



# Measuring the Impact of IXL Math and IXL Language Arts in North Carolina Schools

## Introduction

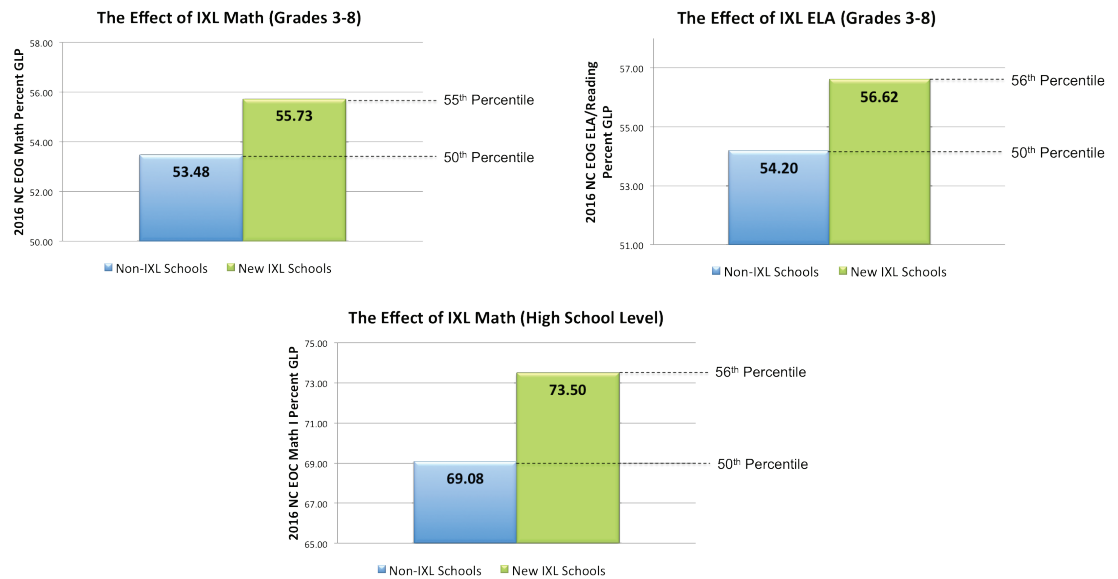
Previous research has shown that the use of IXL can have significant impact on student achievement for an individual school (Empirical Education, 2013). In this study, we explore IXL usage across the entire state of North Carolina. Examining such a large sample of schools allows us to quantify the impact of IXL Math and IXL English Language Arts (ELA) on school performance as measured by North Carolina state exams.

## Abstract

This study investigated hundreds of public schools in the state of North Carolina that used IXL Math or IXL ELA between 2014 and 2016. Using data from the 2016 North Carolina End-of-Grade (EOG) tests for elementary and middle schools and the 2016 North Carolina End-of-Course (EOC) tests for high schools, researchers examined student achievement in both IXL schools and non-IXL schools. Scores from the 2013 North Carolina EOG or EOC tests were used to control for schools' performance prior to using IXL. IXL usage by the schools in this study ranged from less than one minute per student, per week, to over 50 minutes per student, per week. Even with the wide range in student usage, our researchers found a strong positive correlation between IXL usage and school performance. These results are statistically significant.

## Key Findings

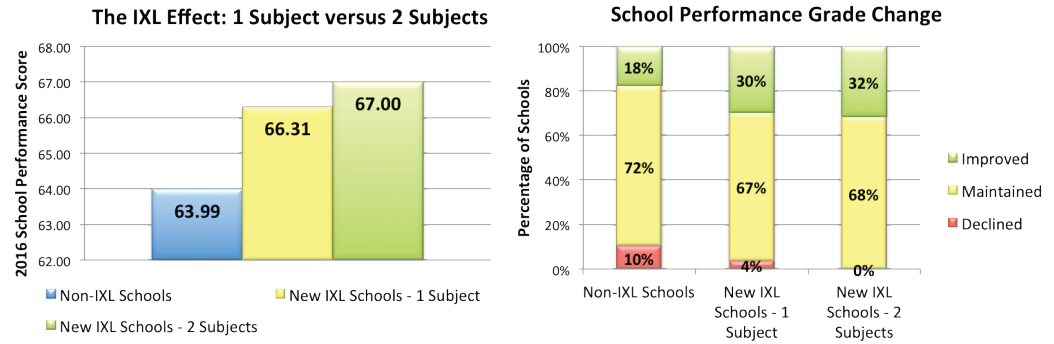
North Carolina elementary and middle schools using IXL outperformed schools without IXL in both math and reading on standardized tests. North Carolina high schools using IXL Math also outperformed schools without IXL.



