0.3%
Asian	2.7%
Black /African American	7.2%
HI/Pacific Islander	0.2%
White	63.2%
Hispanic	22%
Multiracial	4.5%
Free/Reduced Meals	56.2%
Limited English Proficient	4.3%
Students with Disabilities	15.5%
Title I Schools	45.2%

Figure 1:
2016–2017 District Demographic Characteristics



Tables 1-3, located in the appendix, provide detailed demographic and academic characteristics of students included in study sample (Tutorials users and comparison group) by grade level and group. Tables 4 and 5, also located in the appendix, show the average Apex Learning Tutorials use statistics of students in the analytic sample overall and by grade level.

Results

Students using Tutorials outscore comparable students not participating in course recovery on state tests.

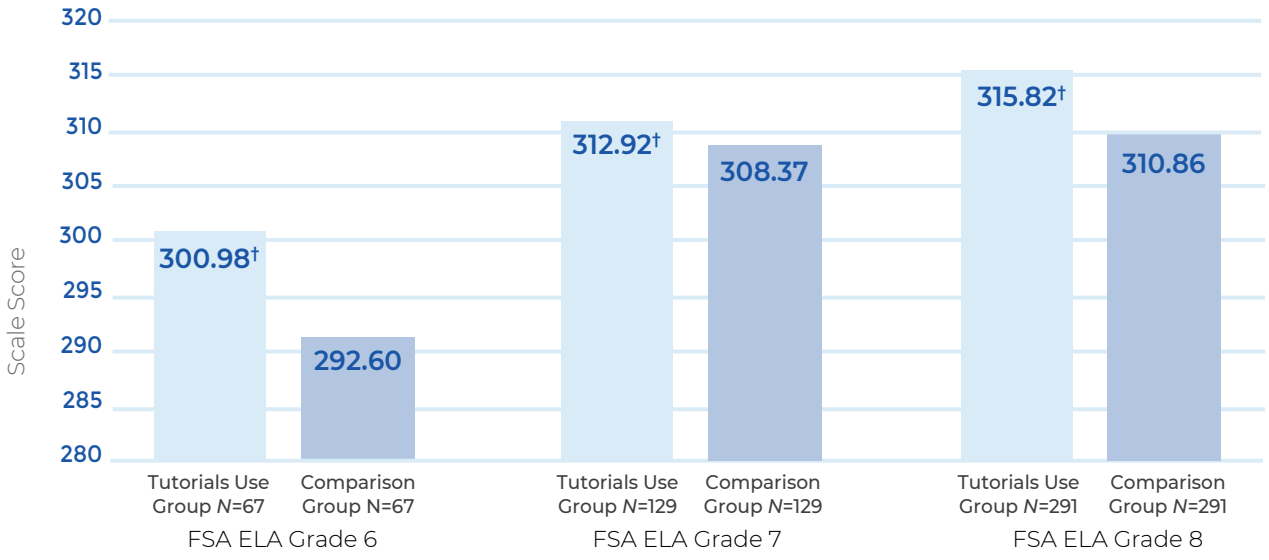
Does using Apex Learning Tutorials for middle school course recovery improve achievement on the Florida Standards Assessments compared to similar students?

Students using Apex Learning Tutorials for middle school course recovery achieved greater average scores than similar students not using Tutorials on all ELA and mathematics grade level assessments (Table 6, appendix).

Figure 3 shows that students using Tutorials achieved significantly greater average scores than comparable students not using Tutorials on all FSA ELA grade level assessments. Compared to similar students, Tutorials users scored 8.4, 4.5, and 4.9 points higher on the sixth, seventh, and eighth grade assessments respectively. The magnitude of the effect of Tutorials on the FSA ELA assessments was significant across all grade levels (Table 6, appendix).

Figure 3:

