



Measuring the Impact of IXL Math and IXL Language Arts in Georgia Schools

Peer Review

This study was peer reviewed and presented at the 2018 Annual Meeting of the American Educational Research Association in New York, NY.

Introduction

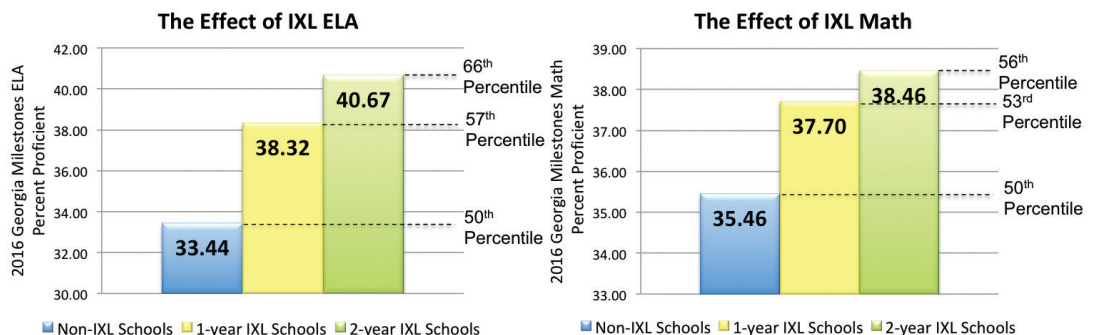
Previous research has shown that the use of IXL can have significant impact on student achievement for an individual school (Empirical Education, 2013). In this study, we explore IXL usage across the entire state of Georgia. Examining such a large sample of schools allows us to quantify the impact of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

Abstract

This study investigated hundreds of public schools in the state of Georgia that used IXL Math or IXL ELA between 2014 and 2016. Using data from the 2016 Georgia Milestones Assessment System (Georgia Milestones), researchers examined student achievement in both IXL schools and non-IXL schools. Scores from the 2014 Criterion-Referenced Competency Tests program 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 60 minutes per student, per week. Even with the wide range in usage, our researchers found a strong positive correlation between IXL usage and school performance. These results are statistically significant.

Key Findings

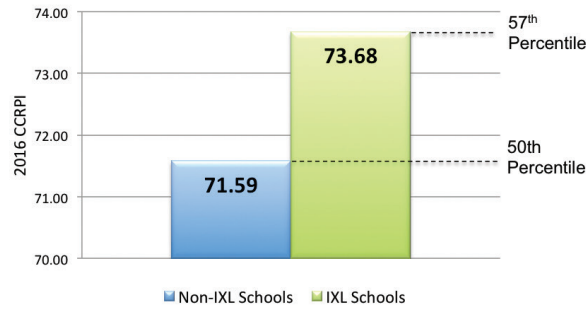
IXL schools performed better than non-IXL schools in both ELA and math. Schools that used IXL for two school years performed better than schools that used IXL for only one school year.



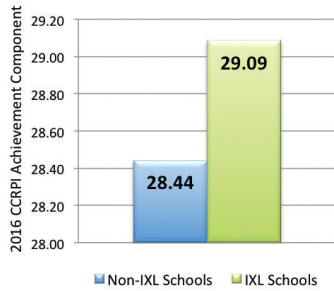
The IXL Effect

IXL schools better prepared their students for the next educational level as measured by the College and Career Ready Performance Index (CCRPI). In particular, IXL schools showed higher achievement, made more progress, and were more successful in closing the achievement gap than similar non-IXL schools.

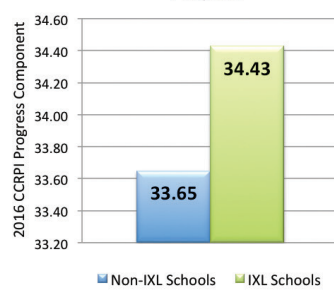
The IXL Effect on the CCRPI



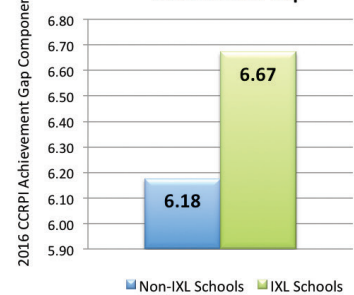
The IXL Effect on the CCRPI - Achievement