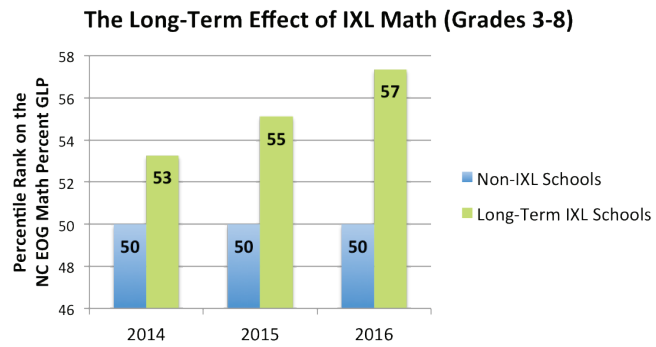
*Note: Since IXL ELA for high school students was not launched until 2015, our analysis does not include ELA at the high school level.*

## The IXL Effect

Elementary and middle schools with two IXL subjects received higher school performance scores<sup>1</sup> in 2016 than schools with one IXL subject. Thirty-two percent of schools with two IXL subjects and 30 percent of schools with one IXL subject improved their school performance grades<sup>2</sup> from 2015 to 2016, compared to just 18 percent of non-IXL schools.



Schools using IXL Math for three school years demonstrated increasing gains over time on the EOG Math I test from 2014 to 2016.



<sup>1</sup> School performance scores, ranging from 0 to 100, are calculated by the North Carolina Department of Public Instruction based on a school's achievement and growth on the state standardized tests.

<sup>2</sup> School performance grades are letter grades of A, B, C, D, or F assigned to each school by the North Carolina Department of Public Instruction based on a school's performance score.

## The IXL Effect in North Carolina Schools

APRIL 25, 2017

### Study Design

Our researchers wanted to determine the effect of IXL on student achievement at the school level, as measured by the percentage of students in the school meeting proficiency goals set by the state. To do this, we looked at state test results for schools before and after implementing IXL. We used schools not implementing IXL as a control.

This study used a pretest-posttest control group design to measure the impact of IXL. This type of study design evaluates the treatment effect by comparing the performance of the treatment group and the control group on the posttest, after adjusting for their performance on the pretest (see Figure 1). The treatment group included schools that started using IXL in the 2015-16 school year (called “new IXL schools”). The control group consisted of schools that did not use IXL in the 2014-15 or 2015-16 school years (called “non-IXL schools”).

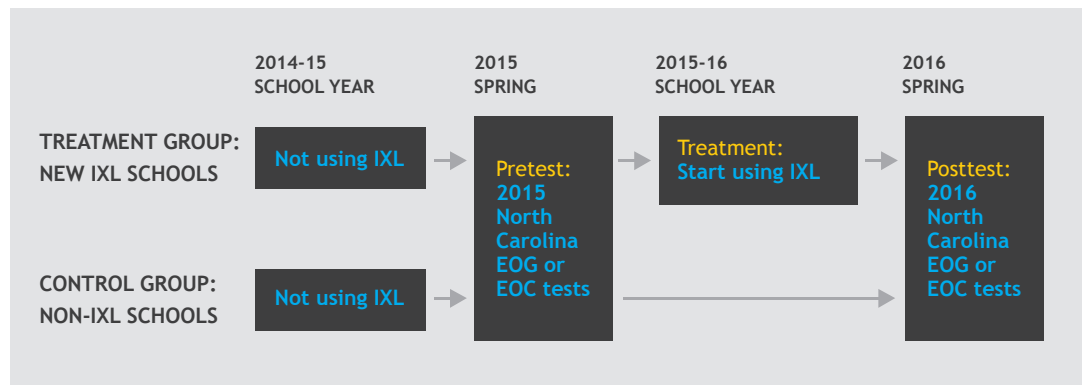


Figure 1. Pretest-Posttest Study Design

Schools that used IXL in the 2013-14, 2014-15, and 2015-16 school years were considered “long-term IXL schools.” The study used a longitudinal design to compare performance between long-term IXL schools and non-IXL schools on Test 1, Test 2, and Test 3 simultaneously, after controlling for school characteristics (see Figure 2). The IXL effect is indicated by comparing the change in performance from Test 1 to Test 2 and from Test 2 to Test 3 in both long-term IXL schools and non-IXL schools.

