RESEARCH REPORT

October 2020

The Effect of IXL Math and IXL Language Arts in an Indiana School District

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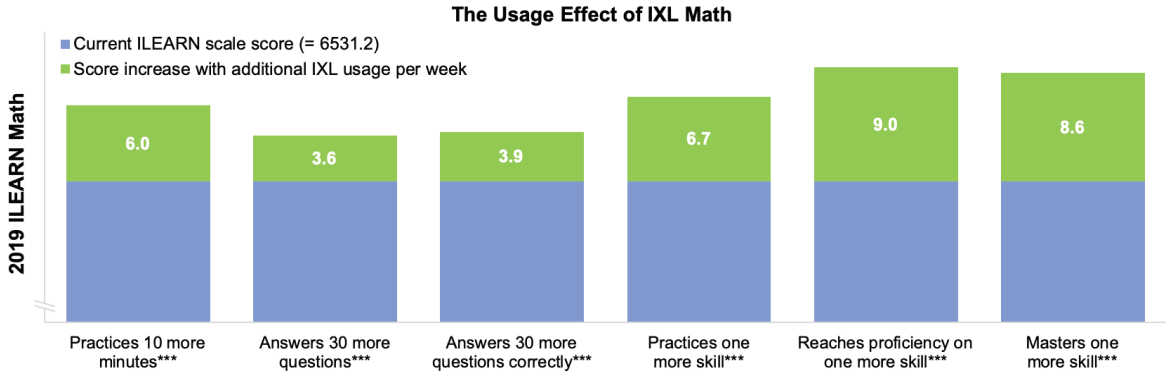
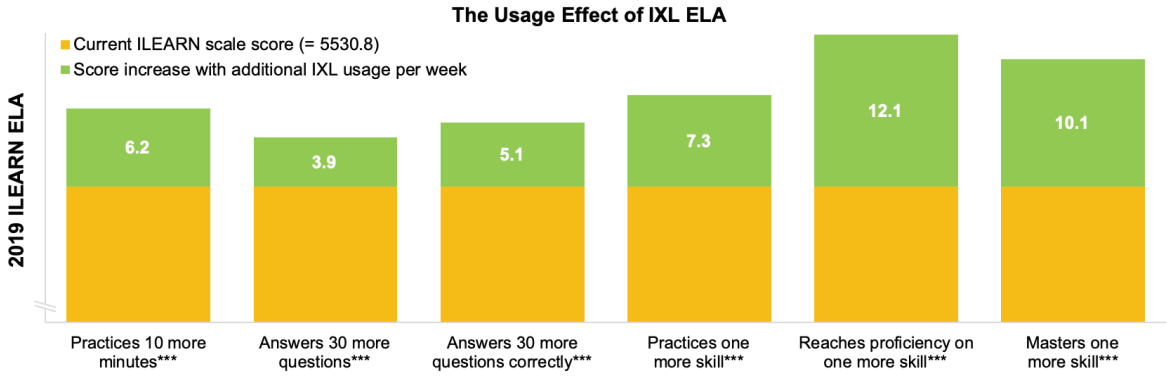
Executive Summary

IXL is a personalized learning platform designed to help students build academic skills in subjects including but not limited to math and English language arts (ELA). Previous research has shown that IXL can have a significant impact on academic performance at schools or districts (Empirical Education, 2013).

To further evaluate the impact of IXL Math and IXL ELA, researchers studied 2,898 students from 12 public elementary schools in an Indiana school district who used IXL for the first time in the 2018-19 school year. Using multilevel linear regression models to control for students' baseline performance and demographic background, researchers found statistically significant positive effects on performance on the 2019 Indiana Learning Evaluation Assessment Readiness Network (ILEARN) for both IXL Math and IXL ELA across a series of usage indicators. Key findings include:

- **More IXL practice is associated with better performance.** For both math and ELA, students performed better on the 2019 ILEARN when they spent more time on IXL practicing, answering more questions, answering more questions correctly, practicing more skills, reaching proficiency in more skills, and/or mastering more skills[1,2].