The IXL Effect on the CCRPI - Progress

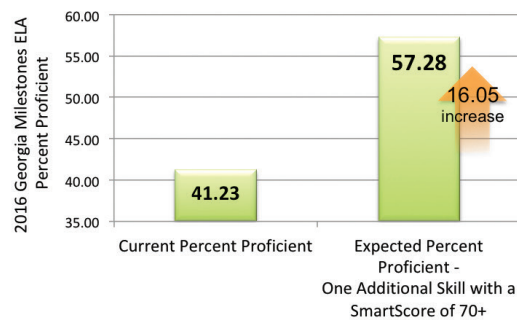


The IXL Effect on the CCRPI - Achievement Gap

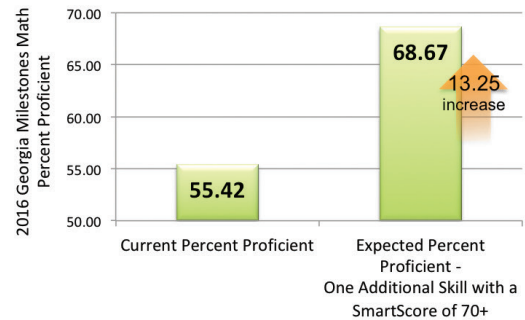


Practice makes perfect. If every student at a school achieved a SmartScore¹ of at least 70 on one additional skill per week, the school's proficiency rate on the 2016 Georgia Milestones would increase by 16.05 points in ELA and 13.25 points in math.

The Usage Effect of IXL ELA



The Usage Effect of IXL Math



¹ SmartScore is a score ranging from 0 to 100 that measures how well a student understands a skill. This proprietary IXL score is calculated based on a number of metrics, including percentage of questions correct, question difficulty, and consistency.

The IXL Effect in Georgia Schools

JULY 13, 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 2014-15 or 2015-16 school years. The control group consisted of schools that did not use IXL in the 2013-14, 2014-15, or 2015-16 school years.

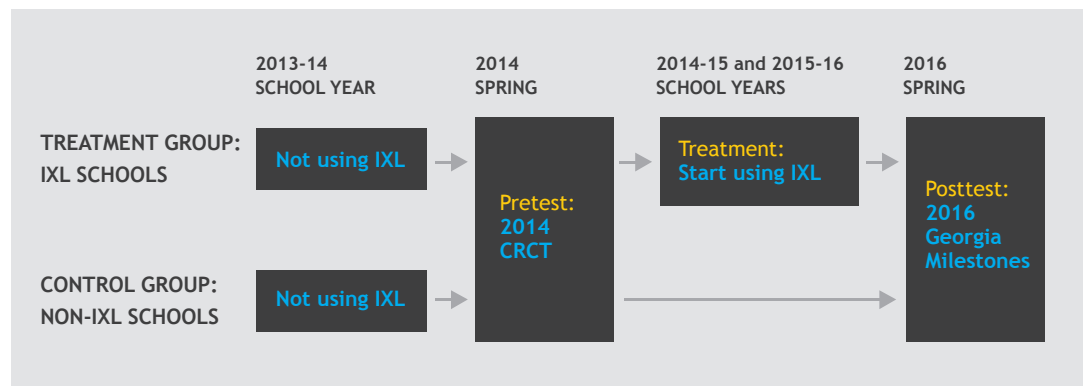


Figure 1. Pretest-Posttest Study Design

The 2014 Criterion-Referenced Competency Tests (CRCT) program was used as a pretest to determine the baseline performance for all schools. The CRCT program was the Georgia state standardized test from 2010 to 2014. It was developed specifically to measure student understanding of the skills and knowledge described in the state-mandated content standards in reading, English language arts (ELA), mathematics, science, and social studies.

The 2016 Georgia Milestones Assessment System (Georgia Milestones) was used as the posttest in this study. Georgia Milestones replaced the CRCT as Georgia's state standardized test in 2015². It measures student understanding of the knowledge and skills outlined in the state-adopted content standards in ELA, mathematics, science, and social studies. Students in grades 3 through 8 take an end-of-grade assessment in ELA and mathematics while students in grades 5 and 8 are also assessed in science and social studies.

² This study evaluated the IXL effect over two school years, so it did not consider the 2015 Georgia Milestones.

The Georgia Department of Education uses the College and Career Ready Performance Index (CCRPI) as an annual tool to measure how well schools are preparing students for the next educational level. The CCRPI includes four main components: Achievement, Progress, Achievement Gap, and Challenge. These components are combined for a total CCRPI score on a scale of 0 to 110, with 50 Achievement points, 40 Progress points, 10 Achievement Gap points, and 10 Challenge points. The CCRPI provides a comprehensive roadmap to help educators, parents, and community members promote and improve college and career readiness for all students.