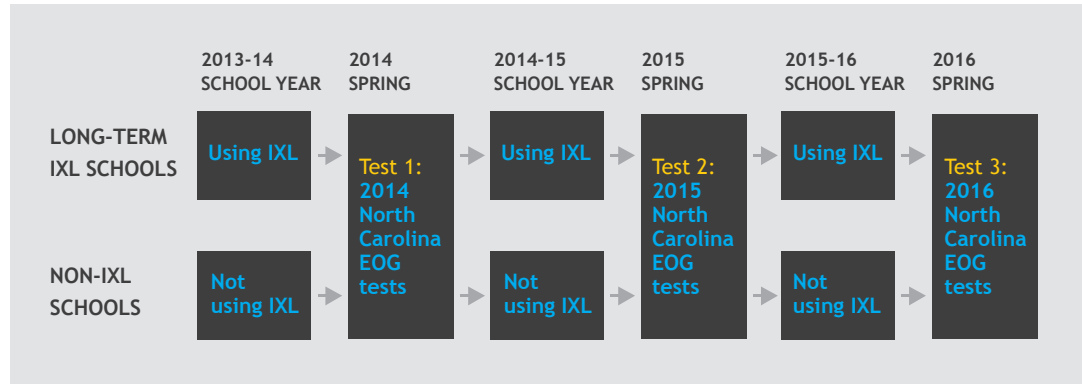


Figure 2. Longitudinal Study Design

School testing data for the study came from two standardized tests: 1) the North Carolina End-of-Grade (EOG) Mathematics and Reading Comprehension Tests for students in grades 3 through 8, and 2) the North Carolina End-of-Course (EOC) Tests (i.e., NC Math I and English II) for high school students and some students in grade 8. The North Carolina EOG Tests are designed to measure student performance on the goals, objectives, and grade-level competencies specified in the North Carolina Standard Course of Study. The North Carolina EOC Tests are used to sample student knowledge of subject-related concepts as specified in the North Carolina Standard Course of Study and to provide a global estimate of student mastery of each content area.

The North Carolina Department of Public Instruction evaluates schools’ academic performance in each subject based on the percent grade level proficiency (GLP), which is the percentage of students scoring at Level 3 and above on the EOG or EOC tests. To measure the overall performance of each public school, the North Carolina Department of Public Instruction calculates a school performance score based on the school’s achievement and growth. The school performance score ranges from 0 to 100. A letter grade of A, B, C, D, or F (called the school performance grade) is then assigned to each school according to the school performance score. School performance grades provide a straightforward way for teachers and parents to understand the performance of a school.

## Methodology

The study analyzed data from 2,673 North Carolina public schools, including both traditional public schools and charter schools. A total of 711 public schools used IXL Math and/or IXL ELA between 2013 and 2016. As the number of students who practiced on IXL within a school ranged from a single classroom to the entire school, this study defined a school as a “new IXL school” if the school started to use IXL in the 2015-16 school year and if at least one third of the students enrolled at the school practiced on IXL (see Appendix A for details on school selection and classification). This study defined a school as a “long-term IXL school” if the school used IXL continuously in the 2013-14, 2014-15, and 2015-16 school years

and if at least one third of the students enrolled at the school practiced on IXL in all three school years. Based on these criteria, new IXL schools included 40 elementary/middle schools using IXL Math, 20 elementary/middle schools using IXL ELA, and 25 high schools using IXL Math. Long-term IXL schools included 128 elementary/middle schools using IXL Math. Appendix B shows the characteristics of new IXL schools, long-term IXL schools, and the North Carolina state averages. The school performance and enrollment data were obtained from the North Carolina Department of Public Instruction and the Institute of Education Science.

Our researchers used a linear regression model to calculate the IXL effect—i.e., the performance difference between new IXL schools and non-IXL schools on the 2016 EOG/EOC tests, controlling for factors such as prior performance, school size, percentage of English language learners (ELLs), and school location. To evaluate the IXL effect over time for long-term IXL schools, a linear mixed effect model was used to compare the performance of long-term IXL schools and non-IXL schools on the state tests in all three years. We also calculated the odds ratio to examine whether new IXL schools were more likely to improve their school performance grades than non-IXL schools. We used another linear regression model to estimate the strength of association between IXL usage and school performance. (See Appendix C for a detailed explanation of analytical methods.)

This form of analysis allowed us to answer four key questions:

1. What is the IXL effect on student achievement for new IXL schools? In other words, did new IXL schools outperform non-IXL schools on the 2016 North Carolina EOG/EOC tests?
2. What is the effect of using one IXL subject (i.e., Math or ELA) or two IXL subjects (i.e., Math and ELA) on student achievement for new IXL schools?
3. For long-term IXL schools, what is the IXL effect on student achievement over time? That is, did IXL schools continuously show more growth than non-IXL schools from year to year?
4. What is the association between IXL usage and school performance?

## Results

Analysis of the data showed that IXL had positive and statistically significant effects on school performance in both math and ELA, indicating there is a high probability that similar schools using IXL would achieve similar results. The IXL effect was larger for new IXL schools that used two IXL subjects as opposed to one subject. For schools that used IXL for at least three years, our analysis found a significantly higher performance gain than in similar non-IXL schools. We also found a positive correlation between IXL usage and school performance. In particular, achieving a SmartScore of at least 70 on two additional skills per student, per week, was associated with an expected 13.07 percent increase on a school's percent proficient in ELA and a 4.22 percent increase in math.

## The Efficacy of IXL Math at the Elementary/Middle School Level

The implementation of IXL Math at the elementary/middle school level showed a statistically significant effect on schools' performance on the 2016 North Carolina EOG Math tests across grades 3 through 8 (see Appendix D, Table D1 for details).

