



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

Introduction

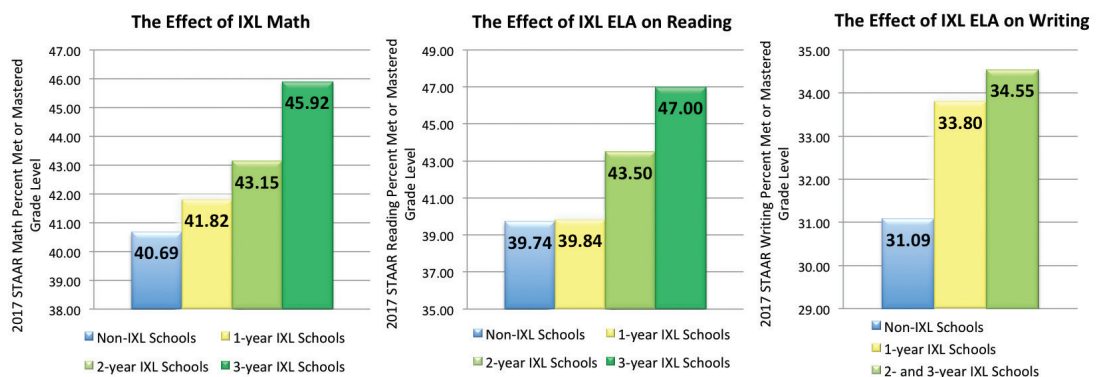
Previous research has shown that the use of IXL can have significant impact on student achievement for an individual school (Empirical Education, 2013). In this study, we explored IXL usage across the entire state of Texas. Examining such a large sample of schools allows us to quantify the impact of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

Abstract

This study investigated thousands of public schools in Texas that used IXL Math or IXL ELA between 2014 and 2017. Using data from the 2017 State of Texas Assessments of Academic Readiness (STAAR) exams, researchers examined academic achievement in both IXL schools and non-IXL schools. Scores from the 2014 STAAR program were used to control for schools' achievement prior to using IXL. IXL usage by the schools in this study ranged from less than one minute per student, per week, to over 100 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

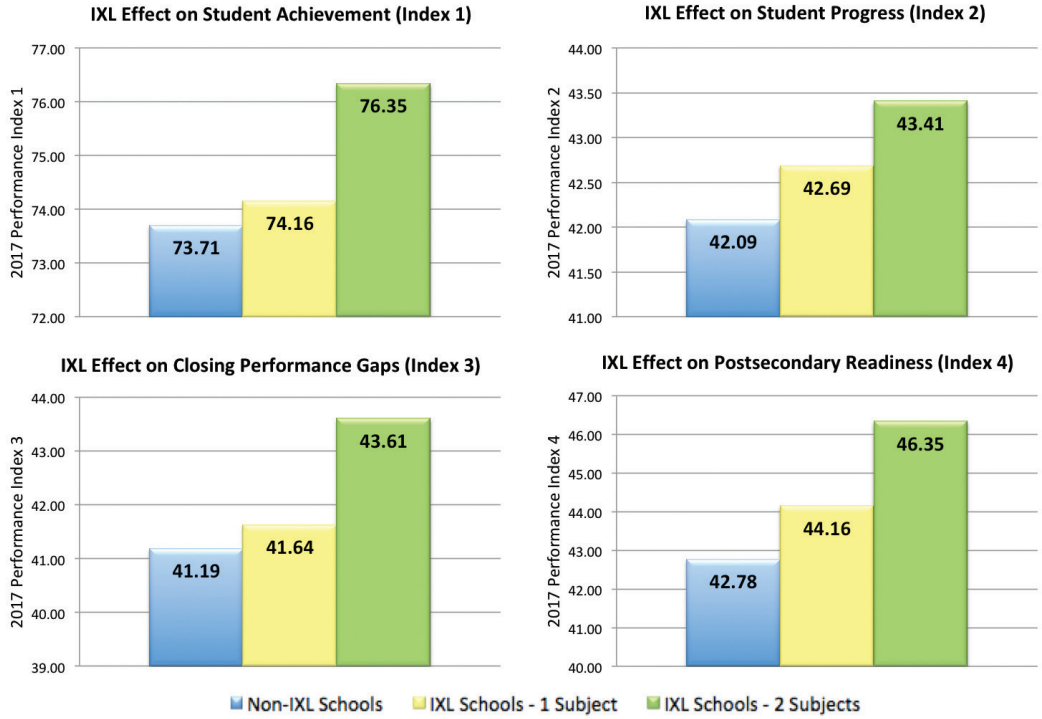
Texas schools using IXL outperformed schools without IXL in math (grades 3-8), reading (grades 3-8), and writing (grades 4 and 7¹). Schools that used IXL for two or three school years performed better than schools that used IXL for only one school year.