Adjusted Average FSA ELA Scale Score by Tutorials Use

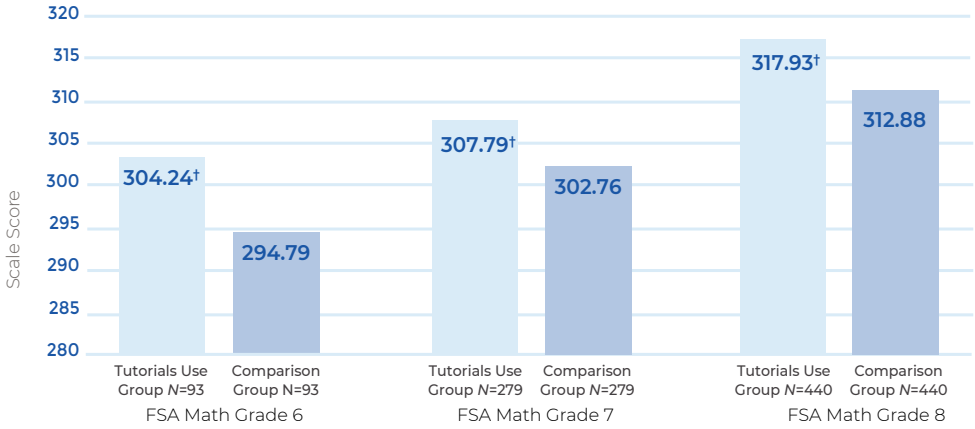


All differences statistically significant Sig. p<.05

Below, Figure 4 shows that on the FSA Mathematics grade level assessments, students using Tutorials also achieved significantly greater average scores than students in the comparison group. Compared to similar students, Tutorials users achieved an additional 9.4, 5.0, and 5.0 scale score points on the sixth, seventh, and eighth grade assessments respectively. The magnitude of the effect of Tutorials on the FSA Mathematics assessments was significant across all grade levels (Table 6, appendix).

Figure 4:

Adjusted Average FSA Mathematics Scale Score by Tutorials Use



All differences statistically significant Sig. p<.05

In addition to achieving higher average scores, students using Tutorials were just as likely or more likely to achieve proficiency on the FSA ELA and Mathematics assessments than students in the comparison group (Table 7, appendix). The magnitude of the effect was not significant.

Tutorials use is positively correlated with FSA achievement.

What is the relationship between Tutorials use and achievement on the FSA exams?

Tutorials achievement and the FSA scale score were positively correlated and statistically significant (p<.05, Table 8, appendix). The effect size of the quality of work score on the FSA ELA achievement was significant (r=.21, p=.000).

Ninety-six percent of students recovering courses with Tutorials were promoted to high school on time.

Does using Tutorials for middle school course recovery improve the probability of entering high school on time compared to similar students not using Tutorials?

Tutorials achievement and the FSA scale score were positively correlated and statistically significant (p<.05, Table 8, appendix). The effect size of the quality of work score on the FSA ELA achievement was significant (r=.21, p=.000).

Recovering courses with Tutorials leads to year-end promotion for students in 6th and 7th grades.

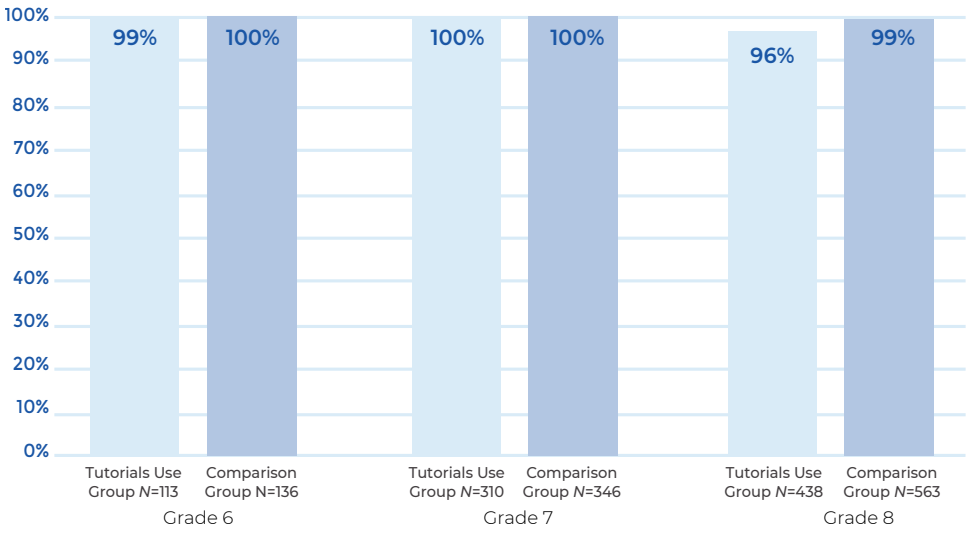
Does using Tutorials for middle school course recovery improve the probability of end-of-year promotion compared to similar students not using Tutorials?

Figure 5 shows the percent of students promoted to the next grade level by Tutorial use.