Figure 3 shows that the adjusted percent GLP<sup>3</sup> was 53.48 for non-IXL schools and 55.73 for new IXL schools. The 2.25 percent difference corresponds to a percentile gain of 5 points in school ranking. That is, if an average non-IXL school (at the 50th percentile) had begun using IXL Math during the 2015-16 school year, the school's percent GLP would be expected to increase 2.25 percent, putting the school at the 55th percentile.

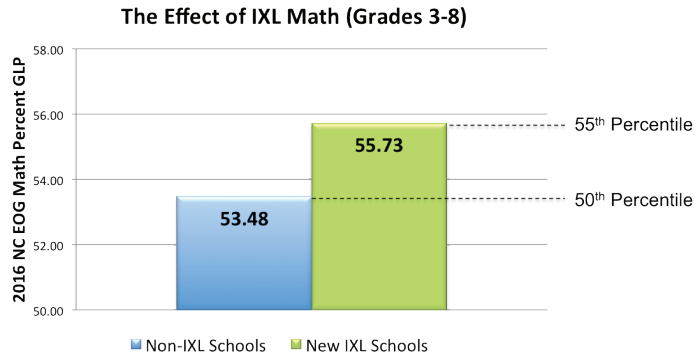


Figure 3. The Effect of IXL Math at the Elementary/Middle School Level

## The Efficacy of IXL Math at the High School Level

The implementation of IXL Math at the high school level<sup>4</sup> also showed a statistically significant effect on schools' performance on the 2016 North Carolina EOC Math I test (see Appendix D, Table D1 for details).

Figure 4 shows that the adjusted percent GLP was 69.08 for non-IXL schools and 73.50 for new IXL schools. The 4.42 percent difference corresponds to a percentile gain of 6 points in school ranking. That is, if an average non-IXL school (at the 50th percentile) had begun using IXL Math during the 2015-16 school year, the school's percent GLP would be expected to increase 4.42 percent, putting the school at the 56th percentile.

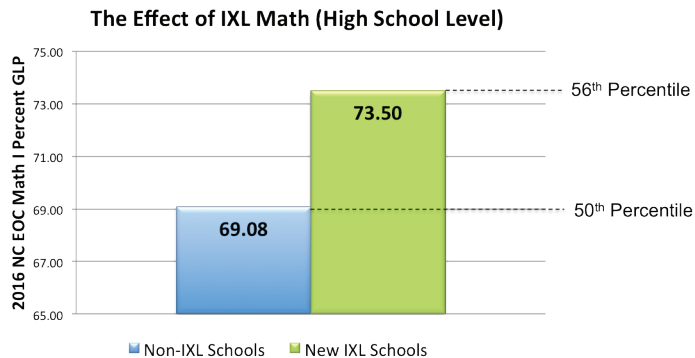


Figure 4. The Effect of IXL Math at the High School Level

<sup>3</sup> Adjusted percent GLP: the percentage of students who scored at Level 3 and above on the North Carolina EOG/EOC tests after adjusting for differences in prior performance and school characteristics between IXL schools and non-IXL schools.

<sup>4</sup> The analysis also included a few middle schools, as some 8th grade students took the North Carolina Math I test.

## The Efficacy of IXL ELA at the Elementary/Middle School Level

The implementation of IXL ELA at the elementary/middle school level also showed a statistically significant effect on schools' performance on the 2016 North Carolina EOG ELA/reading tests (see Appendix D, Table D1 for details).

Figure 5 shows that the adjusted percent GLP was 54.20 for non-IXL schools and 56.62 for new IXL schools. The 2.42 percent difference corresponds to a percentile gain of 6 points in school ranking. That is, if an average non-IXL school (at the 50th percentile) had begun using IXL ELA during the 2015-16 school year, the school's percent GLP would be expected to increase 2.42 percent, putting the school at the 56th percentile.

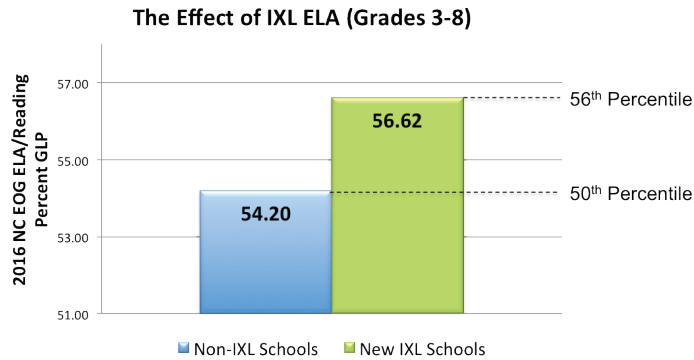


Figure 5. The Effect of IXL ELA at the Elementary/Middle School Level

## The Efficacy of Using One IXL Subject versus Two IXL Subjects

Figure 6 shows the effect of using one IXL subject (i.e., Math or ELA) versus two IXL subjects on schools' 2016 school performance grade for elementary/middle schools (see Appendix D, Table D2 for details).

