

EFFICACY STUDY

A Study of the Efficacy of Apex Learning Digital Curriculum

Cherokee County School District

May 2015



Introduction

Cherokee County School District (CCSD) uses Apex Learning Comprehensive Courses to provide customized, self-paced coursework designed to meet the needs of high school students. The digital curriculum provides computerized direct instruction of content aligned to the Georgia Learning Standards in subjects including English language arts (ELA), mathematics, science, social studies, and many electives.

CCSD offers Apex Learning courses through their C3 Academy in two distinct programs: a high school program for credit recovery and an alternative settings program for students completing coursework for initial credit or credit recovery.

In the high school program, Apex Learning Comprehensive Courses are offered for credit recovery during the traditional school day, before and after school, and during the summer. Students complete coursework in a computer lab with teacher assistance as needed. Certified teachers who have availability in their teaching schedule are assigned to support the computer lab.

In the alternative program, including ACE Academy, Tippens Educational Center and Polaris Evening Program, Apex Learning Comprehensive Courses are used for initial credit and credit recovery during the school day. Students work at their own pace to complete courses in a classroom facilitated by a certified teacher who has received additional training to deliver online curriculum in a blended learning environment.

In both programs, CCSD employs mastery based learning, a feature of Apex Learning that requires a student to pass all graded assignments and tests at 70% or above before progressing to the next unit of instruction.

In the 2013-2014 school year, Georgia administered eight end-of-course tests (EOCT) to assess mastery of the Georgia Learning Standards. This study examined the impact of using Apex Learning Comprehensive Courses on EOCTs administered during the 2013-2014 school year. The achievement of students using Apex Learning to complete courses that lead to an EOCT was compared to similar students completing courses for initial credit in traditional classroom environments by program and programs combined. In addition, an ad-hoc exploratory analysis was conducted to identify characteristics of course usage that lead to achieving a passing score on the EOCT.

Three hundred twenty-five (325) students using 393 Apex Learning courses are included in the study. CCSD students in Apex Learning courses:

- Passed 58% of 393 EOCTs
- Their average 8th grade pretest ability is equivalent to the 23rd percentile in relation to CCSD district norms
- Are mostly white/non-Hispanic (71%) and male (66%)
- Thirteen percent have a disability requiring an individual education plan (IEP)
- Students used Apex Learning courses for an average of 32 hours, completing 85% of their coursework with an average quality of work of 81%

Located in the Appendix, tables 1-3 provide detailed demographic and prior achievement characteristics of students included in the study using Apex Learning courses and for each comparison group by program. Table 4 shows average usage statistics for Apex Learning courses.

Results

Do students completing Apex Learning Comprehensive Courses perform the same as or better on EOCTs than similar students not using Apex Learning Comprehensive Courses?

In the alternative program, the average performance of students using Apex Learning Comprehensive Courses for initial credit or credit recovery is not significantly different than students attending alternative settings who did not use Apex Learning courses (Figure 1, Table 7) ($p > .05$, ES $d = -.23$).

In the high school program, the average performance of students using Apex Learning Comprehensive Courses for credit recovery is slightly less than similar students completing courses for initial credit in traditional classroom settings. The size of the difference is insignificant (Figure 1, Table 6) ($p < .00$, ES $= -.19$).

Figure 1. Average EOCT z-score

Setting	Treatment	N	CRCT Pretest Performance		EOCT Post-test Performance		
			Mean Z-score ^{ab}	PR Equivalent	Mean Z-score ^{ab}	PR Equivalent	Percent Passing EOCT
All	Control	393	-.696	24	-.440	33	69.7%
	Apex	393	-.696	24	-.635	26	57.5%
Alternative	Control	71	-.468	32	-.288	39	83.1%
	Apex	71	-.472	32	-.522	30	76.1%
High School	Control	322	-.746	23	-.502	31	66.8%
	Apex	322	-.746	23	-.688	25	53.4%

a. Estimated pretest mean calculated by subtracting the mean post-pretest gain from the mean EOCT. Mean gain and EOCT were controlled for pretest ability, race/ethnicity, gender, ELL status, disability, subject, and grade level. Mean z-score transformed into percentile rank (PR).

b. Estimated means controlled for pretest ability, race/ethnicity, gender, ELL status, disability, subject, and grade level.