Students in sixth and seventh grades using Tutorials in the middle school course recovery program— who were at risk of failure due to failing grades—were just as likely to be promoted to the next grade level as comparable students not participating in course recovery.

Figure 5:

Percent of Students Promoted to Next Grade Level



All differences statistically significant Sig. p<.05

Conclusion

Apex Learning increases FSA achievement and grade promotion for struggling students.

Pasco County Schools uses Apex Learning Tutorials for middle school course recovery, a just-in-time remediation program designed to support middle school students earning a failing quarter or semester grade in a core course who are at risk of not entering high school on time.

This study compared multiple academic outcomes of program participants to a sample of comparable students not participating in course recovery. Findings suggest:

- **Students using ELA and mathematics Tutorials achieved significantly greater average scores than comparable students not using Tutorials on FSA grade-level assessments.**
- **Tutorials achievement is positively correlated with achievement on the FSA assessments.**
- **Students in sixth and seventh grades participating in course recovery were just as likely as comparable students not participating in course recovery to be promoted to the next grade level.**
- **The effect size of the difference between the high school promotion rate of Tutorials users and students not participating in course recovery in eighth grade was insignificant.**

Study Description

Study Design

This quasi-experimental observational study used a matched control group design. The effectiveness of Apex Learning digital curriculum was evaluated by comparing the achievement of course recovery program participants using Apex Learning Tutorials to students not using Apex Learning Tutorials.

Sample Formation

Students in grades 6-8 who completed an FSA ELA or Mathematics grade-level assessment during the 2016-2017 school year and the year prior were eligible to be included in the study. The analytic sample included students who used Apex Learning Tutorials for middle school ELA or mathematics (treatment group) and a group of students who did not use Apex Learning Tutorials (comparison group), matched by prior ability and demographic characteristics.

Data Preparation

Joining the files

Pasco County Schools Data

Pasco County Schools (PCS) provided three data files. The first file contained FSA assessment results and demographic characteristic fields. For assessments completed in the 2016–2017 school year, 27,736 rows of data were provided for students completing FSA ELA or Mathematics Grades 6 through 8 assessments. An additional 25,828 rows of data containing FSA ELA and Mathematics Grades 5 through 7 results for assessments administered in 2015-2016 were provided as a measure of prior ability.

Prior ability measures (FSA ELA and Mathematics SY2015-2016) were joined to outcome measures (FSA ELA and Mathematics SY2016-2017). Eighty-five percent (85%) of 2016–2017 FSA scores matched with a corresponding prior ability measure.

Each record contained assessment data and demographic characteristic variables including: local student identifier, school name, grade level, date of birth, gender, reported race/ethnicity, limited English proficiency flag, learning disability flag, free and/or reduced lunch flag, achievement scale scores, and proficiency levels.

The second file contained course data for students in grades 6 through 8 completing an ELA or mathematics course during the 2016-2017 school year. The data contained in the file were not able to be matched to the Tutorials data and therefore were not used. The third file contained 16,174 rows of data identifying the grade level of students enrolled the next school year (2017-2018). These data were appended to the final dataset after the analytical sample was generated.

Apex Learning Data

Apex Learning provided 3,407 records for students who attempted Apex Learning Tutorials for ELA or mathematics between August 1, 2016 and July 30, 2017. The data file included a local student identifier; school name; classroom name; course track; course title; product name; number of pretests, Test Its, and posttests activities completed; total minutes used; total number of sessions and average session time; and quality of work score (number of scored activities answered correctly divided by the total number of scored activities completed). The records were aggregated so that each student had one row of data for ELA Tutorials use and one for mathematics Tutorials use. After the files were aggregated, the Tutorials dataset contained 2,593 rows of data.

Creating the sampling frame

District records were merged with and appended to the Apex Learning file of Tutorials enrollments by assessment and Tutorials subject. Fifty percent (1,299/2,593) of Tutorials enrollments were successfully matched to district records containing complete demographic, prior ability, and assessment results.

Generating a comparison group

Case control random selection was used to generate a comparison group of students matching Tutorials users. For each EOC assessment, matching was conditioned on prior ability and student demographic characteristics. Tables containing demographic characteristics and prior ability measures of students in the analytic sample are included in the appendix.

Analysis

The following analyses were performed to determine the impact of Tutorials use on student achievement.

First, an exploratory two-way ANCOVA was conducted for each assessment to identify significant interactions between treatment and each factor including: pretest ability, minority status, gender, age, limited English proficiency, learning disability, and free/reduced lunch status. In all cases, school was fitted as a random effect to control for possible interactions between group and school.