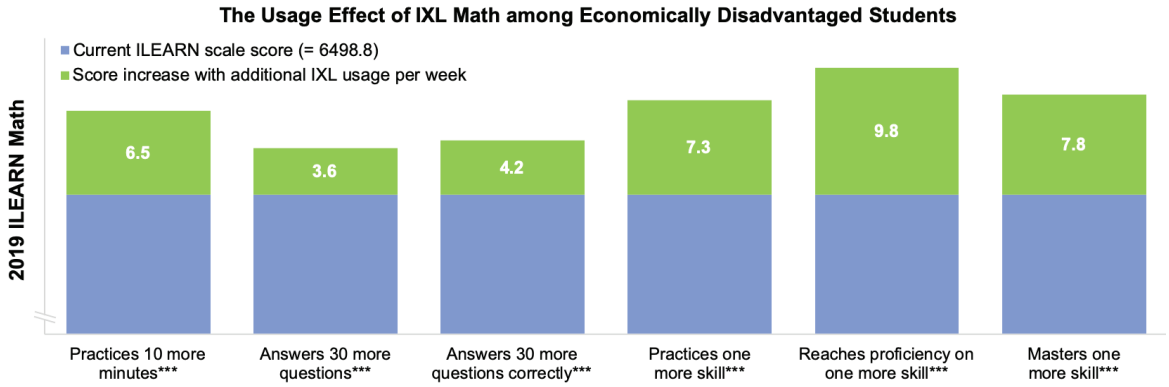


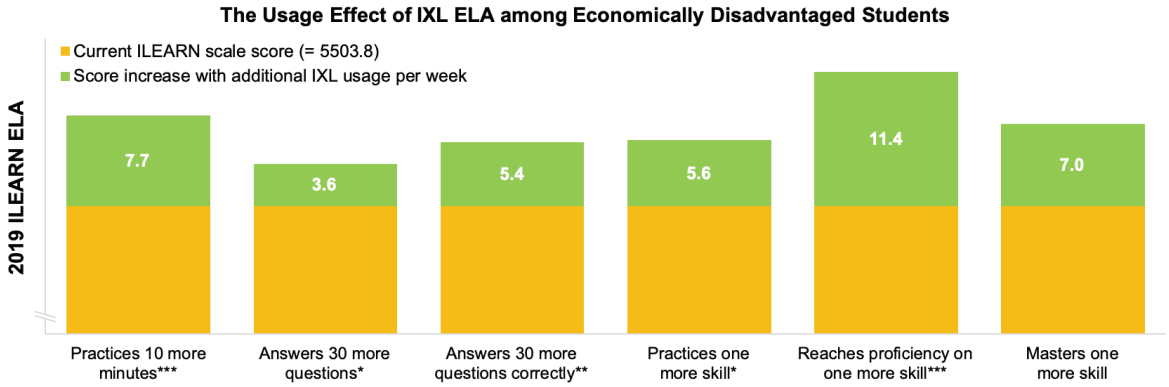


[1] *In all figures: * indicates significance at the .05 level; ** indicates significance at the .01 level; *** indicates significance at the .001 level.*

[2] *Current ILEARN scale score: averaged scale score after adjusting for prior performance and demographic characteristics.*

- **IXL supports economically disadvantaged students.** Economically disadvantaged students experience similar gains in performance with additional practice as their peers.





THE EFFECT OF IXL IN AN INDIANA SCHOOL DISTRICT

Study Design and Methodology

This study analyzed data from 2,898 students in 12 public elementary schools in an Indiana school district who used IXL Math and IXL ELA for the first time during the 2018-19 school year. Two sources of data were used in this study: students' state assessment data and their IXL practice data.

The district provided the 2018 and 2019 state assessment data as well as the demographic background data for students in grades 3 through 6. Each year, the state math and ELA assessments are administered to students in grades 3 and above. The Indiana Statewide Testing for Educational Progress (ISTEP) was used between 2014 and 2018 as the statewide assessment, and the Indiana Learning Evaluation Assessment Readiness Network (ILEARN) replaced ISTEP in 2019. ILEARN reports student achievement levels according to the Indiana Academic Standards, and students' proficiency levels are determined based on their scale scores. For example, for 6th graders, ILEARN math scores ranging from 6488 to 6544 indicate *Approaching Proficiency*, and ILEARN math scores ranging from 6545 to 6604 indicate the student is *At Proficiency* (Indiana Interpretive Guide for Statewide Assessments).