Post-hoc analysis: What usage characteristics determine achievement for students using Apex Learning Comprehensive Courses in CCSD?

Additional analysis of Apex Learning usage characteristics suggest that both EOCT pass rates and average achievement for students who completed 80% or more Apex Learning coursework (333 out of 393 enrollments) with a quality of work score greater than 80% (216 out of 393 enrollments) is not significantly different than students who completed courses for initial credit in traditional classrooms.

Figure 4 shows the percent of EOCTs passed for students who completed 80% or more Apex Learning coursework by quality of work and for the control group. Students completing 80% or more of Apex Learning course activities with a quality of work score above 80 have similar pass rates as students completing non-Apex Learning coursework for initial credit in a traditional classroom ($z = -0.5$, $p = .29$).

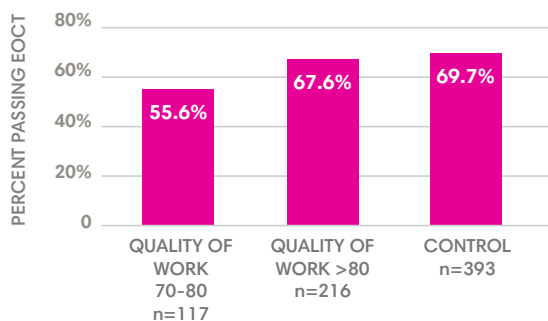


FIGURE 4:
EOCT pass rate of students completing 80% or more course activities by quality of work

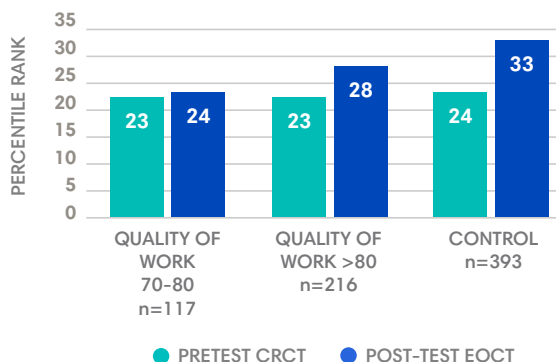


FIGURE 5:
Average percentile rank of students completing 80% or more coursework by quality of work

Figure 5 shows the average pre and posttest achievement for students who completed 80% or more Apex Learning coursework by quality of work and for the control group. The average posttest achievement for students completing 80% or more of Apex Learning coursework with a quality of work score above 80 is not significantly different than students completing coursework for initial credit in a traditional classroom ($t(607)=1.5, p=.13$).

Conclusion

CCSD students used Apex Learning Comprehensive Courses to earn initial credit or recover credit for classes previously failed through two programs offered by the CCSD C3 Academy. In the alternative program, the average EOCT achievement of students using Apex Learning Comprehensive Courses is not significantly different than students not using Apex Learning courses.

In the high school program, the average EOCT standardized scores of students using Apex Learning Comprehensive Courses for credit recovery is lower compared to students completing coursework for initial credit in a traditional classroom environment. The magnitude of the difference between the two groups' performance was insignificant.

Further analysis of Apex Learning usage suggests that both average EOCT achievement and pass rates for students who completed 80% of Apex Learning coursework with a quality of work score greater than 80% is not significantly different than students completing non-Apex Learning coursework for initial credit in a traditional classroom.

Study Description

Study Design

This quasi-experimental study used an observational case-control group design. The effectiveness of Apex Learning Comprehensive Courses was evaluated by comparing the achievement of students who used the digital curriculum to similar students who completed coursework in a traditional classroom environment.

A post-hoc exploratory analysis was conducted on Apex Learning user data to identify characteristics of course use that lead to achieving a passing score on the EOCT exam.

Participants

Students included in the study completed at least one subject-area EOCT during the 2013-2014 school year and the 8th grade Georgia Criterion-Referenced Competency Tests (CRCT). Tables 1-3 in the appendix show the demographic and prior ability characteristics of the Apex Learning and comparison groups for each program and combined.