Methodology

This study analyzed data from 1,727 Georgia public schools, including both traditional public schools and charter schools. A total of 827 public schools used IXL Math and/or IXL ELA between 2014 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 an “IXL school” at each grade level rather than at a school level. A school is identified as an IXL school at a certain grade level if at least two thirds of the students enrolled in this grade level practiced on IXL (see Appendix A for details on school selection and classification). Based on this criteria, 431 grade level cohorts from 212 schools were identified as IXL schools for IXL Math and 329 grade level cohorts from 161 schools were identified as IXL schools for IXL ELA. Appendix B shows the characteristics of IXL schools and the Georgia state averages. The school performance and enrollment data were obtained from the Georgia Department of Education and the Institute of Education Science.

Our researchers used a multilevel linear model to calculate the IXL effect—i.e., the performance difference between IXL schools and non-IXL schools on the 2016 Georgia Milestones, controlling for factors such as prior performance, school size, and school location. Similar multilevel linear models were used to evaluate the IXL effect on the CCRPI and its Achievement, Progress, and Achievement Gap components. We applied another set of multilevel linear models to estimate the strength of association between IXL usage and school performance, and to compare the performance difference between IXL schools with different amounts of IXL usage (i.e., fewer than or at least 15 questions answered per student per week). (See Appendix C for a detailed explanation of analytical methods.)

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

1. What is the IXL effect on student achievement for IXL schools? In other words, did IXL schools perform better on the 2016 Georgia Milestones than non-IXL schools?
2. Did IXL schools score higher on the 2016 CCRPI than non-IXL schools?
3. What is the association between IXL usage and school performance?

Results

Analysis of the data showed that the use of IXL had positive and statistically significant effects on school performance on the Georgia Milestones in both ELA and math, indicating there is a high probability that similar schools using IXL would achieve similar results. We also found that IXL helps schools better prepare their students to be college and career ready as measured by the CCRPI. Compared to similar non-IXL schools, IXL schools showed higher achievement, made more progress, and were more successful in closing the achievement gap. The analysis also showed a positive correlation between IXL usage and school performance. In particular, IXL schools with at least 15 questions answered per student, per week outperformed IXL schools with fewer than 15 questions answered per student, per week. Furthermore, achieving a SmartScore of at least 70 on one additional skill per student, per week, was associated with an expected 16.05 percent increase on a school’s percent proficient in ELA and a 13.25 percent increase in math.

The Efficacy of IXL ELA

The implementation of IXL ELA showed a statistically significant effect on schools’ performance on the 2016 Georgia Milestones ELA tests across grades 3 through 8 (see Appendix D, Table D1 for details).

Figure 2 shows that the adjusted percent proficient³ was 33.44 for non-IXL schools, 38.32 for IXL schools that used IXL ELA for one school year, and 40.67 for IXL schools that used IXL ELA for two school years. For 1-year IXL schools, the 4.88 percent difference corresponds to a percentile gain of 7 points in school ranking. For 2-year IXL schools, the 7.23 percent difference corresponds to a percentile gain of 16 points. That is, if an average non-IXL school (at the 50th percentile) had used IXL ELA for two school years, the school’s percent proficient would be expected to increase 7.23 percent, putting the school at the 66th percentile.

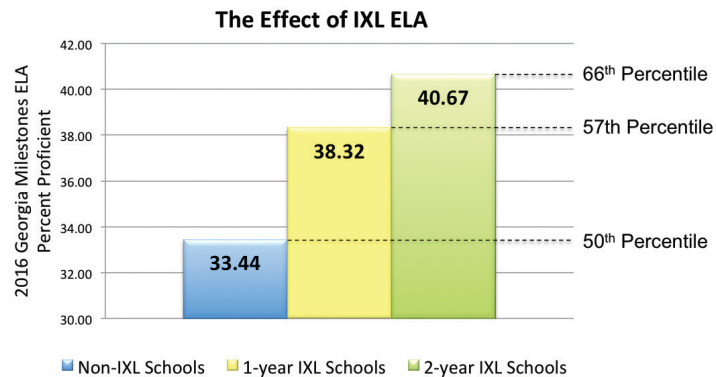


Figure 2. The Effect of IXL ELA on the 2016 Georgia Milestones

³ Adjusted percent proficient: the percentage of students who scored at the proficiency level and above on the Georgia Milestones after adjusting for differences in prior performance and school characteristics between IXL schools and non-IXL schools.

Figure 3 shows the effect of IXL ELA at the elementary school level (i.e., grades 3-5) and at the middle school level (i.e., grades 6-8). For elementary schools, the IXL effect for 1-year IXL schools is 6.20 points, corresponding to a 9 point percentile gain. The IXL effect for 2-year IXL schools is 9.01 points, corresponding to a 19 point percentile gain. For middle schools, the IXL effect for 1- and 2-year IXL schools⁴ is 6.13 points, corresponding to a 14 point percentile gain.

