A Study of the Efficacy of Apex Learning Digital Curriculum Year 2

Sarasota County Schools, FL

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Introduction

Sarasota County Schools (SCS) uses Apex Learning Comprehensive Courses to provide customized, self-paced coursework designed to meet the needs of high school students participating in the Performance Based Diploma (PBD) Program. The Performance Based Diploma Program, an alternative education program implemented on-site in each high school, serves students who have not achieved success in the traditional classroom and are at-risk of dropping out of high school or not graduating at the end of four years. The goal of PBD is to give at-risk students the opportunity to master course content at their own pace, earn course credits, and graduate college- and career-ready instead of dropping out of school.

Students participating in the PBD program complete Apex Learning Comprehensive Courses for initial credit or credit recovery in a high school computer lab and at home, supported by certified teachers dedicated to the PBD program. Apex Learning Comprehensive Courses provide computerized direct instruction of content aligned to the Florida Next Generation Sunshine State Standards in subjects including English language arts (ELA), mathematics, science, social studies, and many electives. PBD program administrators employ a feature of Apex Learning digital curriculum called mastery-based learning. Program administrators set mastery-based learning at 70%, requiring students to pass all graded assignments and tests at 70% or above before progressing to the next unit of instruction. Teachers monitor student progress and work with students individually and in small groups to facilitate learning. PBD participants complete proctored Apex Learning tests in the computer lab and are unable to access tests from home.

In the 2014-2015 school year, Florida administered end-of-course assessments (EOC) to evaluate mastery of the Next Generation Sunshine State Standards in Algebra I, Geometry, Biology, and U.S. History. This study examined the impact of using Apex Learning Comprehensive Courses on the number of credits earned and EOC performance for assessments administered during 2014-2015 school year. The achievement of PBD participants using Apex Learning Courses for original credit and credit recovery leading to an EOC assessment was compared to similar students completing courses for only original credit in traditional classroom environments.

Figure 1

Sarasota County Schools Demographic Characteristics

District PK–12 Enrollment 2015. 41,910
Urban Locale . . . . Suburban, Small City

American Indian/AK Native 0.3%
Asian 2%
Black /African American 9%
HI/Pacific Islander 0.02%
White 65%
Hispanic 19%
Multiracial 5%

Free/Reduced Meals 50%
Limited English Proficient 6%
Students with Disabilities. 15%Tit
Title I Schools. 25%

Two hundred ninety (290) Apex Learning enrollments for courses leading to an EOC assessment were included in the study. PBD participants using Apex Learning Courses leading to an EOC:

- Have an average 8th grade pretest ability equivalent to the 24th percentile in relation to district norms
- Are mostly white (55%)
- Twenty percent have a learning disability
- Completed course activities with an average quality of work score of 81%

Located in the appendix, Table 2 provides detailed demographic and prior ability characteristics of students using Apex Learning Courses and the comparison group included in the analytic sample. Table 4, also located in the appendix, shows the average usage statistics for Apex Learning Courses completed by students included in the analytic sample by EOC assessment.

Results

What is the impact of Apex Learning Comprehensive Courses on credits earned for PBD participants?

During the 2014-2015 school year, 1,706 students participating in the PBD program attempted 5,998 Apex Learning Comprehensive Course enrollments. Seventy-one percent of enrollments (4,227 out of 5,998) were completed by 1,226 students with a passing grade earning a total of 2,490 credits. The percent of credits earned for Courses attempted ranged from 63.3% to 81.0% by subject. Table 1 shows the number of enrollments completed and withdrawn, and number of credits attempted and earned by subject for students participating in the PBD program. Table 3 in the appendix shows Apex Learning Course usage characteristics for enrollments completed by PBD participants.

| Table 1. Enrollments attempted, completed, and credits earned by subject								
	Total	Enrollments				Credits		
		Withdrawn		Completed		Attempted	Earned	
Subject	N	N	%	N	%	N	N	%
Electives	51	18	35.3%	33	64.7%	48.5	31.5	64.9%
English	1,346	466	34.6%	880	65.4%	686.0	446.0	65.0%
Math	1,895	667	35.2%	1,228	64.8%	975.0	617.0	63.3%
Science	1,118	281	25.1%	837	74.9%	559.0	418.5	74.9%
Social Studies	1,588	339	21.3%	1,249	78.7%	1,206.0	977.0	81.0%
Total	5,998	1,771	29.5%	4,227	70.5%	3,474.5	2,490.0	71.7%

[1]Enrollments attempted include all courses in a given subject including those not leading to an EOC exam. Semester long courses are worth .5 credits. Year-long courses are worth 1 credit.