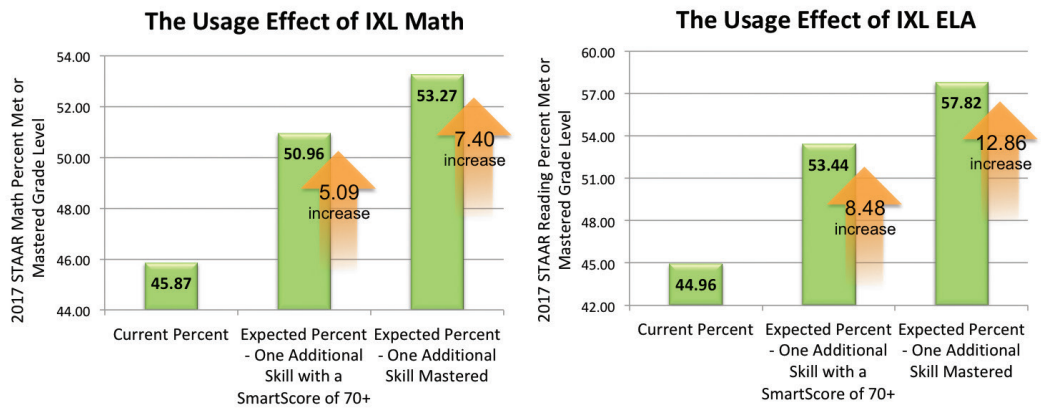
Elementary and middle schools using both IXL Math and IXL ELA received better accountability ratings (i.e., showed higher achievement, made more progress, were more successful in closing achievement gaps, and did better in advancing student postsecondary readiness) than similar schools using just one IXL subject or not using IXL.

¹ The STAAR exam for writing is only administered in grades 4 and 7, so the IXL effect was calculated just for these two grades.

The IXL Effect



Practice makes perfect. If every student achieved a SmartScore² of 70 or above on one additional skill per week, the school's proficiency rate would increase by 5.09 points in math and 8.48 points in reading. If every student mastered one additional skill per week, the school's proficiency rate would increase by 7.40 points in math and 12.86 points in reading.



² 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 Texas Schools

JANUARY 5, 2018

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 of Texas. 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, 2015-16, or 2016-17 school years (called “IXL schools”). The control group consisted of schools that did not use IXL in the 2014-15, 2015-16, or 2016-17 school years (called “non-IXL schools”).

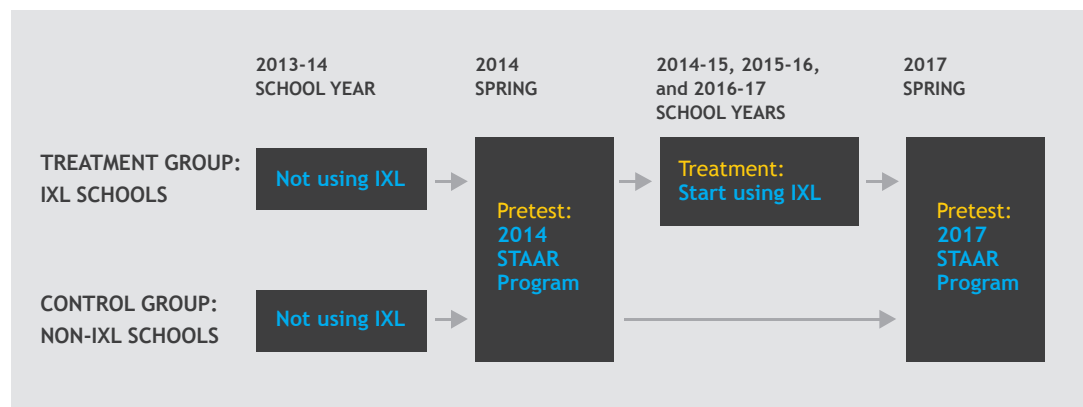


Figure 1. Pretest-Posttest Control Group Design

The State of Texas Assessments of Academic Readiness (STAAR) program was used as the pretest and the posttest for this study. STAAR is designed to measure the extent to which students have learned and are able to apply the knowledge and skills defined in the state-mandated curriculum standards. Students in grades 3-8 are tested in mathematics and reading. Students in grades 4 and 7 are also tested in writing.

The Texas Education Agency provides annual academic accountability ratings to evaluate all public schools in Texas. Nearly all schools receive one of two ratings: Met Standard or Improvement Required. The ratings are calculated based on four performance indices: Student Achievement (Index 1), Student Progress (Index 2), Closing Performance Gaps (Index 3), and Postsecondary Readiness (Index 4). Index 1, Student Achievement, provides a snapshot of STAAR performance across subjects. Index 2, Student Progress, measures year-to-year student progress. Index 3, Closing Performance Gaps, emphasizes the academic achievement of economically disadvantaged students and the two lowest-

performing racial/ethnic student groups. Index 4, Postsecondary Readiness, emphasizes the importance of earning a high school diploma that provides students with the foundation necessary for success in college, job training programs, the workforce, or the military. These accountability ratings provide a roadmap to help educators, parents, and community members understand their school's performance.