Next, a linear mixed model was applied to each assessment to generate parameter estimates used to calculate the adjusted average score for each outcome variable. All models controlled for prior ability, demographic characteristics, and significant interactions. Pretest ability, minority flag, gender, age, limited English proficiency flag, special education program participation flag, free/reduced lunch status, and significant interactions were fitted as main effects. School was fitted as a random effect. An F-test was used to determine the significance of the difference between adjusted average scores by treatment group. Hedge's g was used to estimate the effect size of the mean difference.

A binary linear logistic model was run to produce the parameter estimates used to report the estimated proportions and adjusted odds of achieving proficient or above on each EOC assessment. The model controlled for demographic, prior ability, and significant interactions. Pretest ability, minority flag, gender, age, limited English proficiency flag, special education program participation flag, free/reduced lunch status, school by treatment group, and significant interactions specific to each EOC assessment were fitted as main effects. A z-test was used determine the significance of the difference between two independent proportions. The odds ratio was reported as the effect size.

For the grade promotion analysis, unadjusted proportions were reported. A z-test was used determine the significance of the difference between two independent proportions.

Outcome Measures

Outcome measures used in this study included scale scores and proficiency levels on the FSA ELA and Mathematics Grades 6 through 8 assessments. FSA assessments were administered in the spring of 2017.

Appendix

Table 1. Demographic Characteristics by Group and FSA Assessment

Assessment			Group				Total	
			Apex Users		Control			
			Count	Column *N* %	Count	Column *N* %	Count	Column *N* %
FSA ELA	Sample Size		487	100%	487	100%	974	100%
	Grade Level	6th	67	13.80%	67	13.80%	134	13.80%
		7th	129	26.50%	129	26.50%	258	26.50%
		8th	291	59.80%	291	59.80%	582	59.80%
	Sex	F	149	30.60%	149	30.60%	298	30.60%
		M	338	69.40%	338	69.40%	676	69.40%
	Race	A	2	0.40%	4	0.80%	6	0.60%
		B	37	7.60%	37	7.60%	74	7.60%
		H	126	25.90%	121	24.80%	247	25.40%
		I	1	0.20%	2	0.40%	3	0.30%
		M	16	3.30%	24	4.90%	40	4.10%
		W	305	62.60%	299	61.40%	604	62.00%
	ELL	NO	469	96.30%	468	96.10%	937	96.20%
		YES	18	3.70%	19	3.90%	37	3.80%
	SWD	NO	328	67.40%	340	69.80%	668	68.60%
		YES	159	32.60%	147	30.20%	306	31.40%
	FRL	NO	69	14.20%	131	26.90%	200	20.50%
		YES†	418	85.80%	356	73.10%	774	79.50%

† Significantly different p< .05.

Assessment			Group				Total	
			Apex Users		Control			
			Count	Column *N* %	Count	Column *N* %	Count	Column *N* %
FSA Math	Sample Size		812	100%	812	100%	1624	100%
	Grade Level	6th	93	11.50%	93	11.50%	186	11.50%
		7th	279	34.40%	279	34.40%	558	34.40%
		8th	440	54.20%	440	54.20%	880	54.20%
	Sex	F	277	34.10%	277	34.10%	554	34.10%
		M	535	65.90%	535	65.90%	1070	65.90%
	Race	A	5	0.60%	8	1.00%	13	0.80%
		B	74	9.10%	85	10.50%	159	9.80%
		H	232	28.60%	234	28.80%	466	28.70%
		I	5	0.60%	1	0.10%	6	0.40%
		M	25	3.10%	42	5.20%	67	4.10%
		W	471	58.00%	442	54.40%	913	56.20%
	ELL	NO	763	94.00%	762	93.80%	1525	93.90%
		YES	49	6.00%	50	6.20%	99	6.10%
	SWD	NO	541	66.60%	571	70.30%	1112	68.50%
		YES	271	33.40%	241	29.70%	512	31.50%
	FRL	NO	180	22.20%	206	25.40%	386	23.80%
		YES	632	77.80%	606	74.60%	1238	76.20%

Table 2. Unadjusted Prior Ability Statistics by Apex Learning Use

Assessment	Grade Level	Group					
		Apex Users			Control Group		
		Count	Mean	Standard Deviation	Count	Mean	Standard Deviation
FSA ELA	6	67	293.97	20.47	67	297.72	17.60
	7	129	303.02	21.8	129	305.35	19.39
	8	291	308.37	19.42	291	309.41	18.95
FSA Mathematics	6	93	294.24	21.93	93	295.03	21.85
	7	279	294.97	18.96	279	297.37	16.93
	8	440	305.48	18.64	440	305.85	18.56