[2]Courses considered completed 1) when teacher entered a final grade into the learning management system, or 2) 90% or more course activities were completed and enrollment was withdrawn. For courses that meet the second criteria, the Quality of Work score was used as the final grade.

Do students in the PBD program completing Apex Learning Comprehensive Courses for original credit or credit recovery perform the same or better on EOC assessments as similar students completing courses for original credit in traditional classrooms?

PBD participants completing Apex Learning Courses for original credit and credit recovery achieved similar average scores as students completing courses for original credit in traditional classroom settings on the Algebra I, Biology, and Geometry EOC assessments (Figure 4). The average U.S. History EOC score for PBD participants completing Apex Learning Courses for original credit and credit recovery was lower than the average score of similar students completing coursework for original credit in traditional classroom environments (ES = -.38, p<.00).

Figure 4:
Average EOC scale score by subject and Apex Learning use

Comparison Group   Apex Learning Users
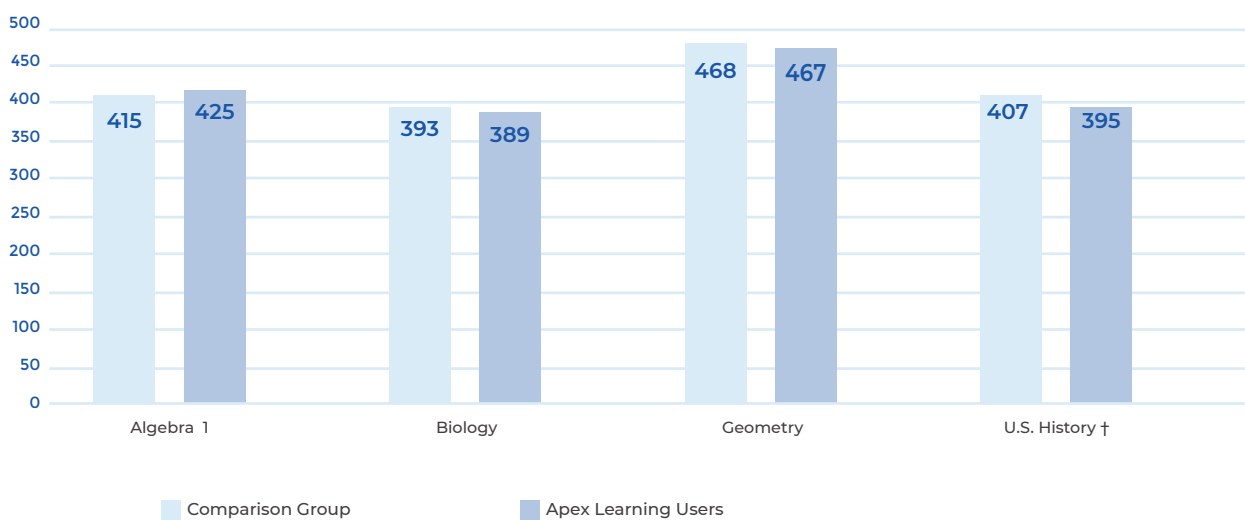
†Statistically significant p<.05

Additionally, PBD participants completing Apex Learning Courses for original credit and credit recovery passed the Algebra I, Biology, and Geometry EOC assessments at similar rates as students completing courses for original credit in traditional classroom settings. Conversely, PBD participants passed the U.S. History EOC assessment at lower rates than students completing courses for initial credit in traditional classroom settings (OR=.23, p<.05). Table 9 located in the appendix shows the odds ratio for passing each EOC exam for students participating in the PBD program compared to similar students completing courses for original credit in traditional classrooms controlling for pretest ability, minority race/ethnicity, gender, learning disability, grade level, and school.

Conclusion

SCS uses Apex Learning Comprehensive Courses as core curriculum in the PBD Program, an alternative education program for students at risk of dropping out of high school. Students in this program have failed previous classes, lack credits needed to graduate on time, and experience difficult life circumstances that make earning a high school diploma in a traditional classroom environment challenging. The goal of PBD is to graduate students at risk of dropping out college- and career-ready.