Methodology

The study analyzed data from 6,516 Texas public schools, including both traditional public schools and charter schools. A total of 1,539 public schools used IXL Math and/or IXL ELA between 2014 and 2017. 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 70 percent 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, 734 grade level cohorts from 365 schools were identified as IXL schools for IXL Math and 361 grade level cohorts from 206 schools were identified as IXL schools for IXL ELA. Appendix B shows the characteristics of IXL schools and the Texas state averages. The school performance and enrollment data were obtained from the Texas Education Agency and the Institute of Education Science.

Our researchers used multilevel linear models to calculate the IXL effect—i.e., the performance difference between IXL schools and non-IXL schools on the 2017 STAAR, controlling for factors such as prior performance, school size, percentage of students with limited English proficiency, percentage of students in special education, and school location. Similar multilevel linear models were applied to low-income schools (i.e., schools with an above-average percentage of economically disadvantaged students³) and low-performing schools (i.e., schools that performed below the state average on the 2014 STAAR program) to calculate the IXL effect for these two types of schools. We used a different set of multilevel linear models to evaluate the IXL effect on schools' 2017 accountability ratings. Another set of multilevel linear models was applied 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 four key questions:

1. What is the IXL effect on student achievement for IXL schools? In other words, did IXL schools perform better on the 2017 STAAR than non-IXL schools?
2. What is the IXL effect for low-income schools and low-performing schools?
3. Did IXL schools received higher accountability ratings than non-IXL schools?
4. 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 in math, reading, and writing, indicating there is a high probability that similar schools using IXL would achieve similar results. A positive and statistically significant IXL effect was also found in low-income schools and low-performing schools. The IXL effect on school accountability ratings was larger when schools used both IXL Math and IXL ELA as opposed to just one IXL subject. Our analysis also showed a positive correlation between IXL usage and school performance. In particular, on the 2017 STAAR, IXL schools with at least 15 questions answered per student per week outperformed IXL schools with fewer questions answered. One additional skill mastered per student, per week, was associated with an expected 7.40 percent increase on a school’s percent proficient in math and a 12.86 percent increase in ELA.

The Efficacy of IXL Math

The implementation of IXL Math showed a statistically significant effect on schools’ performance on the 2017 STAAR math tests across grades 3 through 8 (see Appendix D, Table D1 for details).

Figure 2 shows that the adjusted percent of students that met or mastered grade level⁴ was 40.69 for non-IXL schools, 41.82 for 1-year IXL schools, 43.15 for 2-year IXL schools, and 45.92 for 3-year IXL schools. The effect of IXL Math is not statistically significant for 1-year IXL schools, but it is statistically significant for 2-year and 3-year IXL schools. For 2-year IXL schools, the 2.46 percent difference corresponds to a percentile gain of 5 points in school ranking. For 3-year IXL schools, the 5.23 percent difference corresponds to a percentile gain of 11 points in school ranking. That is, if an average non-IXL school (at the 50th percentile) had used IXL Math for three school years from 2014 to 2017, the percent of students that meet or master grade level would be expected to increase 5.23 percent, putting the school at the 61st percentile.

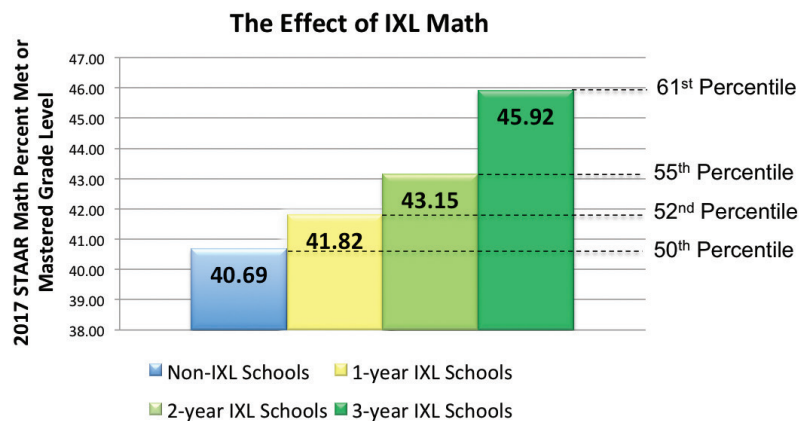


Figure 2. The Effect of IXL Math on the 2017 STAAR Math

⁴ Adjusted percent met or mastered grade level: the percentage of students who received a performance level of “meets or masters grade level” after adjusting for differences in prior performance and school characteristics between IXL schools and non-IXL schools.