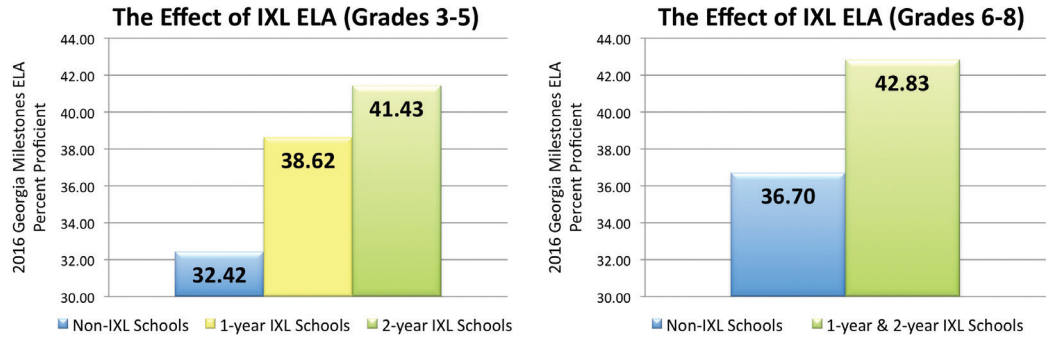


Figure 3. The Effect of IXL Math at Elementary and Middle School Levels

The Efficacy of IXL Math

The implementation of IXL Math also showed a statistically significant effect on schools’ performance on the 2016 Georgia Milestones math tests across grades 3 through 8 (see Appendix D, Table D2 for details).

Figure 4 shows that the adjusted percent proficient was 35.46 for non-IXL schools, 37.70 for IXL schools that used IXL Math for one school year, and 38.46 for IXL schools that used IXL Math for two school years. For 1-year IXL schools, the 2.24 percent difference corresponds to a percentile gain of 3 points in school ranking. For 2-year IXL schools, the 3.00 percent difference corresponds to a percentile gain of 6 points. That is, if an average non-IXL school (at the 50th percentile) had used IXL Math for two school years, the school’s percent proficient would be expected to increase 3.00 percent, putting the school at the 56th percentile.

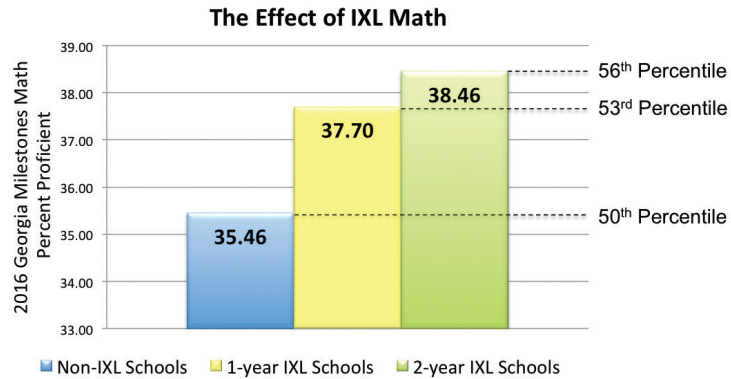


Figure 4. The Effect of IXL Math on the 2016 Georgia Milestones

⁴ Since a smaller number of middle schools used IXL ELA during the time period studied, 1- and 2-year IXL schools have been combined in this analysis.

Figure 5 shows the effect of IXL Math at the elementary school level and at the middle school level. For elementary schools, the IXL effect for 1-year IXL schools is 3.35 points, corresponding to a 5 point percentile gain. The IXL effect for 2-year IXL schools is 3.98 points, corresponding to a 8 point percentile gain. For middle schools, the IXL effect for 1-year IXL schools is 2.38 points, corresponding to a 4 point percentile gain. The IXL effect for 2-year IXL schools is 2.77 points, corresponding to a 6 point percentile gain.

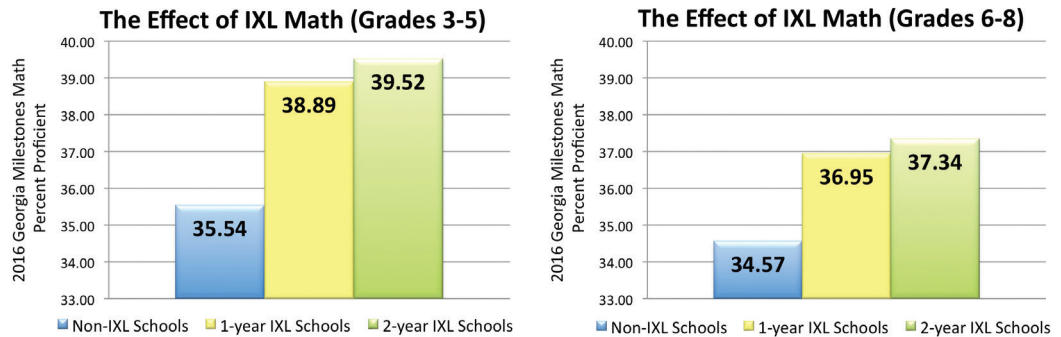


Figure 5. The Effect of IXL Math at Elementary and Middle School Levels

The IXL Effect on College and Career Readiness

The use of IXL Math and/or IXL ELA had a statistically significant effect on schools' College and Career Ready Performance Index (CCRPI) across grades 3 through 8 (see Appendix D, Table D3 for details).