In 2014-2015 PBD participants using Apex Learning Comprehensive Courses for original credit and credit recovery achieved similar average scores and pass rates as students completing courses for original credit in traditional classroom settings on three out of four EOC assessments including Algebra I, Geometry, and Biology. Additionally, students participating in the PBD program earned 71% of attempted credits needed for graduation, successfully completing 4,227 Apex Learning Comprehensive Course enrollments with a passing grade.

Study Description

Study Design

This quasi-experimental observational study used a randomly selected matched control group design. The effectiveness of Apex Learning digital curriculum was evaluated by comparing the achievement of students completing Comprehensive Courses for original credit and credit recovery in a dropout prevention program to similar students completing coursework for original credit in traditional classroom environments.

The study design may be limited due to selection bias that could exist due to differences in participant history. Propensity scores were constructed based on known confounders of student achievement to control for selection bias. Even so, students in the Apex Learning group have been identified as at-risk of dropping out of high school due to lack of credits as a result of previous course failure and/or difficult personal circumstances. Students in the control group did not complete coursework in the dropout prevention program.

Sample Formation

This study used de-identified extant data collected by the school district during the normal course of the 2014-2015 school year. Students eligible to be included in the study completed at least one subject-area EOC assessment during the 2014-2015 school year and the 8th grade Florida Comprehensive Assessment Test (FCAT). The analytic sample included students who completed an Apex Learning Course leading to an EOC test (treatment group) and a randomly selected comparison group of students who did not use Apex Learning digital curriculum and were matched by prior ability and demographic characteristics using propensity score matching techniques. Table 2 in the appendix show the demographic and prior ability characteristics of students in the analytic sample. The following procedures describe the preparation of the data and creation of the analytic sample.

Data Preparation

Joining the files

SCS provided 12,345 rows of data containing demographic characteristics and assessment results for all Algebra I, Geometry, Biology, and U.S. History NGSSS EOC exams completed by high school students during the 2014-2015 school year. An additional 45,256 rows of data containing FCAT Grade 8 reading, math, and science results for assessments administered between the 2009 and 2014 school years were provided as a measure of prior ability. A standardized z-score was calculated for each school year and assessment generating a pretest or outcome measure. The standardized z-score was calculated by subtracting the district mean from the student score and dividing the result by the standard deviation of scores for each assessment and school year.

Prior ability measures were joined to outcome measures. FCAT Grade 8 math scores were joined to Algebra I and Geometry EOC assessment records; FCAT Grade 8 science scores to Biology; and FCAT Grade 8 reading scores to U.S. History. Seventy-six percent (76%) of EOC assessments matched with a corresponding Grade 8 FCAT score providing a total of 9,371 records in the district data file. Each record contained the following information: 1) assessment data: grade 8 scale scores, z-scores, and achievement levels, and EOC assessment scale scores, z-scores, and achievement levels; and 2) 2014-2015 demographic data: local student identifier, school name, grade level, date of birth, gender, reported race/ethnicity, and learning disability flag. School year 2014-2015 English language proficiency was not provided. The percent of English language learners district-wide in 2014-2015 was 6%.

Apex Learning provided course records for all students in the district who attempted an Apex Learning Comprehensive Course between August 1, 2014 and July 30, 2015. The data file included a local student identifier, school name, classroom name, course track, course title, product name, number and percent of activities completed, total minutes used, a quality of work score (number of scored activities answered correctly divided by the total number of scored activities completed), and overall course percent correct score (number of scored activities answered correctly divided by the total number of scored activities contained in the course). A total of 5,998 enrollments were attempted and 4,227 enrollments were completed.

Creating the sampling frame

District records were merged with and appended to the Apex Learning file of attempted enrollments by assessment and Apex Learning course. Apex Learning enrollments that did not complete a course were removed from the file. A course was considered completed if one of two conditions were met: 1) a final grade was entered into Apex Learning management system thereby completing the enrollment, or 2) the student completed 90% of the coursework and was withdrawn without receiving a final grade. Six hundred seventynine Apex Learning enrollments completed courses leading to an EOC assessment. Forty-three percent (290/679) of completed Apex Learning enrollments leading to an EOC exam were successfully matched to district record containing demographic and matched assessment records.