Data Preparation

Three steps were completed to create the final analytical dataset. The steps included joining the files provided by CCSD and Apex Learning, splitting the file into school settings, and generating a matched comparison group for each EOCT subject test in each setting.

Joining the files

CCSD provided assessment data including EOCT scale scores, performance levels, and 8th grade CRCT scale scores. The files included the following demographic variables: English language learner (ELL) and individual education plan status (disability), gender, grade, school identifier, reported race, and birth month and year. Eighth grade CRCT subject area results were used as a measure of prior ability for each EOCT test.

Assessment data were provided for all high school students in the district who completed an ECOT during the 2013-2014 school year and for all students who completed an 8th grade CRCT in the 2009-2010 through 2012-2013 school years. For each assessment, scale scores were pooled by subject area test and were transformed into standardized z-scores. Student records for each subject area EOCT were appended with the appropriate subject area CRCT scores (e.g. CRCT Math appended to ECOT Coordinate Algebra). Student records with both pre- and post-test scores were included in the final assessment data file. For each setting a single student could have up to eight records, one record for each subject area EOCT.

Apex Learning provided course records for all students enrolled in any Apex Learning course in CCSD prior to July 2014. The data file included school, classroom name, course track, course title, number and percent of activities completed, total minutes used, quality of work, and overall course percent correct metrics.

Apex Learning courses leading to a subject-area EOCT were identified by classroom naming conventions used by CCSD. The list of courses were reviewed by the CCSD site coordinator. Unit recovery classes were excluded from the file. The final list of courses was verified by CCSD personnel. Apex Learning records for students enrolled in courses that lead to an EOCT were joined to the assessment file.

Splitting the file into school settings

Two school setting groups were formed. The alternative group included three school settings: ACE Academy, Tippens Education Center, and Polaris Evening Program. The high school group contained all other high school settings. Students in the Apex Learning group were assigned to a setting according to the name of the school identified in the Apex Learning file. Students who did not use Apex Learning courses were assigned to a setting according to the school identified in the EOCT data file.

Generating a comparison group

For each school setting and EOCT subject-area test, a randomly selected comparison group was generated to match Apex Learning users by prior ability and demographic characteristics. Propensity score matching and sampling with replacement was used to generate the final analytical sample for each setting.

Analysis

Research Question 1

A separate analysis comparing Apex Learning users to a comparison group was conducted for each school setting (alternative and high school) and settings combined.

An analysis of covariance was used to compare the average EOCT achievement of students using Apex Learning courses to those of students not using Apex Learning controlling for pretest ability, race/ethnicity, gender, ELL status, disability and grade. School was fitted as a random effect to control for differences that could be related to school level factors.

Research Question 2

Three analyses were performed to explore and identify characteristics of course usage that lead to achieving a passing score on the EOCT exam.

First, the decision tree procedure in SPSS was used to identify Apex Learning variables that accounted for variance in the ECOT pass/fail variable. Second, for each identified variable the SPSS optimal binning procedure was used to group Apex Learning usage data into categories that best predict EOCT pass/fail performance. Third, a regression analysis was performed to identify the impact each binned variable had on EOCT achievement controlling for pretest ability, race/ethnicity, gender, ELL status, disability, subject and grade. Activity completed percent (binned), quality of work (binned) and total course minutes (binned) were found to be significantly associated with increased EOCT z-scores.

Outcome Measures

The findings are based on the EOCT assessments, which measures student content mastery in two courses in four subject areas including ELA, mathematics, social studies, and science. A retired EOCT (GPS Geometry) was also administered in 2013–2014 to students eligible to take that exam. Assessments were administered in the winter, spring, and summer. The EOCT tests were pooled by subject area across administrations and the scale scores were transformed to standardized z-scores to allow analysis across subject areas.