Figure 6 shows that the adjusted CCRPI⁵ was 71.59 for non-IXL schools and 73.68 for IXL schools that used IXL Math and/or IXL ELA for at least one school year. For IXL schools, the 2.09 percent difference corresponds to a percentile gain of 7 points in school ranking. That is, if an average non-IXL school (at the 50th percentile) had used IXL Math and/or IXL ELA for at least one school year, the school's CCRPI would be expected to increase 2.09 percent, putting the school at the 57th percentile.

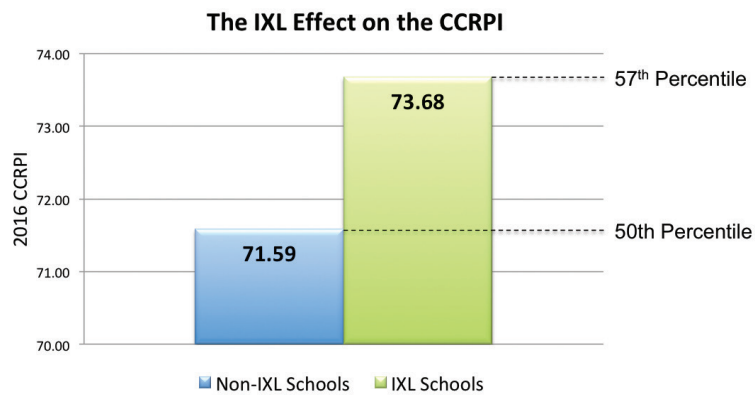


Figure 6. The IXL Effect on the 2016 CCRPI

⁵ Adjusted CCRPI: the CCRPI after adjusting for differences in prior performance and school characteristics between IXL schools and non-IXL schools.

Figure 7 shows the IXL effect on the Achievement, Progress, and Achievement Gap components of the 2016 CCRPI. These results are statistically significant. The IXL effect on the Achievement component is 0.65 points, corresponding to a 4 point percentile gain; the IXL effect on the Progress component is 0.78 points, corresponding to an 8 point percentile gain; and the IXL effect on the Achievement Gap component is 0.49 points, corresponding to a 12 point percentile gain.