New IXL schools that used one IXL subject outperformed non-IXL schools by 2.43 points, which is statistically significant and corresponds to a percentile gain of 7 points. For IXL schools that used two subjects, a 3.01 point difference was observed. This difference is also statistically significant and corresponds to a percentile gain of 9 points. That is, if an average non-IXL school (at the 50th percentile) had begun using both IXL Math and IXL ELA during the 2015-16 school year, the school performance score would be expected to increase 3.01 points, putting the school at the 59th percentile.

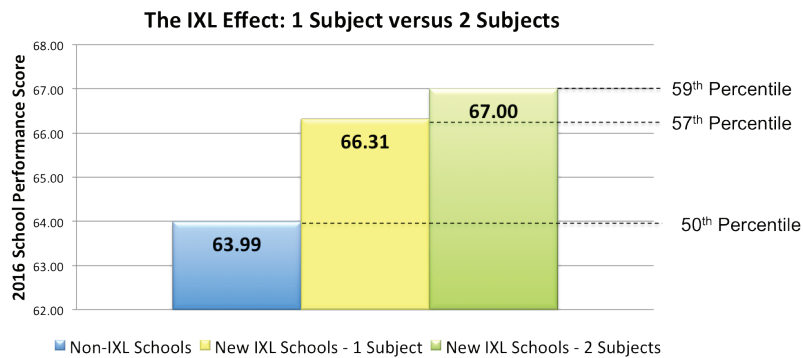


Figure 6. The Effect of Using One IXL Subject versus Two IXL Subjects

Figure 7 shows the percentages of non-IXL schools and new IXL schools that received A or B, C or D, and F school performance grades in 2015 and 2016 (see Appendix D, Table D3 for details). The percentage of non-IXL schools that received each school performance grade stayed almost the same in 2015 and in 2016. For new IXL schools with one subject, the percentage of schools receiving an A or B doubled from 2015 to 2016. For new IXL schools with two subjects, the percentage of schools receiving an F decreased from 21 percent to 5 percent from 2015 to 2016.

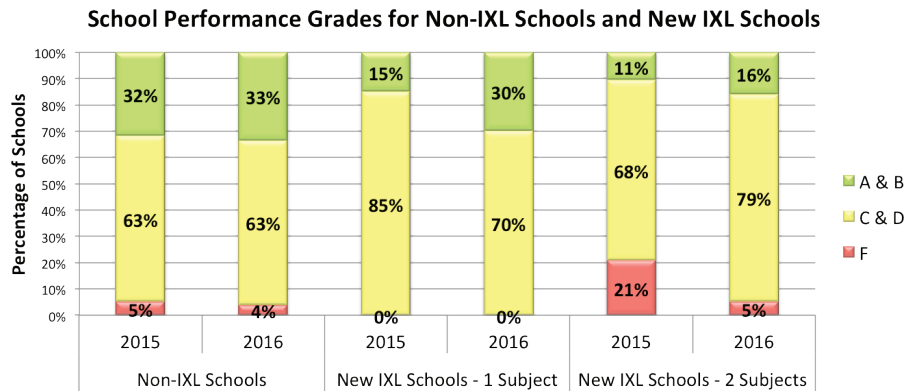


Figure 7. The IXL Effect on School Performance Grades

Our researchers also looked at the number of schools that improved, maintained, or declined in school performance grades from 2015 to 2016. Schools that moved up at least one category from 2015 to 2016 (e.g., B to A, D to B, etc.) are labeled “improved.” Schools that received the same grade (e.g., C to C, A to A, etc.) are labeled “maintained.” Schools that moved down at least one category (e.g., A to B, B to D, etc.) are labeled “declined.” As shown in Figure 8, the percentage of schools that improved their school performance grades was 18 percent for non-IXL schools, 30 percent for new IXL schools with one IXL subject, and 32 percent for new IXL schools with two IXL subjects. The percentage of schools whose school performance grades declined was 10 percent for non-IXL schools, 4 percent for new IXL schools with one IXL subject, and 0 percent for new IXL schools with two IXL subjects. New IXL schools who used one IXL subject were 1.96 times more likely to improve their school performance grades than non-IXL schools. New IXL schools who used two IXL subjects were 2.14 times more likely to improve their school performance grades than non-IXL schools (see Appendix D, Table D4 for details).