Generating a comparison group

Propensity scores analysis and case-control matching was used to generate a sample of students not using Apex Learning digital curriculum to serve as a comparison group. Propensity scores were constructed based on known confounders of student achievement including prior ability, race/ethnicity, age at the time of endof- course testing, gender, and special education program participation. Sampling without replacement was used to randomly select a sample of students completing coursework in traditional classrooms that matched the demographic and prior ability measures of students completing coursework using Apex Learning Comprehensive Courses for each assessment generating an outcome measure. A table containing the demographic and prior ability measures of students in the analytic sample is presented in the appendix.

Analysis

A linear mixed model was used to compare the average achievement of students using Apex Learning Courses to the comparison group of students not using Apex Learning Courses. School was fitted as a random effect to control for school level factors that could impact the outcome measure. Pretest ability, race/ethnicity, gender, learning disability status, and grade level were treated as covariates. Hedge's g was used to estimate the effect size.

Logistic regression was used to compare the assessment pass rate of students using Apex Learning Courses to the comparison group of students not using Apex Learning Courses. Pretest ability, race/ethnicity, gender, learning disability status, and grade level were treated as covariates. The odds ratio was reported as the effect size.

Outcome Measures

Florida Department of Education school accountability end-of-course assessments that measure Next Generation State Sunshine Standards were used as outcome measures. EOC assessments measures student content mastery in four areas: Algebra I, Biology, Geometry, and U.S. History. Assessments were administered in the fall, winter, spring, and summer of the 2014-2015 school year. Students are required to pass the Algebra I EOC in order to graduate. Results of the Biology, Geometry, and U.S. History EOC assessments are averaged into the course final grade.

References

Sarasota County Schools 2014-15 Demographic Characteristics. Retrieved from: http://www.fldoe.org/ accountability/data-sys/edu-info-accountability-services/pk-12-public-school-data-pubs-reports/ archive.stml on 11/21/2016.

Appendix

Table 2. Demographic characteristics and academic achievement by Apex Learning use

Demographic Characteristics	Comparison Group		Apex Learning Group		Total
	N	Percent	N	Percent	N
Student Count	290	100%	290	100%	580
9th Grade	7	2%	7	2%	14
10th Grade	77	27%	61	21%	138
11th Grade	126	43%	136	47%	262
12th Grade	80	28%	86	30%	166
Female	121	42%	133	46%	254
Male	169	58%	157	54%	326
Asian	4	1%	1	0%	5
African-American	38	13%	49	17%	87
Hispanic	73	25%	67	23%	140
Native American	2	1%	0	0%	2
Multi-racial	7	2%	13	5%	20
White	166	57%	160	55%	326
Disability-Y†	63	22%	58	20%	121
LEP-Y	.	.	.	.	.

EOC Exam	Gr 8 Prior Ability Z-Scores	N	Mean	StdDev	N	Mean	StdDev	N
Algebra I	Gr8 FCAT Math	34	-0.85	0.74	34	-0.91	0.69	68
Biology	Gr8 FCAT Science	66	-0.66	1.05	66	-0.72	0.95	132
Geometry	Gr8 FCAT Math	96	-0.93	0.70	96	-0.89	0.86	192
U.S. History	Gr8 FCAT Reading	94	-0.36	0.67	94	-0.41	0.76	188

EOC Exam Unadjusted Scale Scores	N	Mean	StdDev	N	Mean	StdDev	N
Algebra I	34	414.59	50.07	34	425.15	54.27	68
Biology	66	392.85	26.52	66	388.97	24.12	132
Geometry	96	467.59	41.68	96	467.01	38.23	192
U.S. History	94	407.05	24.89	94	394.78	27.39	188

Table 3. Average Apex Learning usage statistics for completed enrollments by subject

Subject	N	Number of Days between First Access and Completion Date	Percent of Activities Completed	Quality of Work
Electives	33	51	98%	83
English	880	125	95%	80
Math	1,228	125	99%	78
Science	837	99	98%	81
Social Studies	1,249	100	97%	83
Total	4,227	112	97%	81

Table 4. Average Apex Learning usage statistics for enrollments included in the analytic sample[1] by EOC assessment				
Subject	N	Number of Days between First Access and Completion Date	Percent of Activities Completed	Quality of Work
Algebra I	34	144	97%	80
Biology	66	119	99%	81
Geometry	96	129	98%	74
U.S. History	94	109	97%	84
Total	290	122	98%	80