Appendix

Table 1. Apex Learning users vs. comparison group: All programs					
Demographic Characteristics	Comparison		Apex Learning		Total
	N	Percent	N	Percent	N
Student Count	393	100%	393	100%	786
9th Grade	192	49%	162	41%	354
10th Grade	116	30%	119	30%	235
11th Grade	78	20%	103	26%	181
12th Grade	7	2%	9	2%	16
Female	139	35%	132	34%	271
Male	254	65%	261	66%	515
Asian/Pacific Islander	7	2%	8	2%	15
Black/Non-Hispanic	45	12%	42	11%	87
Hispanic	54	14%	49	13%	103
Native American/Alaskan Native	0	0%	3	1%	3
White/Non-Hispanic	281	72%	279	71%	560
Multi-racial	6	2%	12	3%	18
ELL-Y	2	1%	4	1%	6
IEP-Y*	41	10%	64	16%	105
CRCT Scale Score Results	N	Mean	N	Mean	N
9TH	73	829.34	73	827.67	146
AGE	56	815.73	56	816.84	112
AME	47	839.55	47	834.34	94
BIO†	71	819.01	71	807.14	142
CAL	63	815.10	63	810.57	126
GEO	24	813.67	24	818.08	48
PHY	29	805.90	29	801.86	58
USH	30	813.27	30	815.17	60
Total (Z-Score)	393	-0.65	393	-0.74	786
EOCT Scale Score Results	N	Mean	N	Mean	N
9TH	73	431.75	73	424.89	146
AGE	56	394.54	56	388.80	112
AME	47	442.57	47	430.00	94
BIO	71	435.77	71	413.25	142
CAL	63	389.14	63	381.22	126
GEO	24	402.88	24	400.71	48
PHY	29	436.52	29	427.62	58
USH	30	424.10	30	426.23	60
Total (Z-Score)	393	-0.39	393	-0.66	786
EOCT Pass Rate	393	69.7%	393	57.5%	786

*Chi Square Sig p<.05

†T-test Sig p<.05

Table 2. Apex Learning users vs. comparison group: High school program					
Demographic Characteristics	Comparison		Apex Learning		Total
	N	Percent	N	Percent	N
Student Count	322	100%	322	100%	644
9th Grade	167	52%	140	44%	307
10th Grade	86	27%	91	28%	177
11th Grade	64	20%	83	26%	147
12th Grade	5	2%	8	3%	13
Female	121	38%	116	36%	237
Male	201	62%	206	64%	407
Asian/Pacific Islander	6	2%	6	2%	12
Black/Non-Hispanic	21	7%	31	10%	52
Hispanic	40	12%	37	12%	77
Native American/Alaskan Native	0	0%	2	1%	2
White/Non-Hispanic	249	77%	235	73%	484
Multi-racial	6	2%	11	3%	17
ELL-Y	2	1%	4	1%	6
IEP-Y*	41	13%	50	16%	91
CRCT Scale Score Results	N	Mean	N	Mean	N
9TH	58	830.76	58	826.79	116
AGE	56	815.73	56	816.84	112
AME	37	838.38	37	831.32	74
BIO†	41	816.93	41	803.39	82
CAL	60	814.97	60	809.92	120
GEO	22	810.14	22	813.95	44
PHY	25	802.92	25	798.24	50
USH	23	814.74	23	810.17	46
Total	322	-0.69	322	-0.80	644
EOCT Scale Score Results	N	Mean	N	Mean	N
9TH	58	431.76	58	423.09	116
AGE	56	394.54	56	388.80	112
AME	37	443.35	37	429.32	74
BIO	41	438.05	41	413.02	82
CAL	60	389.45	60	380.13	120
GEO	22	402.18	22	399.36	44
PHY	25	430.20	25	422.84	50
USH	23	421.48	23	420.52	46
Total (Z-Score)	322	-0.39	322	-0.68	644
EOCT Pass Rate	322	66.8%	322	53.4%	644