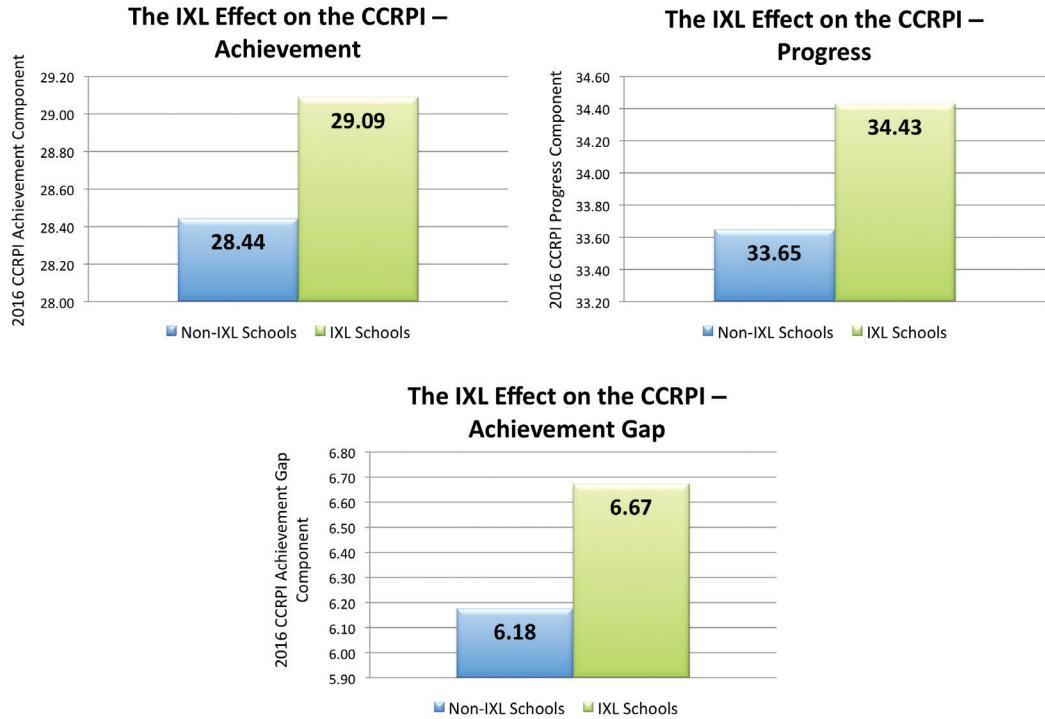


Figure 7. The IXL Effect on the 2016 CCRPI Components

The Usage Effect of IXL ELA

For IXL schools that used IXL ELA during the 2014-15 and/or 2015-16 school years, our analyses found a positive and statistically significant association between the usage of IXL ELA and schools’ performance on the 2016 Georgia Milestones ELA tests (see Appendix D, Table D4 for details).

Figure 8 shows the adjusted percent proficient for IXL schools with different amounts of usage on IXL ELA. IXL schools with at least 15 ELA questions answered per student per week had 5.12 percent more students score at or above the proficiency level on the 2016 Georgia Milestones ELA tests.

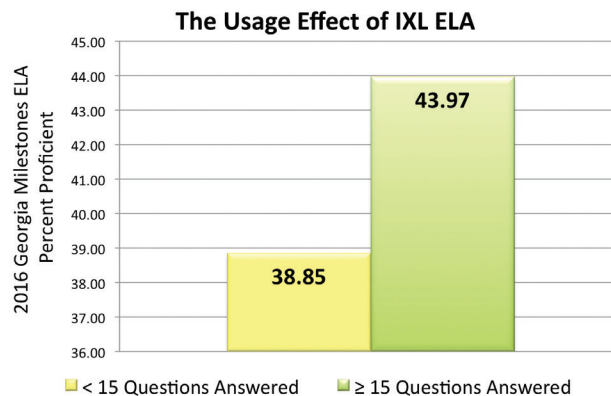


Figure 8. The IXL ELA Usage Effect - Below or Above 15 Questions

As shown in Figure 9, for IXL schools that used IXL ELA, if every student scored at 70 or above on one additional ELA skill every week, the school could expect 16.05 percent more students to score at or above the proficiency level on the 2016 Georgia Milestones ELA tests.

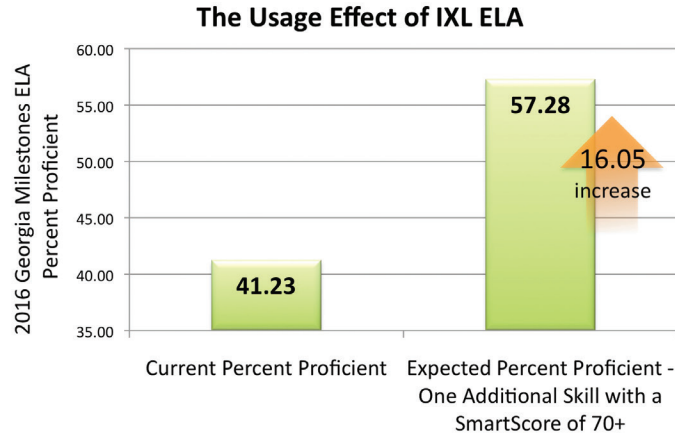


Figure 9. The IXL ELA Usage Effect on the 2016 Georgia Milestones

The Usage Effect of IXL Math

For IXL schools that used IXL Math for at least one school year during the 2014-15 and 2015-16 school years, our analyses found a positive and statistically significant association between the IXL Math usage and schools' performance on the 2016 Georgia Milestones math tests (see Appendix D, Table D4 for details).

Figure 10 shows the adjusted percent proficient for IXL schools with different amounts of usage on IXL Math. IXL schools with at least 15 math questions answered per student per week had 3.87 percent more students score at or above the proficiency level on the 2016 Georgia Milestones math tests.