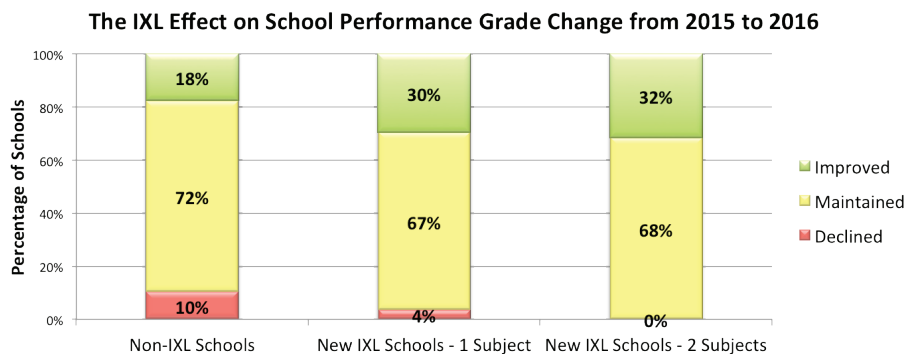


Figure 8. The IXL Effect on Change in School Performance Grade



## The Long-Term Effect of IXL Math at the Elementary/Middle School Level

Our researchers also looked at the long-term effect of IXL Math on schools that have been using the program for at least three school years. In 2014, long-term IXL schools outperformed non-IXL schools by three percentile points on the EOG Math tests, which suggests that using IXL Math would have led to a three point increase in the percentile rank for an average (50th percentile) non-IXL school. The performance gap increased to five percentile points in 2015 and to seven percentile points in 2016. The analysis showed statistically significant interaction effects between time and IXL implementation (see Appendix D, Table D5 for details), suggesting that the longer schools use IXL, the more they will benefit.

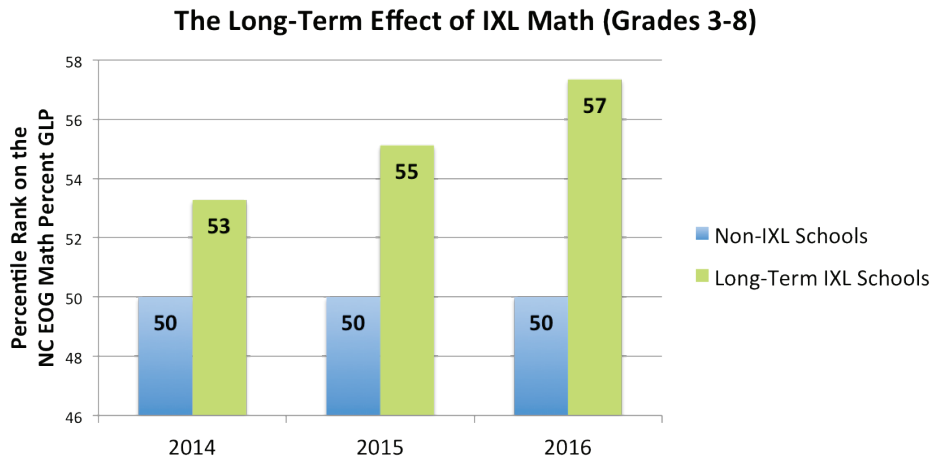


Figure 9. The Long-Term Effect of IXL Math at the Elementary/Middle School Level

## The Usage Effect of IXL Math and IXL ELA

Figure 10 shows a positive and statistically significant association between the use of IXL Math and 2016 EOG Math test performance. The results suggest that, for IXL schools that used IXL Math in the 2015-16 school year, if every student scored 70 or above on two additional IXL Math skills every week, the school could expect 4.22 percent more students to meet grade level proficiency on the 2016 EOG Math tests.

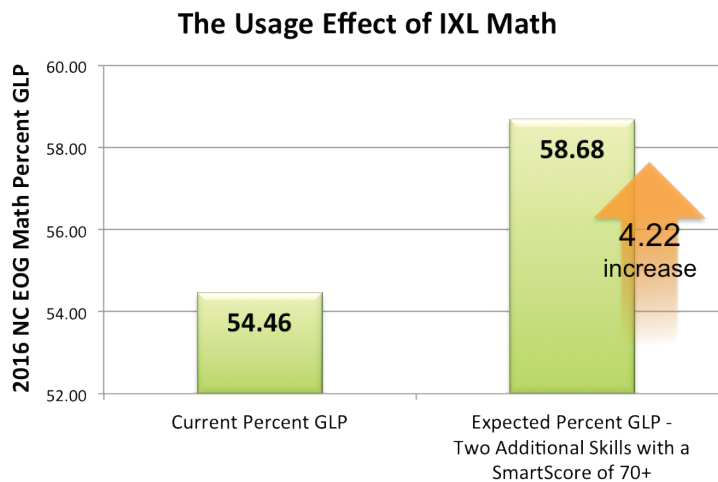


Figure 10. The IXL Usage Effect on the 2016 EOG Math Percent GLP

Figure 11 shows a positive association between the use of IXL ELA and 2016 EOG ELA/reading test performance. The results suggest that, for IXL schools that used IXL ELA in the 2015-16 school year, if every student scored 70 or above on two additional IXL ELA skills every week, the school could expect 13.07 percent more students to meet grade level proficiency on the 2016 EOG ELA/reading tests. Although the effect was not statistically significant, the results still suggested a positive relationship between IXL usage and school performance.