†T-test Sig p<.05

Table 3. Apex Learning users vs. comparison group: Alternative program					
Demographic Characteristics	Comparison		Apex Learning		Total
	N	Percent	N	Percent	N
Student Count	71	100%	71	100%	142
9th Grade	25	35%	22	31%	47
10th Grade	30	42%	28	39%	58
11th Grade	14	20%	20	28%	34
12th Grade	2	3%	1	1%	3
Female	18	25%	16	23%	34
Male	53	75%	55	78%	108
Asian/Pacific Islander	1	1%	2	3%	3
Black/Non-Hispanic	24	34%	11	16%	35
Hispanic	14	20%	12	17%	26
Native American/Alaskan Native	0	0%	1	1%	1
White/Non-Hispanic	32	45%	44	62%	76
Multi-racial	0	0%	1	1%	1
ELL-Y	0	0%	0	0%	0
IEP-Y*	0	0%	14	20%	14
CRCT Scale Score Results	N	Mean	N	Mean	N
9TH	15	823.87	15	831.07	30
AGE	.	.	.	.	.
AME	10	843.90	10	845.50	20
BIO	30	821.87	30	812.27	60
CAL	3	817.67	3	823.67	6
GEO	2	852.50	2	863.50	4
PHY	4	824.50	4	824.50	8
USH	7	808.43	7	831.57	14
Total (Z-Score)	71	-0.48	71	-0.46	142
EOCT Scale Score Results	N	Mean	N	Mean	N
9TH	15	431.73	15	431.87	30
AGE	.	.	.	.	.
AME	10	439.70	10	432.50	20
BIO	30	432.67	30	413.57	60
CAL	3	383.00	3	403.00	6
GEO	2	410.50	2	415.50	4
PHY	4	476.00	4	457.50	8
USH	7	432.71	7	445.00	14
Total (Z-Score)	71	-0.38	71	-0.56	142
EOCT Pass Rate	71	83.1%	71	76.1%	142

*Chi Square Sig p<.05

Table 4. Apex Learning usage by program

Setting	Subject	Total Course Min		Total Course Hrs		Activity Complete %		Quality of Work	
		N	Mean	N	Mean	N	Mean	N	Mean
High School	English	95	1351	95	22.5	95	90.6	95	82.1
	Math	138	2275	138	37.9	138	80.1	138	80.2
	Science	66	1942	66	32.4	66	87.1	66	80.2
	Social Studies	23	2124	23	35.4	23	87.4	23	82.5
	Total	322	1923	322	32.1	322	85.2	322	80.9
Alternative	English	25	1671	25	27.9	25	96.5	25	81.2
	Math	5	1352	5	22.5	5	90.9	5	78.3
	Science	34	3023	34	50.4	34	96.4	34	78.5
	Social Studies	7	2394	7	39.9	7	98.8	7	84.6
	Total	71	2367	71	39.5	71	96.3	71	80.0
All	English	120	1418	120	23.6	120	91.9	120	81.9
	Math	143	2243	143	37.4	143	80.5	143	80.1
	Science	100	2310	100	38.5	100	90.2	100	79.6
	Social Studies	30	2187	30	36.4	30	90.1	30	83.0
	Total	393	2004	393	33.4	393	87.2	393	80.8

Table 5. Parameter estimates: All programs

Fixed Effects	Estimate B	Std. Error	Sig.	Observed Power ^b
Intercept	-.590	.210	.005	.800
Pretest (CRCT as a z-score)	.672	.031	.000	1.000
Minority	-.182	.055	.001	.911
GENDER=M	-.045	.051	.378	.143
ELL=Y	-.119	.277	.668	.071
IEP=Y	-.249	.078	.002	.888
Grade_9	.035	.074	.641	.075
Grade_10	-.033	.083	.685	.069
Grade_GT10	0 ^a	.	.	.
EOCT_SubjN	0.06	0.02	.003	.841
English	.395	.154	.010	.727
Math	.394	.123	.001	.894
Science	.211	.117	.071	.438
SocialStudies	0 ^a	.	.	.
Treatment=Apex	-0.194	0.048	0.000	.980

a This parameter is set to zero because it is redundant.
 b. Computed using alpha = .05

Table 6. Parameter estimates: High school program

Fixed Effects	Estimate B	Std. Error	Sig.	Observed Power ^b
Intercept	-.926	.211	.000	.992
Pretest (CRCT as a z-score)	.714	.034	.000	1.000
Minority	-.151	.061	.013	.700
GENDER=M	-.062	.054	.248	.211
ELL=Y	-.117	.270	.664	.072
IEP=Y	-.234	.080	.004	.832
Grade_9	.066	.078	.398	.135
Grade_10	.117	.094	.212	.238
Grade_GT10	0 ^a	.	.	.
EOCT_SubjN	.076	.021	.000	.947
English	.526	.167	.002	.884
Math	.424	.131	.001	.898
Science	.281	.128	.029	.591
SocialStudies	0 ^a	.	.	.
Treatment=Apex	-0.186	0.052	0.000	0.949

a This parameter is set to zero because it is redundant.
 b. Computed using alpha = .05