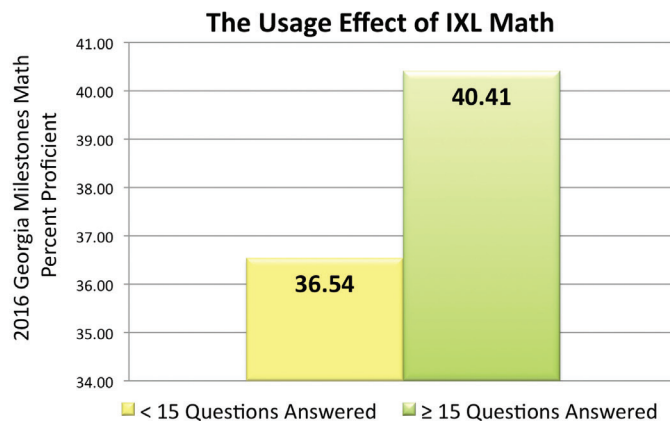


Figure 10. The IXL Math Usage Effect - Below or Above 15 Questions

As shown in Figure 11, for IXL schools that used IXL Math, if every student scored at 70 or above on one additional math skill every week, the school could expect 13.25 percent more students to score at or above the proficiency level on the 2016 Georgia Milestones math tests.

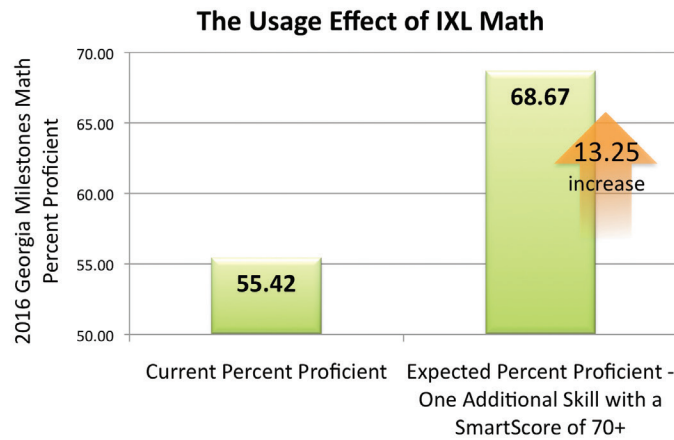


Figure 11. The IXL Math Usage Effect on the 2016 Georgia Milestones

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

Appendix A: IXL School Identification

This study determined if a school is an IXL school based only on the number of students who have used IXL. Because a school may choose to use IXL only in a few classrooms or across the entire school, this study defined schools as IXL schools at each testing grade level⁶ rather than at a school level. The group of students at the same grade level within the same school is referred to as a grade level cohort.

Within a certain school year, for a certain grade level cohort within a school, the school is identified as an IXL school for this grade level if: 1) the school has an active IXL account within this school year, and 2) at least two thirds of the enrolled students at this grade level have practiced on IXL within the school year.

Within a certain school year, for a certain grade level cohort within a school, the school is identified as a non-IXL school for this grade level if no students at this grade level have practiced on IXL within the school year.

⁶Testing grade level: a grade level in which students are required to take the state standardized tests.

For example, suppose that a K-6 school had an active IXL account within the 2015-16 school year and over two thirds of students in grades K-4 had practiced on IXL, while less than two thirds of students in grades 5 and 6 practiced on IXL during the school year. This school would be defined as an IXL school for the 3rd and 4th grade level cohorts and as a non-IXL school for the 5th and 6th grade level cohorts. Students in grades K-2 are excluded from the analysis because they do not take the state standardized tests.

**Appendix B:
Schools’
Background
Information**

Table B1 shows the background information for all public schools and for IXL schools in Georgia. In 2014, IXL schools’ performance on the Criterion-Referenced Competency Tests (CRCT) program is comparable to the state average in both math and ELA. In 2016, IXL schools performed better on the Georgia Milestones than the state average.

Table B1. Background Information for Georgia and IXL Schools

	State average	IXL schools	
		IXL Math	IXL ELA
Number of schools	1,727	212	161
Number of grade level cohorts	5,237	431	329
2014 CRCT math percent proficient	84%	84%	-
2016 Georgia Milestones math percent proficient	39%	41%	-
2014 CRCT ELA percent proficient	92%	-	93%
2016 Georgia Milestones ELA percent proficient	39%	-	43%
% of students eligible for FRPL	62%	60%	54%
% of schools in cities	20%	19%	12%
% of schools in suburbs	37%	35%	34%
% of schools in towns	13%	7%	11%
% of schools in rural areas	30%	39%	43%

Note: FRPL: free or reduced-priced lunch

Appendix C: Analytical Methods

A three-level linear model was used to calculate the IXL effect (i.e., the performance difference between IXL schools and non-IXL schools on the 2016 Georgia Milestones), after adjusting for schools' prior academic performance (i.e., 2014 CRCT percent proficient), cohort size (i.e., the number of enrolled students in the grade level cohort), school size (i.e., the number of enrolled students at the school), and school location (i.e., city, suburb, town, or rural as defined by the Institute of Education Science). In this study, the units of analysis for the three-level model are grade level cohorts (i.e., level 1). Grade level cohorts are nested within schools (i.e., level 2), which are further nested within districts (i.e., level 3). Similar multilevel linear models were applied to the elementary school level only (i.e., grades 3-5) and middle school level only (i.e., grades 6-8) to calculate the IXL effect at elementary schools and middle schools separately. We also applied similar three-level linear models to calculate the IXL effect on the College and Career Ready Performance Index (CCRPI) and its Achievement, Progress, and Achievement Gap components. 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 applied another set of three-level linear models to compare the performance difference between IXL schools with different amounts of IXL usage (i.e., fewer than or at least 15 questions answered per student per week). This model was very similar to the one described above, but the model included the IXL usage group (i.e., fewer than or at least 15 questions answered per student per week) as an independent variable, and the sample only included IXL schools.