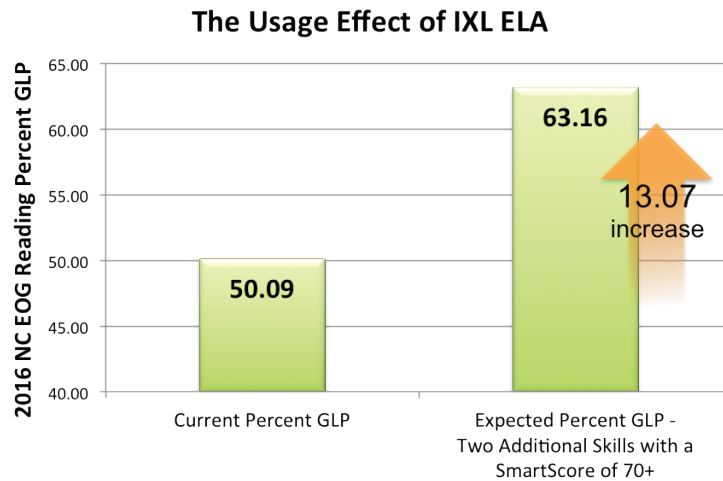


Figure 11. The IXL Usage Effect on the 2016 EOG ELA/Reading Percent GLP

## References

Empirical Education (2013). A Study of Student Achievement, Teacher Perceptions, and IXL Math. Retrieved from <https://www.ixl.com/research/IXL-Research-Study-2013.pdf>

What Works Clearinghouse (2014). What Works Clearinghouse procedures and standards handbook (Version 3.0). Retrieved from [http://ies.ed.gov/ncee/wwc/pdf/reference\\_resources/wwc\\_procedures\\_v3\\_0\\_standards\\_handbook.pdf](http://ies.ed.gov/ncee/wwc/pdf/reference_resources/wwc_procedures_v3_0_standards_handbook.pdf)

## Appendix A: IXL School Identification

This study determined whether a school is an IXL school based only on the number of students using IXL. Because a school may choose to use one IXL subject (i.e., Math or ELA) or both subjects for one year or longer, this study defined schools as IXL schools for each IXL subject and for each school year separately.

For each subject and each school year, a school is considered to be using IXL if: 1) the school has an active IXL account on this subject within this school year, and 2) at least one third of the enrolled students have practiced on IXL within this school year.

For each subject, a school is identified as a *new IXL school* if the school: 1) used IXL for this subject within the the 2015-16 school year, and 2) did not use IXL for this subject within the 2014-15 school year.

## The IXL Effect

For each subject, a school is identified as a *long-term IXL school* if the school used IXL for this subject within the 2013-14, 2014-15, and 2015-16 school years.

For each subject, a school is identified as a *non-IXL school* if the school did not use IXL for this subject within the 2013-14, 2014-15, and 2015-16 school years.

## Appendix B: Schools' Background Information

Table 1 shows the background information for all public schools in North Carolina and for IXL schools. For new IXL schools, because of the relatively small sample size, the average percent grade level proficient (GLP) on the EOG and EOC tests and school locations were different from the state average. Long-term IXL schools performed slightly better than the state average on the EOG math tests. Long-term IXL schools also included fewer charter schools and schools located in cities and suburbs compared to the state average.

**Table 1. Background Information for State and IXL Schools**

	State average	New IXL schools			Long-term IXL schools
		Math ES/MS level	Math HS level	ELA ES/MS level	Math ES/MS level
Number of schools	2,673	40	25	20	128
2014 EOG math percent GLP	51%	-	-	-	52%
2015 EOG math percent GLP	52%	48%	-	-	54%
2016 EOG math percent GLP	55%	52%	-	-	57%
2015 EOG ELA/reading percent GLP	56%	-	-	44%	-
2016 EOG ELA/reading percent GLP	57%	-	-	46%	-
2015 EOC Math I percent GLP	60%	-	83%	-	-
2016 EOC Math I percent GLP	61%	-	84%	-	-
% of English language learners	19%	18%	9%	15%	24%
% of charter schools	7%	3%	8%	5%	2%
% of schools in cities	27%	18%	24%	5%	19%
% of schools in suburbs	19%	8%	4%	25%	14%
% of schools in towns	13%	15%	20%	10%	14%
% of schools in rural areas	41%	60%	52%	60%	53%

Notes: 1) Among the new IXL schools referenced above, 19 schools used both IXL Math and ELA.

2) GLP = grade level proficient

3) ES/MS Level = elementary and middle school level; HS Level = high school level

4) Since some students in grade 8 took the EOC Math I test, the high school level included a few middle schools with grade 8.

