RESEARCH REPORT

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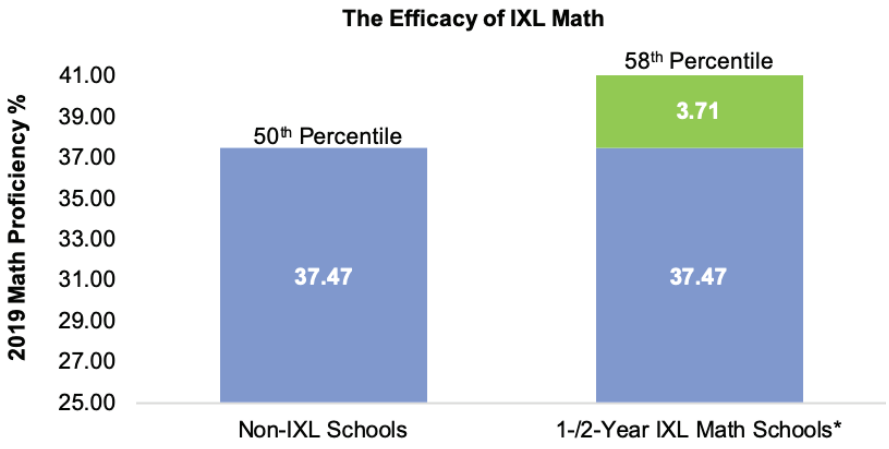
The Impact of IXL on STEM Learning in Alabama Schools

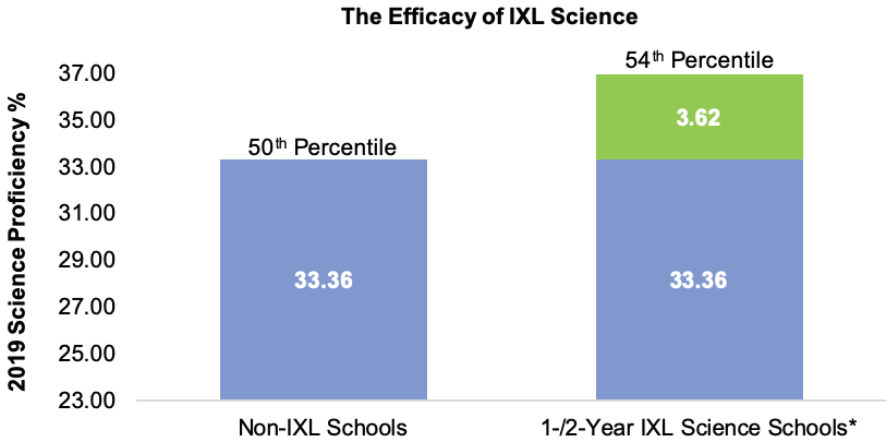
IXL LEARNING 777 Mariners Island Blvd., Suite 600, San Mateo, CA 94404
650-372-4040 | www.ixl.com

Executive Summary

IXL is a personalized learning platform designed to help students build academic skills. Previous research has shown that IXL has a significant impact on academic performance at an individual school or district (Empirical Education, 2013). To further evaluate the impact of IXL Math and IXL Science on STEM learning outcomes, IXL researchers conducted a study using quasi-experimental design with 1,500 public schools across the state of Alabama, among which, 381 schools had adopted IXL Math, and/or IXL Science during the 2017-18 and/or 2018-19 school year(s). IXL usage by these schools ranged from less than one minute to over 70 minutes per student per week, and ranged from less than one question answered to over 180 questions answered per student per week. Even with a wide range in student usage, researchers found positive impacts of IXL, as measured by the Scantron assessments in Alabama. The key findings of this study include[1]:

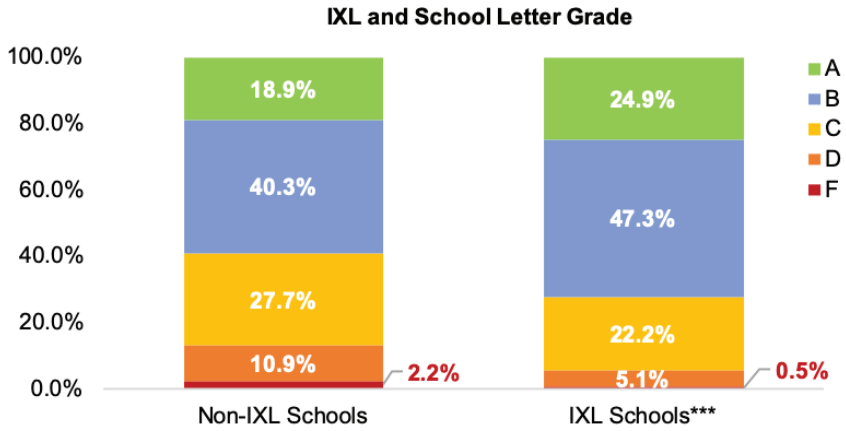
- **IXL has positive effects on school STEM performance.** For both math and science, Alabama schools that used corresponding IXL products outperformed schools that did not use IXL.





[1] *In all figures: * indicates significance at .05 level; ** indicates significance at .01 level; *** indicates significance at .001 level.*

- **IXL STEM schools achieve better school letter grades.** Schools that used IXL Math and/or IXL Science were 1.79 times more likely to receive letter grades of A or B than schools that did not use IXL.



THE IMPACT OF IXL ON STEM LEARNING IN ALABAMA SCHOOLS

Study Design

The purpose of this study was to evaluate the impact of IXL on student achievement in math and science at the school grade level, as measured by the percentage of students in the school meeting academic proficiency goals set by the state. Different IXL implementation patterns in the 2017-18 and 2018-19 school years allowed IXL researchers to examine the impact of IXL. The study adopted a quasi-experimental pretest-posttest control group design, which evaluates the treatment effect by comparing the performance of the treatment group and the control group on the posttest, after accounting for their performance on the pretest.

For IXL Math and IXL Science respectively, the treatment group (IXL schools) included schools that used that IXL product during the 2017-18 and/or 2018-19 school year(s). The control group (non-IXL schools) consisted of schools that did not use IXL at any time during these two school years. See Figure 1 for more details about the study design.

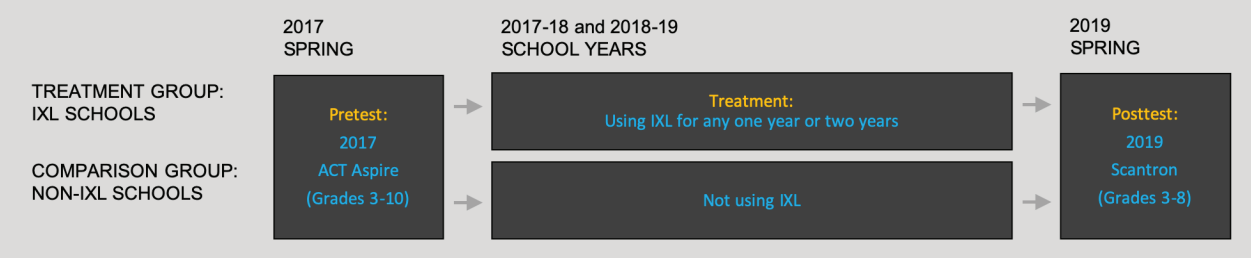


Figure 1. Study Design

In the spring of 2017, the ACT Aspire Math and the ACT Aspire Science exams were administered to students in grades 3-8 and grades 5 and 7, respectively. In 2018, the Alabama state assessment switched from the ACT Aspire to the Scantron. In the spring of 2019, Scantron Math and Scantron Science were administered to students in grades 3-8 and grades 5 and 7, respectively.