Figure 3 shows the effect of IXL Math on low-income schools and low-performing schools. For low-income schools, the IXL effect is 1.62 points and corresponds to a 4 point percentile gain. For low-performing schools, the IXL effect is 2.37 points and corresponds to a 7 point percentile gain. Note that the 50th percentile in Figure 3 refers to the 50th percentile among low-income schools or low-performing schools.

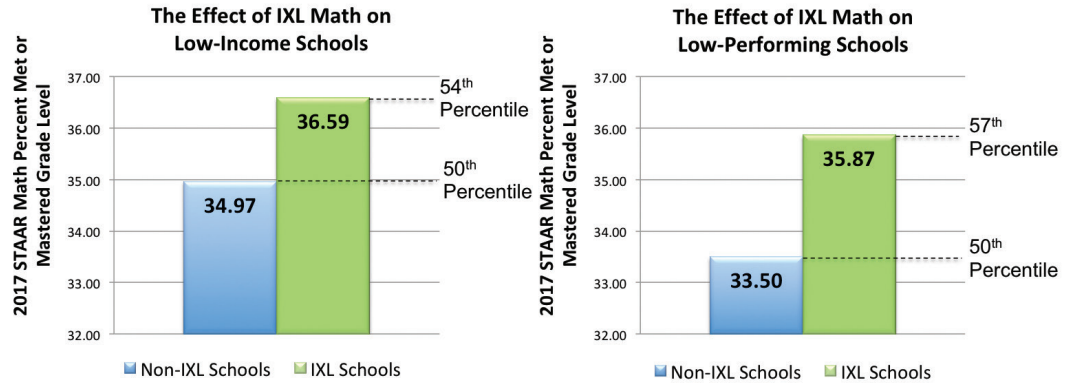


Figure 3. The Effect of IXL Math for Low-Income Schools and Low-Performing Schools

The Efficacy of IXL ELA on Reading

The implementation of IXL ELA showed a statistically significant effect on schools' performance on the 2017 STAAR reading tests across grades 3 through 8 (see Appendix D, Table D2 for details).

Figure 4 shows that the adjusted percent of students that met or mastered grade level was 39.74 for non-IXL schools, 39.84 for 1-year IXL schools, 43.50 for 2-year IXL schools, and 47.00 for 3-year IXL schools. The effect of IXL ELA is not statistically significant for 1-year IXL schools, but it is statistically significant for 2-year and 3-year IXL schools. For 2-year IXL schools, the 3.76 percent difference corresponds to a percentile gain of 9 points in school ranking. For 3-year IXL schools, the 7.26 percent difference corresponds to a percentile gain of 17 points in school ranking. That is, if an average non-IXL school (at the 50th percentile) had used IXL ELA for three school years from 2014 to 2017, the percent of students that meet or master grade level in reading would be expected to increase 7.26 percent, putting the school at the 67th percentile.

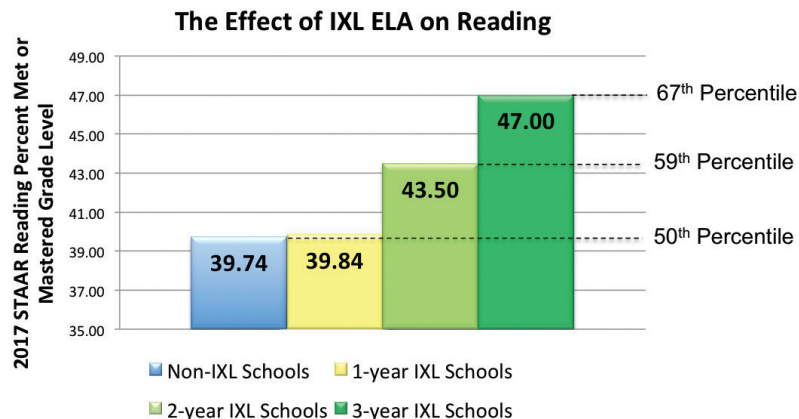


Figure 4. The Effect of IXL ELA on the 2017 STAAR Reading

Figure 5 shows the effect of IXL ELA on reading for low-income schools and low-performing schools. For low-income schools, the IXL effect is 2.10 points and corresponds to a 7 point percentile gain. For low-performing schools, the IXL effect is 1.99 points and also corresponds to a 7 point percentile gain.