## Appendix C: Analytical Methods

A linear regression model was used to calculate the IXL effect (i.e., the performance difference between new IXL schools and non-IXL schools), after adjusting for schools' prior academic performance (i.e., 2014 EOG or EOC percent GLP), school size (i.e., the number of enrolled students), percentage of English language learners (ELLs), school type (i.e., charter school or traditional public school), and school location (i.e., city, suburb, town, or rural). To assist in the interpretation of the IXL effect, we reported statistical significance, effect size, and percentile gain. Statistical significance, also referred to as *p*-value, is the probability that the IXL effect is zero. A small *p*-value (e.g., less than 0.05) indicates strong evidence that the IXL effect is not zero. Effect size is the mean difference in standard deviation units and is known as Hedges' *g*. In this study, effect size is computed using adjusted mean and unadjusted standard deviations. Percentile gain is the expected change in percentile rank for an average non-IXL school if the school had used IXL. It is calculated based on the effect size. More details about these analytical methods can be found in What Works Clearinghouse (2014).

We also calculated the odds ratio to examine the relationship between IXL implementation and the change in school performance grade from 2015 to 2016. Odds ratio quantifies how much more likely IXL schools are to increase their school performance grades than non-IXL schools.

To evaluate the IXL effect for long-term IXL schools, a linear mixed effect model was adopted to detect the performance difference (i.e., percent GLP difference) between long-term IXL schools and non-IXL schools on the EOG tests in all three years, after controlling for school size, percentage of ELLs, school type, and school location. A statistically significant interaction effect between time (i.e., 2014, 2015, and 2016) and school group (i.e., long-term IXL schools and non-IXL schools) indicates long-term IXL schools demonstrated more gains over time than non-IXL schools.

We used another linear regression model to estimate the strength of association between IXL usage and school performance. This regression model was similar to the one described above, but the model included IXL usage as an independent variable and the sample only included schools that used IXL in the 2015-16 school year.

Appendix D:  
Data Tables

**Table D1.** The Efficacy of IXL ELA and IXL Math for New IXL Schools

Values	Math		ELA
	Grades 3-8	High school	Grades 3-8
Number of new IXL schools	40	25	20
Number of non-IXL schools	1,610	915	1,808
The IXL effect	2.25*	4.42*	2.42*
Effect size	0.12	0.16	0.14
Percentile gain	4.64%	6.23%	5.75%
Adjusted average 2016 EOG/EOC test percent GLP for new IXL schools	55.73%	73.50%	56.62%
Adjusted average 2016 EOG/EOC test percent GLP for non-IXL schools	53.48%	69.08%	54.20%

Note: \*: significant at .05 level

**Table D2.** The Efficacy of Using One IXL Subject versus Two IXL Subjects

Values	1 IXL subject (ELA or Math)	2 IXL subjects (ELA and Math)
Number of new IXL schools	27	19
Number of non-IXL schools	1,982	
The IXL effect	2.32*	3.01*
Effect size	0.17	0.22
Percentile gain	6.73%	8.90%
Adjusted average 2016 school performance score for new IXL schools	66.31	67.00
Adjusted average 2016 school performance score for non-IXL schools	63.99	

Note: \*: significant at .05 level

**Table D3.** Number of New IXL Schools and Non-IXL Schools with Different School Performance Grades

Schools	Year	A & B		C & D		F		Total	
		N	%	N	%	N	%	N	%
New IXL schools (1 subject)	2015	4	15%	23	85%	0	0%	27	100%
	2016	8	30%	19	70%	0	0%	27	100%
New IXL schools (2 subjects)	2015	2	11%	13	68%	4	21%	19	100%
	2016	3	16%	15	79%	1	5%	19	100%
Non-IXL schools	2015	628	32%	1,249	63%	105	5%	1,982	100%
	2016	660	33%	1,241	63%	81	4%	1,982	100%

**Table D4.** Schools with Improved, Maintained, or Declined School Performance Grades

Schools	# (%) of schools that improved	# (%) of schools that maintained	# (%) of schools that declined	Odds ratio (improved versus maintained/declined)
New IXL schools (1 subject)	8 (30%)	18 (67%)	1 (4%)	1.96
Non-IXL schools	351 (18%)	1,424 (72%)	207 (10%)	
New IXL schools (2 subjects)	6 (32%)	13 (68%)	0 (0%)	2.14
Non-IXL schools	351 (18%)	1,424 (72%)	207 (10%)	

**Table D5. The Long-Term Effect of IXL Math at the Elementary/Middle School Level**

Values	Number of schools	2014 EOG		2015 EOG		2016 EOG	
		Percent GLP	Percentile rank	Percent GLP	Percentile rank	Percent GLP	Percentile rank
Long-term IXL schools	128	51.10%	53rd	53.57%	55th	57.13%	57th
Non-IXL schools	1,588	50.31%	50th	51.56%	50th	53.72%	50th
Year by group interaction	1.31***						

*Note: \*\*\*: significant at .001 level*