Since math and science assessments were administered to different school grades, different study designs were used to examine the IXL efficacy for each subject. For math, we traced the focal students' math performance from spring 2017 to spring 2019, and the previous performance of the same group of students was controlled as the baseline math performance. For example, for the fifth graders in 2019, their math performance in 2017 when they were in the third grade was controlled as the baseline. This design requires students with both posttest and pretest scores available; therefore, lower primary school grades were excluded (See Figure 2). As a result, 524 grade-level cohorts from 216 IXL Math schools were analyzed in order to examine the IXL Math efficacy.

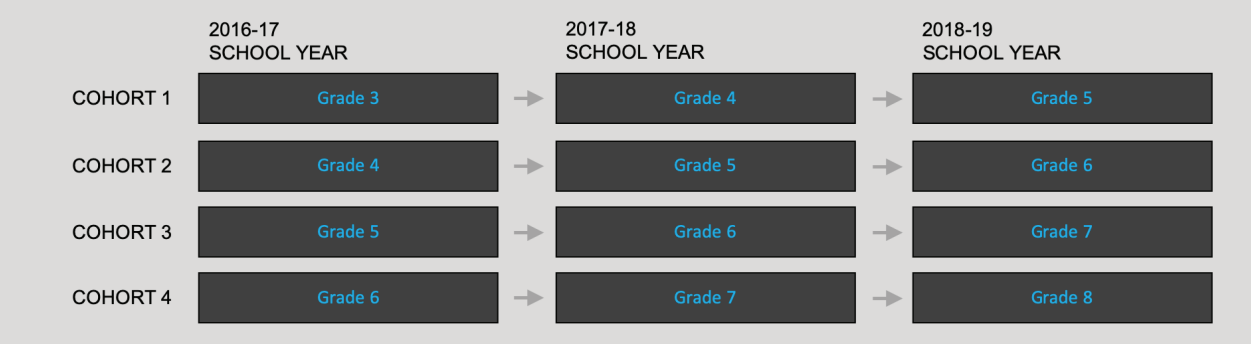


Figure 2. Study Design for Math

For science, since assessments were administered to grade 5 and grade 7 only, the previous performance of the same grade level in the same school was controlled as the baseline science performance. For example, for the fifth graders in 2019, the performance of the fifth graders from the same school in 2017 was controlled as the baseline. As a result, 97 grade level cohorts from 73 IXL Science schools were analyzed in order to examine the IXL Science efficacy.

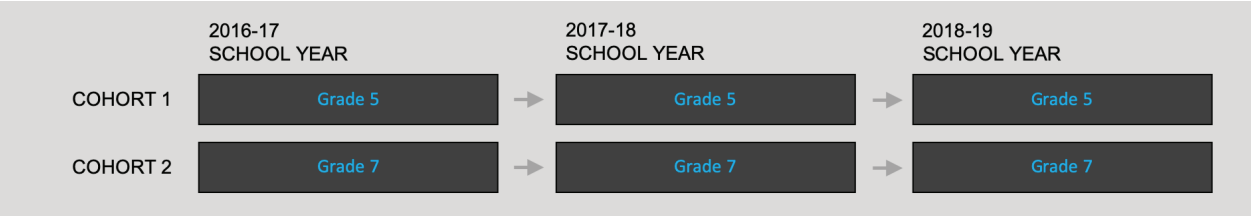


Figure 3. Study Design for Science

Methodology

Two sources of data were used in this study: IXL usage data and school performance data with demographic backgrounds. IXL usage data was retrieved from the IXL database, which provided information on whether a school or school grade had adopted a certain IXL product during a certain school year (i.e., number of active students using IXL).

School performance data and demographic information were obtained from the Alabama Department of Education. Schools' percent proficient rates assessed by the Scantron from the 2019 school report card were used as the posttest. Percent proficient rates assessed by the ACT Aspire from the 2017 school report card were used as the pretest, to control for schools' baseline performance prior to using IXL. Schools' level grades were calculated based on weighted scores of academic achievements, academic growth, progress in English learning proficiency, chronic absenteeism, graduation rate (for schools with 12th grade), and college and career readiness (for schools with 12th grade). The corresponding performance score ranges for the letter grades A, B, C, D and F are 90-100, 80-89, 70-79, 60-69, 0-59, respectively. Demographic background variables include school size, school location, school Title I status, percentages of economically disadvantaged students, English language learners, students with disabilities, student gender, and student race. See Appendix A for details on school performance and demographic information.