Another set of three-level linear models was used to estimate the strength of association between IXL usage and school performance. This model was also similar to the first model described above, but this model included the IXL usage as an independent variable, and the sample only included IXL schools. The IXL usage in this study was measured by the average number of skills in which students achieved a SmartScore of at least 70 each week.

Appendix D:
Data Tables

Table D1. The Effect of IXL ELA on the 2016 Georgia Milestones

Values	Overall (Grades 3-8)		ES level (Grades 3-5)		MS level (Grades 6-8)
	1-year	2-year	1-year	2-year	1- or 2-year
Number of grade level cohorts at IXL schools	255	74	200	69	60
Number of grade level cohorts at non-IXL schools	4,265		2,975		1,390
The IXL effect	4.88**	7.23***	6.20***	9.01***	6.13*
Effect size	0.19	0.41	0.23	0.50	0.35
Percentile gain	7.50%	15.76%	9.08%	19.25%	13.72%
Adjusted 2016 Georgia Milestones ELA percent proficient for IXL schools	38.32%	40.67%	38.62%	41.43%	42.83%
Adjusted 2016 Georgia Milestones ELA percent proficient for non-IXL schools	33.44%		32.42%		36.70%

Note: 1) *: significant at .05 level; **: significant at .01 level; ***: significant at .001 level
 2) ES: elementary school; MS: middle school

Table D2. The Effect of IXL Math on the 2016 Georgia Milestones

Values	Overall (Grades 3-8)		ES level (Grades 3-5)		MS level (Grades 6-8)	
	1-year	2-year	1-year	2-year	1-year	2-year
Number of grade level cohorts at IXL schools	291	140	223	106	68	34
Number of grade level cohorts at non-IXL schools	3,726		2,493		1,233	
The IXL effect	2.24*	3.00*	3.35*	3.98*	2.38	2.77
Effect size	0.08	0.16	0.12	0.21	0.10	0.15
Percentile gain	3.25%	6.30%	4.64%	8.35%	3.81%	5.79%
Adjusted 2016 Georgia Milestones math percent proficient for IXL schools	37.70%	38.46%	38.89%	39.52%	36.95%	37.34%
Adjusted 2016 Georgia Milestones math percent proficient for non-IXL schools	35.46%		35.54%		34.57%	

Note: 1) *: significant at .05 level
 2) ES: elementary school; MS: middle school

Table D3. The Effect of IXL on the 2016 CCRPI

Values	CCRPI	Achievement component	Progress component	Achievement Gap component
Number of grade clusters at IXL schools	175	175	175	175
Number of grade clusters at non-IXL schools	1,218	1,218	1,218	1,218
The IXL effect	2.09**	0.65*	0.78**	0.49***
Effect size	0.16	0.09	0.19	0.31
Percentile gain	6.52%	3.59%	7.71%	12.23%
Adjusted 2016 CCRPI (or its components) for IXL schools	73.68	29.09	34.43	6.67
Adjusted 2016 CCRPI (or its components) for non-IXL schools	71.59	28.44	33.65	6.18

Note: 1) Grade cluster: Schools receive a CCRPI score for each “grade cluster” served (elementary includes grades K-5, middle includes grades 6-8, and high includes grades 9-12).
 2) *: significant at .05 level; **: significant at .01 level; ***: significant at .001 level

Table D4. The Usage Effect of IXL Math and IXL ELA

Values	IXL schools - IXL ELA	IXL schools - IXL Math
Number of grade level cohorts with at least 15 questions answered per student per week	168	316
Number of grade level cohorts with fewer than 15 questions answered per student per week	161	118
Usage effect	5.12**	3.87*
Effect size	0.27	0.20
Adjusted 2016 Georgia Milestones percent proficient for IXL schools with at least 15 questions answered per student per week	43.97%	40.41%
Adjusted 2016 Georgia Milestones percent proficient for IXL schools with fewer than 15 questions answered per student per week	38.85%	36.54%

Note: *: significant at .05 level; **: significant at .01 level.