Table 3. Unadjusted FSA Assessment Scale Scores by Apex Learning Use

Assessment	Grade Level	Group					
		Apex Users Scale Score			Control Scale Score		
		Count	Mean	Standard Deviation	Count	Mean	Standard Deviation
FSA ELA	6	67	295.28	20.65	67	306.82	19.13
	7	129	307.19	23.50	129	313.36	21.09
	8	291	312.97	21.76	291	318.72	21.32
FSA Mathematics	6	93	295.49	22.49	93	305.78	25.64
	7	279	301.55	20.02	279	309.59	21.47
	8	440	313.54	20.09	440	320.21	20.30

Table 4. Analytic Sample Average Apex Learning Use Statistics by Subject

Subject	Enrollments	Sessions *N*	Session Minutes	Total Minutes	Quality of Work	Pretests *N*	Test Its *N*	Posttests *N*
	Count	Mean	Mean	Mean	Mean	Mean	Mean	
English	487	16.91	70.30	803.81	68	5.32	91.25	5.36
Math	812	32.76	71.89	1561.51	63	4.88	80.40	4.49

Table 5. Analytic Sample Average Apex Learning Use Statistics by Grade Level and Subject

Assessment	Subject	Enrollments	Sessions *N*	Session Minutes	Total Minutes	Quality of Work	Pretests *N*	Test Its *N*	Post-tests *N*
		Count	Mean	Mean	Mean	Mean	Mean	Mean	
Grade 6	ELA	67	10.78	82.51	681.10	57	8.39	82.7	11.03
	Math	93	21.19	104.81	1462.08	64	4.96	88.84	5.13
Grade 7	ELA	129	15.91	93.11	871.29	65	5.93	85.95	6.47
	Math	279	32.65	87.33	1591.82	61	4.85	85.01	5.51
Grade 8	ELA	291	18.77	57.38	802.14	0.72	4.34	95.56	3.56
	Math	440	35.27	55.15	1563.3	0.65	4.88	75.7	3.71

Table 6. Estimated Mean, Paired Difference, and Effect Size Statistics by FSA Assessment and Apex Learning Tutorial Use

Assessment	Treatment	Mean	Std. Error	*df*	95% Confidence Interval		F	Sig.	Hedge's g
					Lower Bound	Upper Bound			
FSA ELA Grade 6	Apex Users	300.98	3.40	125.00	294.25	307.70	.	.	.
	Comparison	292.60	3.61	125.00	285.45	299.75	.	.	.
	Difference	8.374†	2.32	125.00	3.79	12.96	13.09	0.00	0.42
FSA ELA Grade 7	Apex Users	312.92	3.21	235.48	306.59	319.24	.	.	.
	Comparison	308.37	3.46	230.45	301.55	315.19	.	.	.
	Difference	4.549†	1.78	232.74	1.04	8.06	6.53	0.01	0.20
FSA ELA Grade 8	Apex Users	315.82	1.64	248.32	312.59	319.05	.	.	.
	Comparison	310.86	1.68	199.96	307.54	314.17	.	.	.
	Difference	4.966†	1.15	428.49	2.70	7.23	18.57	0.00	0.23
FSA Math Grade 6	Apex Users	304.24	3.84	86.17	296.61	311.86	.	.	.
	Comparison	294.79	3.67	81.75	287.48	302.09	.	.	.
	Difference	9.453†	2.62	174.67	4.28	14.63	13.00	0.00	0.39
FSA Math Grade 7	Apex Users	307.79	1.60	118.21	304.61	310.96	.	.	.
	Comparison	302.76	1.61	108.67	299.56	305.95	.	.	.
	Difference	5.031†	1.38	398.41	2.33	7.73	13.39	0.00	0.24
FSA Math Grade 8	Apex Users	317.93	1.65	45.77	314.61	321.25	.	.	.
	Comparison	312.88	1.65	45.81	309.56	316.21	.	.	.
	Difference	5.047†	1.07	868.53	2.95	7.15	22.20	0.00	0.25

† Statistically significant (Sig.< .05).