Research Questions

For IXL Math and IXL Science separately, the analysis allowed us to answer two research questions:

1. **Efficacy of IXL:** What is the impact of IXL on schools' performance in the corresponding subject on the 2019 Alabama state assessments? In other words, did IXL schools using that subject during 2017-19 outperform non-IXL school grades on the 2019 assessment?

2. **IXL and school letter grades:** Compared to non-IXL schools, were IXL STEM schools (i.e., schools that used IXL Math and/or IXL Science during 2017-2019) more likely to receive letter grades of A or B in 2019?

Analysis

To determine the impact of IXL on 2019 Scantron performance, multilevel linear regression analyses were conducted for each subject, controlling for prior performance in 2017 at level 1 (i.e., the school grade level) and important demographic backgrounds at level 2 (i.e., the school level), including school size, school location (i.e., city, suburb, town, or rural), percentages of economically disadvantaged students, English language learners, students with disabilities, student gender, and student race.

To examine the associations between IXL and school letter grade, chi-square statistics were calculated and logistic regression was conducted to obtain the odds ratio at the school level. Chi-square tests examine the differences between IXL and non-IXL schools on the distribution of the letter grades they received. The corresponding odds ratios quantify the likelihood that IXL schools would receive better letter grades (i.e., letter grades A and B) than non-IXL schools.

To assist in the interpretation of the IXL effects, we reported statistical significance, effect size, and percentile gain when applicable. 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 .05) indicates strong evidence that the IXL effect is not zero. Effect size was reported using Cohen's *d*, with .25 or above indicating large effect sizes (Lipsey et al., 2012). Percentile gain is the expected change in percentile rank for an average non-IXL school if the school had used IXL, and is calculated based on the effect size. More details about these analytical methods can be found in What Works Clearinghouse (2020).

Results

The Impact of IXL Math: Efficacy

IXL Math was found to have a positive and statistically significant effect on school performance on the Scantron math assessment. See Appendix B, Table B1 for detailed results. One- or two-year IXL Math adoption had an unstandardized coefficient of 3.71 with $p = .028 < .05$ and Cohen's $d = .19$. That is, if an average non-IXL school at the 50th percentile had used IXL Math for one or two school years, the school could expect its math proficiency rate to increase 8 percent, putting the school at the 58th percentile (see Figure 4).

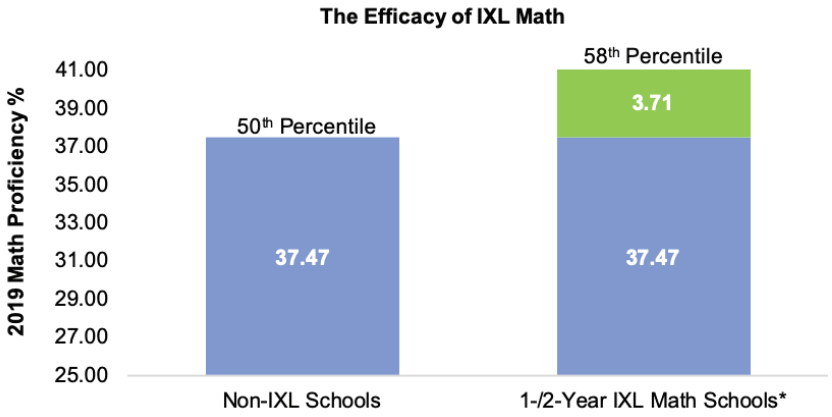


Figure 4. The Efficacy of IXL Math

The Impact of IXL Science: Efficacy

IXL Science was found to have a positive and statistically significant effect on school performance on the Scantron science assessment. See Appendix B, Table B2 for detailed results. One- or two-year IXL Science adoption had an unstandardized coefficient of 3.62 with $p = .013 < .05$ and Cohen's $d = .11$. That is, if an average non-IXL school at the 50th percentile had used IXL Science for one or two school years, the school could expect its science proficiency rate to increase 4 percent, putting the school at the 54th percentile (see Figure 5).