Table 7. Parameter estimates: Alternative program

Fixed Effects	Estimate B	Std. Error	Sig.	Observed Power ^b
Intercept	-.400	.303	.189	.258
Pretest (CRCT as a z-score)	.497	.082	.000	1.000
Minority	-.269	.139	.055	.484
GENDER=M	-.107	.152	.482	.108
IEP=Y	-.259	.303	.395	.135
Grade_9	.168	.228	.462	.113
Grade_10	-.304	.183	.100	.377
Grade_GT10	0 ^a	.	.	.
EOCT_SubjN	.089	.086	.303	.177
English	.244	.416	.559	.090
Math	-.144	.287	.617	.079
Science	-.384	.526	.467	.112
Treatment=Apex	-0.234	0.133	0.081	0.414

a. This parameter is set to zero because it is redundant.
 b. Computed using alpha = .05

Table 8. Parameter estimates: Apex Learning determinates of achievement

Dependent Variable: EOCT_ZDist Fixed Effects	Estimate B	Std. Error	Sig.
(Constant)	-.415	.145	.004
Minority	-.149	.076	.051
Pretest (CRCT as a z-score)	.586	.046	.000
GENDER=M	.012	.074	.866
ELL=Y	-.018	.342	.957
IEP=Y	-.011	.101	.911
GRADE=9.0	.076	.084	.365
GRADE_GT10	-.099	.098	.313
SubjectName=English	-.339	.099	.001
SubjectName=Science	-.255	.095	.008
SubjectName=Social Studies	-.218	.148	.141
TotalPointsAttempted_Perc>=97.16	-0.008	.125	.946
TotalCourseMinutes < 2095	.156	.081	.054
ActivityCompletePerc>=80.00	.295	.152	.053
QualityofWork>=86.24	.584	.114	.000

Note: Math and Grade 10 excluded to reduce collinearity.

Table 9. Impact of Apex Learning usage characteristics on average EOCT performance

Activity Complete Percent	Quality of Work	N	Mean ^a Pretest (CRCT)		Mean ^b Post-test (EOCT)		ES ^b of the Difference	
			Z-score	PR	Z-score	PR	Z-score	Percent Passing EOCT
Less than 80%	Less than 70	10	.	.	.	.	.	.
	Between 70-80	30	-0.742	23	-0.911	18	-0.169	26.7%
	Greater than 80	20	-0.742	23	-0.807	21	-0.065	15.0%
Greater than or equal to 80%	Between 70-80	117	-0.742	23	-0.692	24	0.05	55.6%
	Greater than 80	216	-0.742	23	-0.588	28	0.154	67.6%

a. Estimated (Est) pretest mean calculated by subtracting the mean post-pretest gain from the mean EOCT. Mean gain and EOCT were controlled for pretest ability, race/ethnicity, gender, ELL status, disability, subject, and grade level. Mean z-score transformed into percentile rank (PR).
 b. Estimated means controlled for pretest ability, race/ethnicity, gender, ELL status, disability, subject, and grade level.



More Learning Happens

Apex Learning puts rigorous, standard-based curriculum within reach for all students—from those struggling to those capable of acceleration—to prepare them for the next course, the next stage in their education, work and life. Schools use Apex Learning digital curriculum because it is proven that more learning happens with the powerful, actionable data that gives educators insight into student performance, and the personalization and engagement students need to succeed. During the 2015–2016 school year, there were more than three million enrollments in Apex Learning Comprehensive Courses for original credit and credit recovery and Adaptive Tutorials for intervention, remediation, and to prepare for high-stakes assessments. Headquartered in Seattle, Apex Learning is accredited by AdvancEd and its courses are approved for National Collegiate Athletic Association eligibility.

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