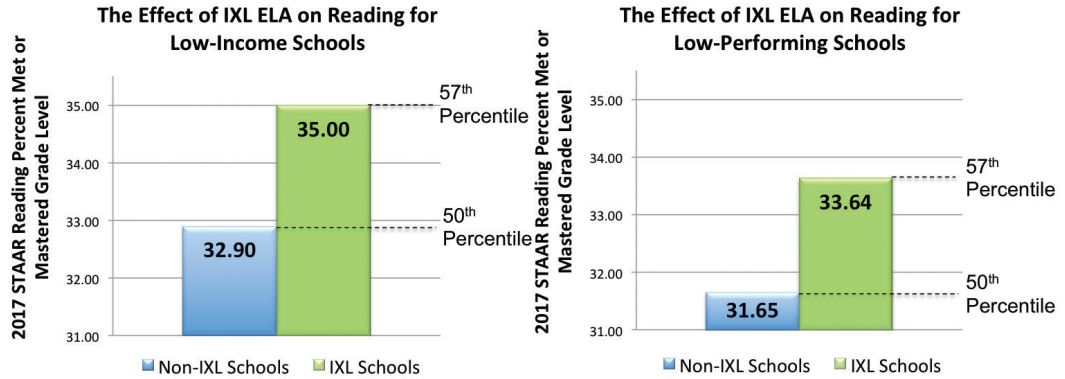


Figure 5. The Effect of IXL ELA on Reading for Low-Income Schools and Low-Performing Schools

The Efficacy of IXL ELA on Writing

The implementation of IXL ELA showed a statistically significant effect on schools' performance on the 2017 STAAR writing tests for grades 4 and 7 (see Appendix D, Table D3 for details).

Figure 6 shows that the adjusted percent of students that met or mastered grade level was 31.09 for non-IXL schools, 33.80 for 1-year IXL schools, and 34.55 for 2-year and 3-year IXL schools. For 1-year IXL schools, the 2.71 percent difference corresponds to a percentile gain of 7 points in school ranking. For 2-year and 3-year IXL schools, the 3.46 percent difference corresponds to a percentile gain of 8 points in school ranking. Although the effect of IXL ELA is not statistically significant for 2-year and 3-year IXL schools, the results still suggest a positive correlation between IXL implementation and students' writing performance.

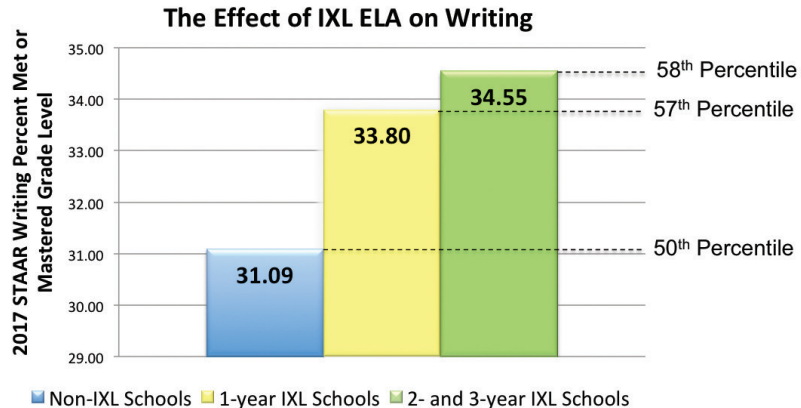


Figure 6. The Effect of IXL ELA on the 2017 STAAR Writing

Figure 7 shows the effect of IXL ELA on writing for low-income schools and low-performing schools. For low-income schools, the IXL effect is 3.97 points and corresponds to a 12 point percentile gain. For low-performing schools, the IXL effect is 2.62 points and corresponds to a 10 point percentile gain.

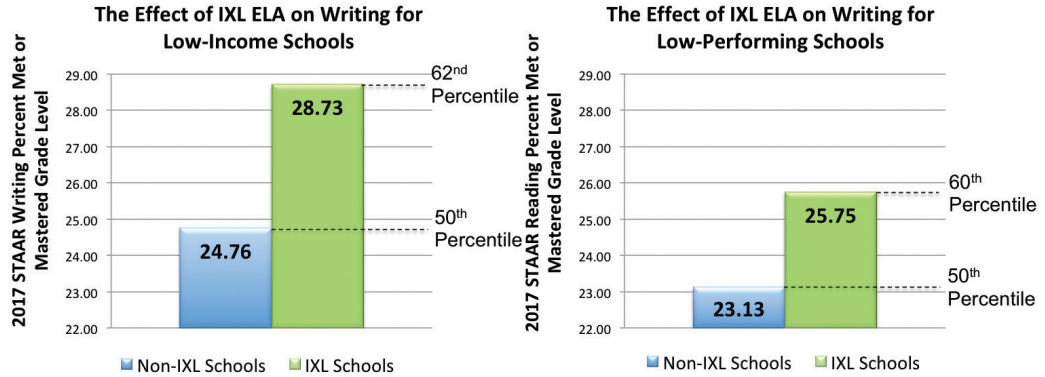


Figure 7. The Effect of IXL ELA on Writing for Low-Income Schools and Low-Performing Schools

The Efficacy of Using One IXL Subject versus Two IXL Subjects

Figures 8 and 9 show the effect of using one IXL subject (i.e., IXL Math or ELA) versus two IXL subjects (IXL Math and ELA) on schools’ accountability ratings at the elementary and middle school levels (see Appendix D, Table D4 for details).