Students' math and ELA performance on the 2018 ISTEP assessment was used as the pretest to control for baseline performance prior to using IXL. Students' math and ELA performance on the 2019 ILEARN assessment served as the posttest and was used to examine the impact of IXL Math and IXL ELA. In order to trace each student's math and ELA performance from spring 2018 to spring 2019, the study design required students with both pretest and posttest scores available. Therefore, data from three cohorts, encompassing 2,898 students, were analyzed in the present study (Figure 1). See Appendix A for details on students' background and state math assessment performance.

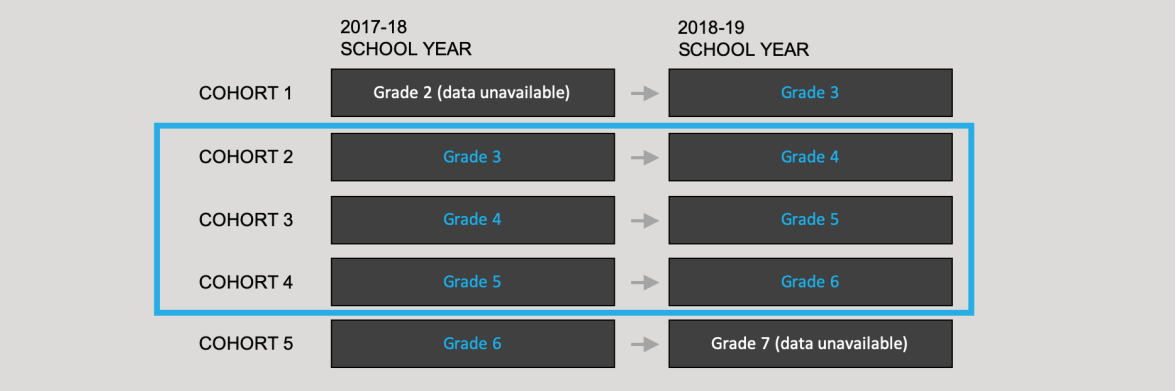


Figure 1. Study Design

Demographic background information provided by the district included student gender, race/ethnicity, economically disadvantaged status, English language learner status, and special education status. Among the 2,898 students, nearly half were identified as economically disadvantaged students. See Appendix A for details on student demographics. In addition, school-level demographics were retrieved from the Indiana Department of Education and included school size, school location, and Title I status. Among the 12 elementary schools, the average school size was 585. The majority of the schools (n = 9) were located in cities, along with one suburban school and two rural schools. Four were Title I schools.

Students' IXL Math and ELA usage data from the 2018-19 school year were retrieved from the IXL database. For both subjects, IXL usage indicators included the amount of time spent on IXL, the number of questions answered, the number of questions answered correctly, the number of skills practiced, the number of skills reaching proficiency, and the number of skills mastered[3]. See Table 1 for detailed information on IXL Math and ELA usage across the 2018-19 school year. There was a wide range of usage among the 2,898 students. For example, time spent on IXL Math ranged from 0 to over 2 hours per week; the number of skills reaching proficiency ranged from 0 to over 10 skills per week.

[3] *IXL uses its proprietary SmartScore to measure student progress on a skill. SmartScores range from 0 to 100 and are calculated based on a number of metrics, including the percentage of questions answered correctly, question difficulty, and response pattern consistency. Students reach proficiency with a SmartScore of 80 and mastery with a SmartScore of 100.*

Table 1. IXL Math and IXL ELA Weekly Practice

IXL usage (per week)	IXL Math				IXL ELA			
	M	*SD*	Min	Max	*M*	*SD*	Min	Max
Time spent (in minutes)	15.86	11.79	0.00	120.65	9.53	8.50	0.00	123.65
Questions answered	44.65	47.04	0.00	761.52	30.62	29.45	0.00	244.38
Questions answered correctly	37.42	42.42	0.00	731.79	24.41	24.78	0.00	216.54
Skills practiced	1.58	1.12	0.00	11.39	0.86	0.68	0.00	6.26
Skills proficient	0.93	0.90	0.00	10.33	0.50	0.54	0.00	5.84
Skills mastered	0.61	0.71	0.00	9.77	0.33	0.47	0.00	5.78

Research Questions

This study aimed to answer two research questions:

1. What were the effects of IXL usage indicators on students' 2019 ILEARN scores (controlling for 2018 baseline performance prior to IXL usage and demographic background)? More specifically, what changes in performance would be expected with additional IXL Math and ELA usage?