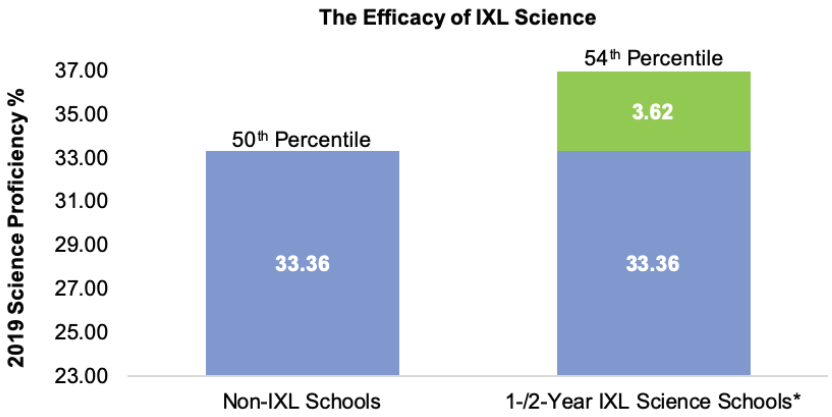


Figure 5. The Efficacy of IXL Science

The Associations between IXL and School Letter Grade

Compared to the non-IXL schools (*n* = 940), IXL schools (*n* = 374) that used IXL Math and/or IXL Science during the 2017-19 school years received better school letter grades. Figure 6 shows the percentages of letter grades received by IXL schools and non-IXL in 2019. Specifically, 24.9% and 47.3% of IXL schools received letter grades of A or B respectively, compared to just 18.9% and 40.3% of non-IXL schools receiving these letter grades. The chi-square test showed that the school letter grade distribution of IXL schools was significantly different from that of non-IXL schools, with $\chi^2 = 24.82$, $p < .001$, indicating significant associations between IXL usage and the 2019 school letter grades.

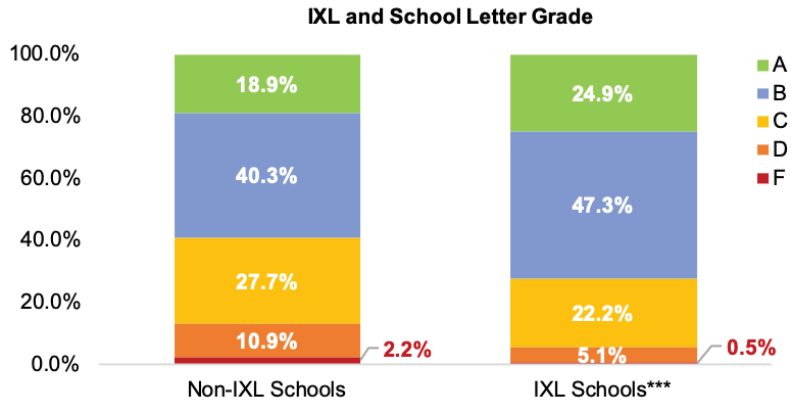


Figure 6. Letter Grades of IXL and Non-IXL Schools

A logistic regression was performed using the two school groups (i.e., IXL schools and non-IXL schools) to predict the probability of receiving a letter grade of A or B. An odds ratio of 1.79 was obtained with $p < .001$, indicating that IXL schools were 1.79 times more likely to receive a letter grade of A or B in 2019 than non-IXL schools.