As shown in Figure 8, for non-IXL schools, the percentage of schools that earned a rating of Met Standard increased from 91 percent in 2014 to 95 percent in 2017. For IXL schools that used one IXL subject, 86 percent of schools received a Met Standard rating in 2014 before they started using IXL. After implementing one IXL subject, the percentage increased to 96 percent in 2017. For IXL schools that used two IXL subjects, the percentage of schools with a Met Standard rating increased from 98 percent in 2014 to 100 percent in 2017.

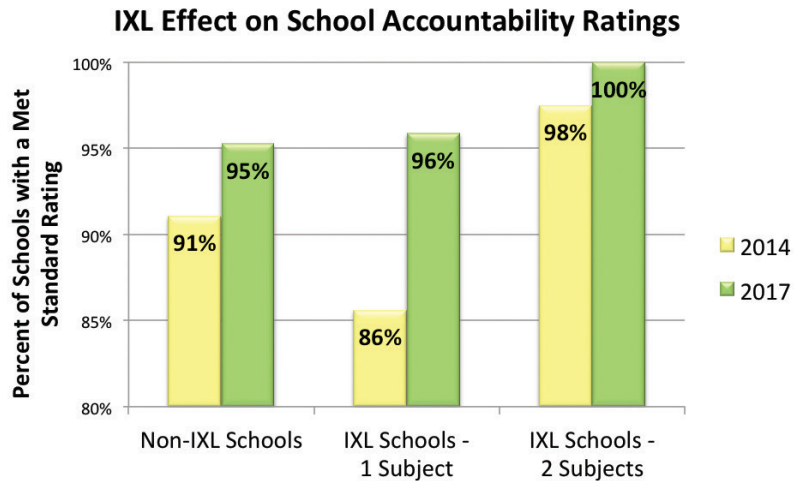


Figure 8. The IXL Effect on School Accountability Ratings

Figure 9 shows the IXL effect on the four performance indices that are used to calculate the 2017 accountability ratings. For Index 1, Student Achievement, the IXL effect is 0.45 for IXL schools that used one IXL subject and 2.64 for IXL schools that used two IXL subjects. The effect for 2-subject IXL schools is statistically significant and corresponds to a 9 point percentile gain. For Index 2, Student Progress, the IXL effect is 0.60 for IXL schools that used one IXL subject and 1.32 for IXL schools that used two IXL subjects. The effect for 2-subject IXL schools corresponds to a 7 point percentile gain. For Index 3, Closing Performance Gaps, the IXL effect is 0.45 for IXL schools that used one IXL subject and 2.42 for IXL schools that used two IXL subjects. The effect for 2-subject IXL schools is statistically significant and corresponds to a 10 point percentile gain. For Index 4, Postsecondary Readiness, the IXL effect is 1.38 for IXL schools that used one IXL subject and 3.57 for IXL schools that used two IXL subjects. The effect for 2-subject IXL schools is statistically significant and corresponds to an 8 point percentile gain.