2. Did the predictive effects of IXL usage on ILEARN scores hold for economically disadvantaged students in math and ELA?

Analyses

Multilevel linear regression models were used to examine the IXL usage effect in math and ELA separately. These models specify students (Level 1) as clustered within schools (Level 2) and account for any shared variability within schools. In the overall analysis, at Level 1 (i.e., the student level), the outcome variable was students' scores on the 2019 ILEARN assessment, controlling for the students' prior performance in 2018 and demographic background, including gender, race/ethnicity, economically disadvantaged status, English language learner status, and special education status. At Level 2 (i.e., the school level), we accounted for clustering and controlled for school demographics, including school size (i.e., 2019 enrollment), school location (i.e., city, suburban, or rural), and Title I status. Upon this baseline model, the six IXL usage indicators were added at Level 1 one at a time to avoid multicollinearity issues due to the strong correlations among them (e.g., students who spent more time on IXL also practiced more skills).

To answer the second research question, we used the same set of multilevel linear regression models described above, but only on the 1,396 economically disadvantaged students. Since this sub-sample was the focus of these analyses, students' economically disadvantaged status was removed from the analysis as a covariate.

Following What Works Clearinghouse (2020) guidelines, each effect is accompanied by a test of statistical significance and a probability (*p*) value. The *p*-value is the probability of observing the current or more extreme data, assuming the effect is zero (Cohen, 1994). As such, the smaller the *p*-value, the less likely it is the result occurred at random, with .05, .01, and .001 commonly used as thresholds in research practice. Effects associated with *p*-values smaller than these thresholds are considered statistically significant at each of these significance levels.

Results

Overall results showed positive and statistically significant associations between all tested IXL usage indicators and 2019 ILEARN performance. For both math and ELA, the amount of time spent, number of questions answered, number of questions answered correctly, number of skills practiced, number of skills reaching proficiency, and number of skills mastered were all significant predictors of performance gains on the 2019 ILEARN assessment (all p values < .001).

The Usage Effect of IXL Math

The results for mathematics indicated that the more a student practiced with IXL Math, the better he or she performed on the 2019 ILEARN math assessment. See Table B1 in Appendix B for the full regression results. Figure 2 shows the expected improvement in ILEARN math scale scores with additional IXL Math usage.

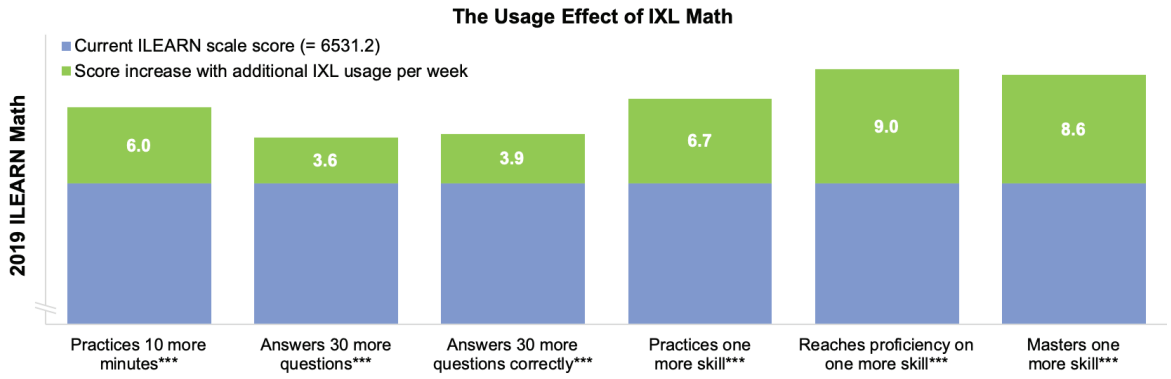


Figure 2. The Usage Effect of IXL Math

Specifically, with each additional minute spent on IXL Math per week, an average student's ILEARN math score is expected to increase by 0.60 points. For example, if a student practiced for 10 more minutes per week, their math score would increase by 6.0 points. For each additional question answered per week, the ILEARN math score is expected to increase by 0.12 points. Meaning, if a student answered 30 more questions per week, their math score would increase by 3.6 points. Similarly, for each additional question answered correctly per week, a typical student's ILEARN math score is expected to increase by 0.13 points. In other words, if a student answered 30 more questions correctly per week, their math score is expected to increase by 3.9 points. Finally, even more sizable gains in ILEARN scores are expected, as students practice, become proficient in, and master more skills per week as shown in Figure 2.