[1]*The analytic sample contains enrollments that completed 90% or more course activities and/or were designated completed by the teacher in the learning management system. All enrollments have both pre and post-test scores.*

Table 5. Parameter estimates: Algebra I EOC						
Dependent Variable: Algebra I Scale Score					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	709.75	113.61	6.25	0.00	482.58	936.91
Grade 8 Prior Ability	18.66	9.29	2.01	0.05	0.08	37.25
Minority Flag	10.51	15.06	0.70	0.49	-19.61	40.63
Learning Disability Flag	21.07	17.34	1.22	0.23	-13.60	55.74
Male Flag	16.83	13.96	1.21	0.23	-11.10	44.75
Grade	-28.75	11.67	-2.46	0.02	-52.09	-5.42
[Treatment=Control Group]	-11.16	12.04	-0.93	0.36	-35.22	12.91
[Treatment=Apex Learning Group]	0b	.	.	.	.	.

b *This parameter is set to zero because it is redundant.*
† *Statistically significant p<.05*

Table 6. Parameter estimates: Biology EOC						
Dependent Variable: Biology Scale Score					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	399.17	20.46	19.51	0.00	358.68	439.67
Grade 8 Prior Ability	16.50	1.84	8.96	0.00	12.85	20.14
Minority Flag	1.80	3.81	0.47	0.64	-5.73	9.33
Learning Disability Flag	-0.29	4.32	-0.07	0.95	-8.85	8.27
Male Flag	7.06	3.47	2.04	0.04	0.20	13.92
Grade	-0.22	1.87	-0.12	0.91	-3.91	3.47
[Treatment=Control Group]	2.42	3.31	0.73	0.47	-4.13	8.98
[Treatment=Apex Learning Group]	0b	.	.	.	.	.

b *This parameter is set to zero because it is redundant.*
† *Statistically significant p<.05*

Table 7. Parameter estimates: Geometry EOC

Dependent Variable: Geometry Scale Score					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	460.75	53.86	8.55	0.00	354.48	567.01
Grade 8 Prior Ability	10.03	4.09	2.45	0.02	1.96	18.11
Minority Flag	10.62	6.15	1.73	0.09	-1.50	22.75
Learning Disability Flag	3.68	6.93	0.53	0.60	-9.99	17.34
Male Flag	3.51	5.89	0.60	0.55	-8.12	15.14
Grade	0.65	4.80	0.14	0.89	-8.82	10.12
[Treatment=Control Group]	0.71	5.75	0.12	0.90	-10.64	12.05
[Treatment=Apex Learning Group]	0b	.	.	.	.	.

b This parameter is set to zero because it is redundant.
† Statistically significant p<.05

Table 8. Parameter estimates: U.S. History EOC

Dependent Variable: U.S. History Scale Score					95% Confidence Interval	
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound
Intercept	375.03	25.19	14.89	0.00	325.33	424.72
Grade 8 Prior Ability	25.32	2.04	12.39	0.00	21.28	29.35
Minority Flag	-1.82	2.81	-0.65	0.52	-7.37	3.73
Learning Disability Flag	-1.82	3.95	-0.46	0.65	-9.62	5.98
Male Flag	10.24	2.81	3.65	0.00	4.70	15.77
Grade	2.27	2.21	1.03	0.31	-2.09	6.62
[Treatment=Control Group]	10.71	2.70	3.98	0.00 †	5.40	16.03
[Treatment=Apex Learning Group]	0b	.	.	.	.	.

b This parameter is set to zero because it is redundant.
† Statistically significant p<.05

Table 9. Covariate adjusted log odds ratio by EOC assessment

EOC Assessment	Variable	B	S.E.	Wald	df	Sig.	Odds Ratio
Algebra I	Treatment	-0.368	0.818	0.203	1	0.65	0.69
Biology	Treatment	0.442	0.644	0.471	1	0.49	1.56
Geometry	Treatment	-0.522	0.455	1.318	1	0.25	0.59
U.S. History	Treatment	-1.465	0.473	9.606	1	0.00 †	0.23

Covariates used: Grade8 prior ability, Minority flag, Male flag, Disability flag, Grade, School, Treatment.
† Statistically significant p<.05

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