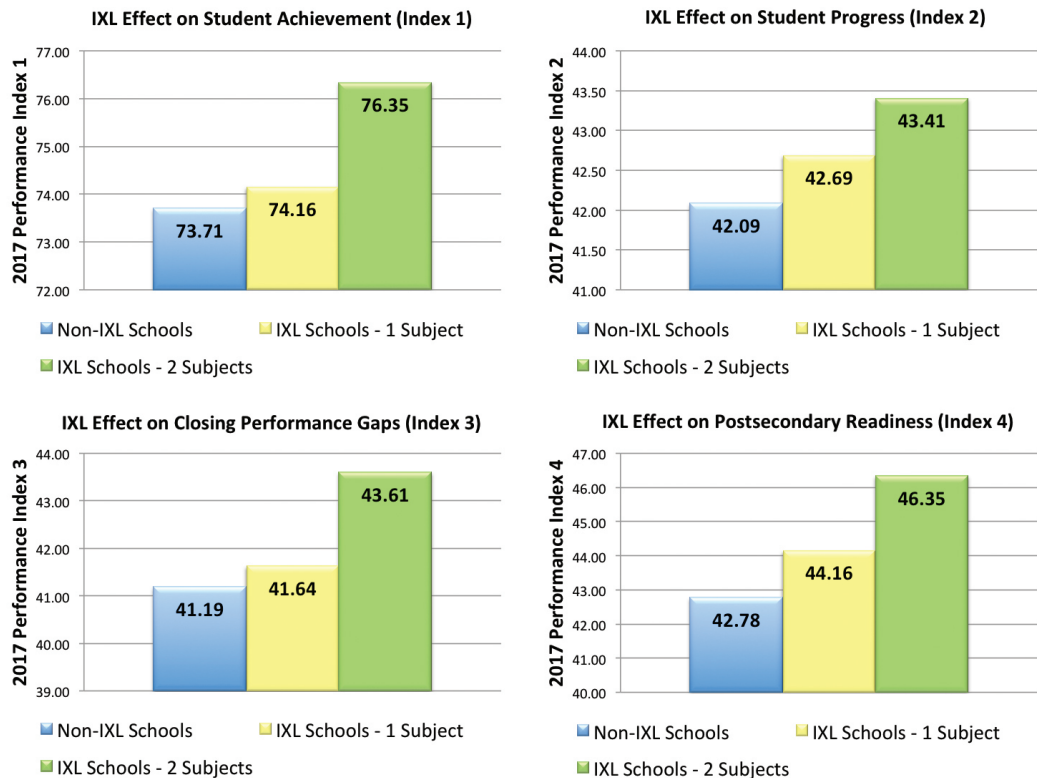


Figure 9. The IXL Effect on Performance Indices 1, 2, 3, and 4

The Usage Effect of IXL Math

For IXL schools that used IXL Math for at least one school year from 2014 to 2017, our analyses found a positive and statistically significant association between IXL Math usage and schools' performance on the 2017 STAAR math tests (see Appendix D, Table D5 for details).

Figure 10 shows the adjusted percentage of students that met or mastered grade level 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 2.57 percent more students meet or master grade level on the 2017 STAAR math tests.

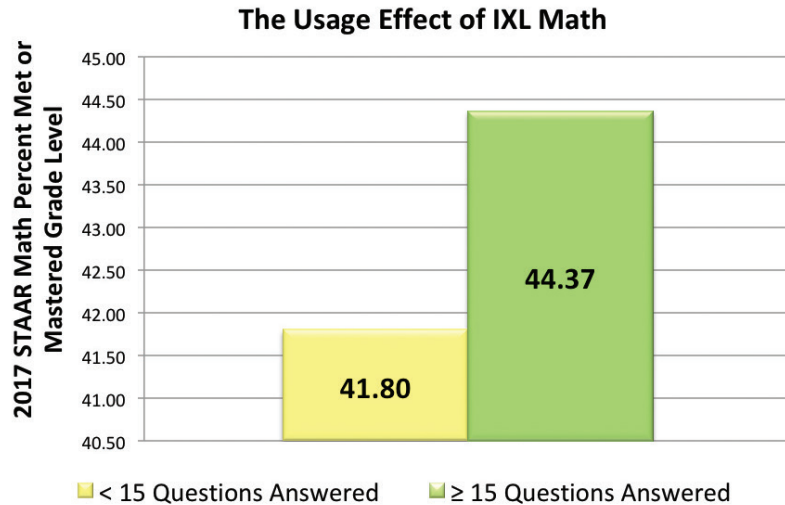


Figure 10. The Usage Effect of IXL Math - 15 Questions Answered

As shown in Figure 11, for IXL schools that used IXL Math, if every student achieved a SmartScore of 70 or above on one additional IXL Math skill every week, the school could expect 5.09 percent more students to meet or master grade level on the 2017 STAAR math tests. If every student mastered one additional IXL Math skill every week, the school could expect 7.40 percent more students to meet or master grade level on the 2017 STAAR math tests.

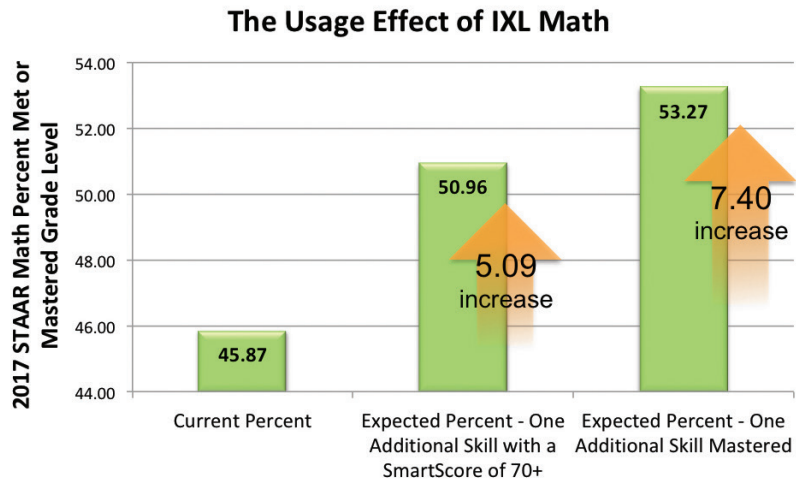


Figure 11. The Usage Effect of IXL Math

The Usage Effect of IXL ELA

For IXL schools that used IXL ELA for at least one school year from 2014 to 2017, our analyses also found a positive and statistically significant association between IXL ELA usage and schools' performance on the 2017 STAAR reading tests (see Appendix D, Table D5 for details).