The Usage Effect of IXL ELA

Significant positive associations were found between IXL ELA usage indicators and 2019 ILEARN ELA scores, with p values < .001. The results indicated that the more a student practiced with IXL ELA, the better he or she performed on the 2019 ILEARN ELA assessment. See Table B1 in Appendix B for the full regression results. Figure 3 shows the expected improvement in ILEARN ELA scale scores with additional IXL ELA usage.

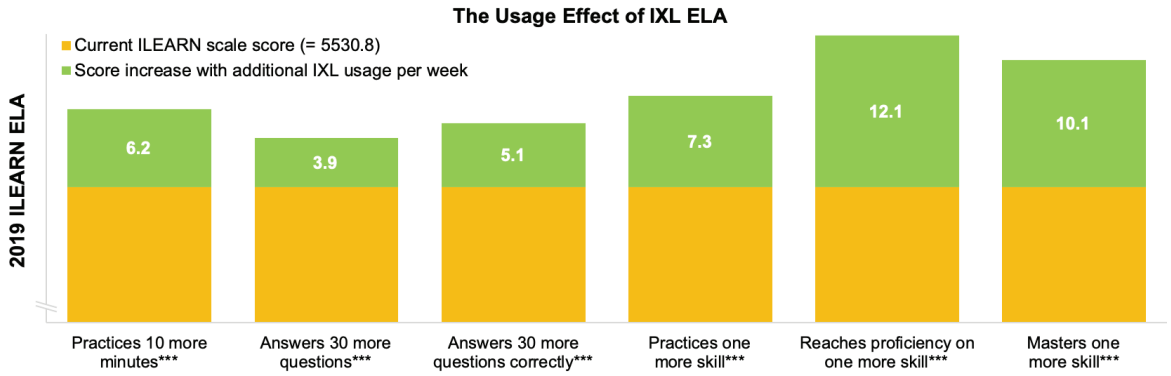


Figure 3. The Usage Effect of IXL ELA

Specifically, with each additional minute spent on IXL ELA per week, an average student's ILEARN ELA score is expected to increase by 0.62 points. For example, if a student practiced for 10 more minutes per week, their ELA score would increase by 6.2 points. For each additional question answered per week, the ILEARN ELA score is expected to increase by 0.13 points. Meaning, if a student answered 30 more questions per week, their ELA score would increase by 3.9 points. Similarly, for each additional question answered correctly per week, a typical student's ILEARN ELA score is expected to increase by 0.17 points. In other words, if a student answered 30 more questions correctly per week, their ELA score is expected to increase 5.1 points. Finally, even more sizable gains in ILEARN scores are expected, as students practice, become proficient in, and master more skills per week as shown in Figure 3.

The Usage Effect of IXL for Economically Disadvantaged Students

As mentioned earlier, another area of focus of this study was economically disadvantaged students. We found similar usage effects for this group of students in both math and ELA. The results indicated that the more an economically disadvantaged student practiced with IXL, the better he or she performed on the 2019 ILEARN math assessment. See Table B2 in Appendix B for the full regression results.

For math, all IXL Math usage indicators were significant at the .001 level. Figure 4 shows the expected improvement in ILEARN scale scores with additional IXL Math usage.