Conclusion

In sum, the study results indicated that IXL usage has a positive and statistically significant impact on school STEM performance. It is concluded that IXL STEM product(s) usage was associated with better school letter grades. Schools that used IXL products had significantly higher probabilities of receiving letter grades of A or B. These findings can be generalized to other public schools—they are likely to achieve similar results by using IXL. Therefore, it is concluded that IXL is an effective program for schools seeking to increase student achievement in math and science.

Reference

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Appendix A. Schools' Background Information

Table A. Background Information for State and IXL Schools

	All schools	IXL Math schools	IXL Science schools
STEM proficiency:			
2017 math	49.88%	53.23%	-
2019 math	40.87%	45.67%	-
2017 science	35.26%	-	35.52%
2019 science	34.20%	-	37.66%
School letter grade:			
A	18.1%	24.4%	
B	37.1%	46.5%	
C	22.9%	21.8%	
D	8.1%	5.0%	
F	1.5%	0.5%	
Missing/Insufficient data[1]	12.4%	1.8%	
Demographic:			
School size	551.13	527.25	526.66
School location: city	22.24%	20.83%	8.22%
School location: suburb	17.71%	12.96%	15.07%
School location: town	14.96%	11.11%	12.33%
School location: rural	45.09%	55.09%	64.38%
Economically disadvantaged	56.77%	55.88%	60.57%
English language learners	7.57%	6.94%	6.23%
Student with disabilities	14.74%	15.35%	15.57%
Gender: male	51.53%	51.38%	51.55%
Race: black	40.75%	31.18%	29.22%
Race: white	61.89%	68.31%	74.82%
Title I	62.47%	72.69%	86.30%

Note. The numbers reported in the table are averaged across schools. Some numbers may be overestimated, since data cells with fewer than 10 cases were masked in the state reports and treated as missing.

[1]186 schools missing 2019 school letter grades were excluded from the related analyses.

Appendix B. Efficacy Testing Results

Table B1. The Efficacy of IXL Math on 2019 Math Proficiency

	Coef.	*SE*	*t*	*p*
(Intercept)	37.47	1.84	20.38	< .001
School size[1]	0.01	0.00	2.38	.018
School location: suburb[2]	1.60	1.75	0.91	.361
School location: town[2]	2.84	2.20	1.29	.199
School location: rural[2]	0.83	2.00	0.41	.680
Economically disadvantaged[1]	6.72	4.28	1.57	.117
English language learners[1]	-4.07	9.05	-0.45	.653
Students with disabilities[1]	-4.16	17.34	-0.24	.810
Gender: male[1]	-13.98	25.70	-0.54	.587
Race: white[1]	-1.76	3.34	-0.53	.599
Title I[3]	1.97	1.91	1.03	.303
Math 2017[1]	0.68	0.03	21.82	< .001
1- or 2-year IXL Math	**3.71**	**1.68**	**2.21**	**.028**

Note. [1]grand-mean centered; [2]dummy coded: city schools as the reference group; [3]dummy coded: non-Title I schools as the reference group.

Table B2. The Efficacy of IXL Science on 2019 Science Proficiency

	Coef.	*SE*	*t*	*p*
(Intercept)	33.36	1.22	27.39	< .001
School size[1]	0.00	0.00	-0.07	.946
School location: suburb[2]	2.57	1.27	2.03	.044
School location: town[2]	0.01	1.53	0.01	.993
School location: rural[2]	0.71	1.26	0.56	.575
Economically disadvantaged[1]	-0.82	2.96	-0.28	.783
English language learners[1]	-22.01	6.18	-3.56	< .001
Students with disabilities[1]	-8.38	11.79	-0.71	.477
Gender: male[1]	21.40	18.47	1.16	.247
Race: white[1]	-1.36	2.13	-0.64	.524
Title I[3]	1.46	1.30	1.12	.263
Science 2017[1]	0.81	0.02	38.42	< .001
1- or 2-year IXL Science	**3.62**	**1.42**	**2.55**	**.013**

Note. [1]grand-mean centered; [2]dummy coded: city schools as the reference group; [3]dummy coded: non-Title I schools as the reference group.