Table 7. Estimated Percent Achieving Proficient or Above

Assessment	Treatment	Percent	Z	Sig.	Odds Ratio
FSA ELA Grade 6	Apex Users	13.82	.	.	.
	Comparison	18.89	.	.	.
	Difference	-5.07	0.93	0.18	1.45
FSA ELA Grade 7	Apex Users	23.73	.	.	.
	Comparison	19.04	.	.	.
	Difference	4.69	0.90	0.18	0.76
FSA ELA Grade 8	Apex Users	9.01	.	.	.
	Comparison	2.83	.	.	.
	Difference	6.18	3.18	0.00	0.29
FSA Math Grade 6	Apex Users	10.69	.	.	.
	Comparison	8.50	.	.	.
	Difference	2.19	0.50	0.31	0.78
FSA Math Grade 7	Apex Users	12.50	.	.	.
	Comparison	6.97	.	.	.
	Difference	5.53	2.29	0.01	0.52
FSA Math Grade 8	Apex Users	9.14	.	.	.
	Comparison	7.00	.	.	.
	Difference	5.53	1.11	0.13	0.75

Table 8. Estimates of Fixed Effects of Tutorials on FSA Assessment Scores

						95% Confidence Interval			
Parameter	Estimate	Std. Error	*df*	*t*	Sig.	Lower Bound	Upper Bound	R2	r
Quality of Work	.160215	.026438	770.592	6.060	.000	.108315	.212114	.045	.21
Posttests sum	.038406	.027917	1200.521	1.376	.169	.016364	.093177	.002	.04
Total Minutes sum	-.000582	.000656	994.275	-.887	.375	.001870	.000706	.001	.03
Avg Session Min	-.000633	.007336	1068.679	-.086	.931	.015028	.013763	.000	.00
Sessions *N*	.027346	.032359	1072.885	.845	.398	.036148	.090840	.001	.03

Table 9. Estimated Parameters and Odd Ratio for Promoting to the Next Grade Level: Tutorials Users Compared to Non-Users

Grade Level		*B*	Std. Error	Wald	df	Sig.	Exp(*B*)
Grade 6	Treatment (Tutorials)	-307.35	9,305.21	0.00	1.00	0.97	0.00
	SchoolN	-0.46	5.86	0.01	1.00	0.94	0.63
	DOB	-0.19	8.94	0.00	1.00	0.98	0.82
	FRL Flag	67.55	3,051.88	0.00	1.00	0.98	2.16E+29
	LEP Flag	136.77	9,046.23	0.00	1.00	0.99	2.50E+59
	Disability Flag	226.11	8,635.01	0.00	1.00	0.98	1.58E+98
	Minority Flag	-33.26	2,089.74	0.00	1.00	0.99	0.00
	Male Flag	114.23	3,037.19	0.00	1.00	0.97	4.06E+49
	Pretest SS	-4.01	54.33	0.01	1.00	0.94	0.02
	Constant	8,991.11	349,407.71	0.00	1.00	0.98	.
Grade 8	Treatment (Tutorials)	-1.37	0.50	7.53	1.00	0.01	0.25
	SchoolN	0.00	0.00	2.10	1.00	0.15	1.00
	DOB	0.00	0.00	0.67	1.00	0.41	1.00
	FRL Flag	1.03	0.76	1.82	1.00	0.18	2.80
	LEP Flag	-18.10	4,844.66	0.00	1.00	1.00	0.00
	Disability Flag	0.23	0.50	0.21	1.00	0.65	1.26
	Minority Flag	0.08	0.46	0.03	1.00	0.86	1.09
	Male Flag	0.12	0.49	0.06	1.00	0.80	1.13
	Pretest SS	0.07	0.02	16.80	1.00	0.00	1.07
	Constant	35.04	4,844.82	0.00	1.00	0.99	1.65E+15

Note: 7th grade not shown as 100% of students in both groups were promoted to the next grade.

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An industry leader with deep expertise in digital curriculum, Apex Learning works closely with school districts across the country to implement proven solutions that increase on-time graduation rates and create opportunities for student success in school and beyond. The company is driven by the understanding that supporting the needs of all students – from struggling to accelerated – strengthens schools and creates stronger communities, brighter futures and a more equitable world. Apex Learning is accredited by AdvancED and its courses are approved for National Collegiate Athletic Association eligibility. Apex Learning, where opportunity thrives. For more information, visit http://www.apexlearning.com.

Contact

Apex Learning

1215 Fourth Ave., Suite 1500
Seattle, WA 98161
Phone: 1 (206) 381-5600
Fax: 1 (206) 381-5601
ApexLearning.com