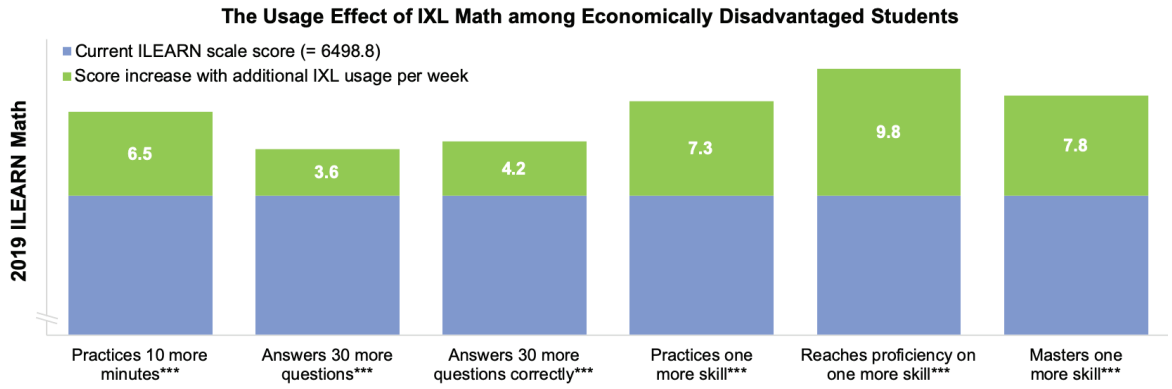


Figure 4. The Usage Effect of IXL Math among Economically Disadvantaged Students

Specifically, with each additional minute spent on IXL Math per week, an average economically disadvantaged student's ILEARN math score is expected to increase by 0.65 points. For example, if a student practiced for 10 more minutes per week, their math score would increase by 6.5 points. For each additional question answered per week, the ILEARN math score is expected to increase by 0.12 points. Meaning, if a student answered 30 more questions per week, their math score would increase by 3.6 points. Similarly, for each additional question answered correctly per week, a typical economically disadvantaged student's ILEARN math score is expected to increase by 0.14 points. In other words, if a student answered 30 more questions correctly per week, the math score is

expected to increase by 4.2 points. Finally, even more sizable gains in ILEARN scores are expected, as students practice, become proficient in, and master more skills per week as shown in Figure 4.

For ELA, all IXL ELA usage indicators were statistically significant except for the number of IXL ELA skills mastered (p = .083[4]). Figure 5 shows the expected improvement in the ILEARN scale scores with additional IXL ELA usage.

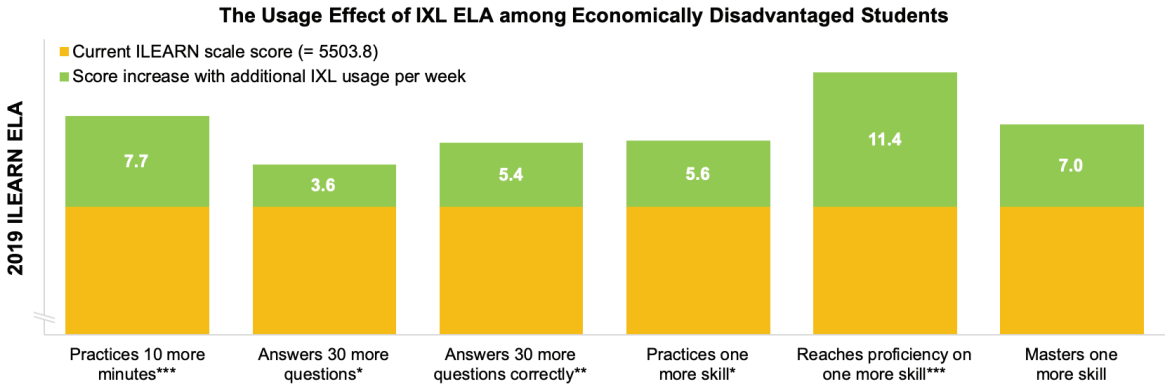


Figure 5. The Usage Effect of IXL ELA among Economically Disadvantaged Students

Specifically, with each additional minute spent on IXL ELA per week, an average economically disadvantaged student's ILEARN ELA score is expected to increase by 0.77 points. For example, if a student practiced 10 more minutes per week, their ELA score would increase by 7.7 points. For each additional question answered per week, the ILEARN ELA score is expected to increase by 0.12 points. Meaning, if a student answered 30 more questions per week, their ELA score would increase by 3.6 points. Similarly, for each additional question answered correctly per week, a typical economically disadvantaged student's ILEARN ELA score is expected to increase by 0.18 points. In other words, if a student answered 30 more questions correctly per week, their ELA score is expected to increase by 5.4 points. Finally, even more sizable gains in ILEARN scores are expected, as students practice, become proficient in, and master more skills per week as shown in Figure 5.

[4] Although not statistically significant, there was still a positive relationship between the number of skills mastered on IXL ELA and ILEARN ELA performance.

Conclusion

This study found a positive and statistically significant relationship between IXL practice and 2019 ILEARN performance. For both math and ELA, the amount of time spent on IXL, number of questions answered, number of questions answered correctly, number of skills practiced, number of skills reaching proficiency, and number of skills mastered were all statistically significant predictors of student performance gains on the ILEARN assessment. Based on prior research and the results presented here, we expect our findings to generalize to other similar schools—the more students practice with IXL, the better they will perform on state assessments. Importantly, the effects of IXL Math and ELA are cumulative, so schools seeking larger assessment gains should encourage additional practice with IXL.

Moreover, the usage effects found in the full sample applied to economically disadvantaged students as well. Some of these effects were even larger for this subgroup. As such, IXL is an ideal product for schools that are specifically targeting gains in achievement for this vulnerable student population.

References

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Appendix A. Student Performance and Background Information

Table A1. Performance on state assessments and background information for all students and economically disadvantaged students

	All students		Economically disadvantaged students	
# of students	2,898		1,396	
Pretest and posttest averages	***M***	***SD***	***M***	***SD***
2018 ISTEP Math	470.5	67.1	448.4	60.9
2019 ILEARN Math	6511.7	93.2	6479.0	84.1
2018 ISTEP ELA	473.7	57.7	455.8	53.9
2019 ILEARN ELA	5519.9	82.6	5493.7	77.1
Student demographic	***M***	**%**	***M***	**%**
Gender:				
Female	1,448	50.0%	690	49.4%
Male	1,448	50.0%	706	50.6%
Race/Ethnicity				
American Indian/Alaska Native	10	0.3%	5	0.4%
Asian	218	7.5%	10	0.7%
Black/African American	66	2.3%	43	3.1%
Hispanic	498	17.2%	367	26.3%
Native Hawaiian/Other Pacific Islander	7	0.2%	1	0.1%
White	1,973	68.1%	896	64.2%
Multiracial/Two or More Races	120	4.1%	74	5.3%
Status:				
Economically disadvantaged students	1,396	48.2%	-	-
English language learners	321	11.1%	201	14.4%
Special education students	448	15.5%	255	18.3%

Appendix B. IXL Usage Effects

Table B1. Usage effects of IXL Math and IXL ELA for all students (*n* = 2,898)

IXL usage (per week)	IXL Math				IXL ELA			
	Coef.	*SE*	*t*	*p*	*Coef.*	*SE*	*t*	*p*
(Intercept in baseline model)	6531.20	12.78	511.08	< .001	5530.80	8.69	636.66	< .001
Time spent (in minutes)	0.60	0.09	6.93	< .001	0.62	0.11	5.44	< .001
Questions answered	0.12	0.02	5.77	< .001	0.13	0.03	3.99	< .001
Questions answered correctly	0.13	0.02	5.99	< .001	0.17	0.04	4.55	< .001
Skills practiced	6.71	0.89	7.52	< .001	7.26	1.45	5.02	< .001
Skills proficient	9.02	1.11	8.13	< .001	12.05	1.82	6.61	< .001
Skills mastered	8.58	1.34	6.39	< .001	10.11	2.09	4.85	< .001

Appendix B. IXL Usage Effects

Table B2. Usage effects of IXL Math and IXL ELA for economically disadvantaged students (*n* = 1,396)

IXL usage (per week)	IXL Math				IXL ELA			
	Coef.	*SE*	*t*	*p*	*Coef.*	*SE*	*t*	*p*
(Intercept in baseline model)	6498.83	17.79	365.32	< .001	5503.84	8.48	648.73	< .001
Time spent (in minutes)	0.65	0.13	4.86	< .001	0.77	0.20	3.90	< .001
Questions answered	0.12	0.03	4.17	< .001	0.12	0.05	2.17	.030
Questions answered correctly	0.14	0.03	4.31	< .001	0.18	0.07	2.73	.006
Skills practiced	7.33	1.33	5.52	< .001	5.59	2.46	2.27	.023
Skills proficient	9.83	1.66	5.93	< .001	11.37	3.32	3.42	< .001
Skills mastered	7.77	1.94	4.00	< .001	6.99	4.03	1.74	.083