Figure 12 shows the adjusted percentage of students that met or mastered grade level for IXL schools with different amounts of usage on IXL Math. IXL schools with at least 15 ELA questions answered per student per week had 3.74 percent more students meet or master grade level on the 2017 STAAR reading tests.

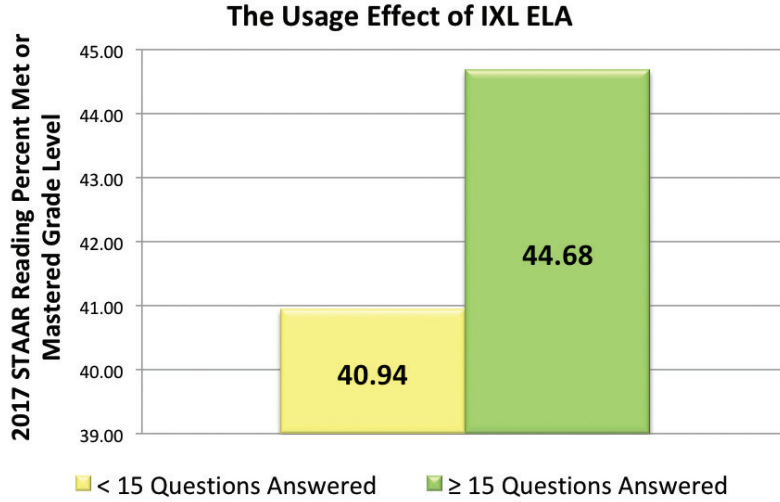


Figure 12. The Usage Effect of IXL ELA - 15 Questions Answered

As shown in Figure 13, for IXL schools that used IXL ELA, if every student achieved a SmartScore of 70 or above on one additional IXL ELA skill every week, the school could expect 8.48 percent more students to meet or master grade level on the 2017 STAAR reading tests. If every student mastered one additional IXL ELA skill every week, the school could expect 12.86 percent more students to meet or master grade level on the 2017 STAAR reading tests.

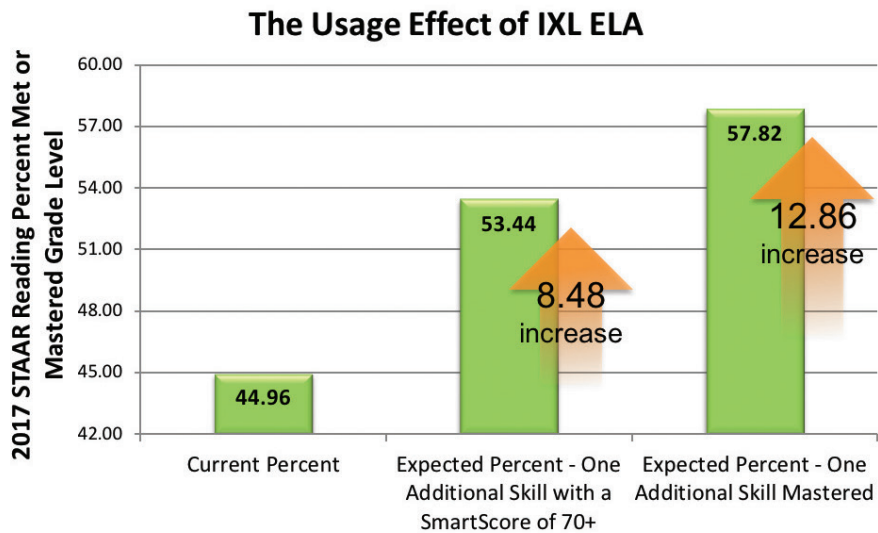


Figure 13. The Usage Effect of IXL ELA

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 whether a school is an IXL school based only on the number of students using 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 level⁵ 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.

During 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 70 percent of the enrolled students at this grade level have practiced on IXL within the school year.

During 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.

For example, suppose that a K-6 school had an active IXL account within the 2015-16 school year and over 70 percent of students in grades K-4 had practiced on IXL, while less than 70 percent 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 in Texas and for IXL schools. IXL schools performed slightly better than the state average on the STAAR math and reading tests in 2014 and 2017. IXL schools had fewer schools located in cities and suburbs compared to the state average.

Table B1. Background Information for Texas and IXL Schools

	State average	IXL schools	
		IXL Math	IXL ELA
Number of schools	6,516	365	206
Number of grade level cohorts	17,717	734	361
2014 STAAR math percent proficient	74%	75%	-
2017 STAAR math percent proficient	44%	46%	-
2014 STAAR reading percent proficient	77%	-	78%
2017 STAAR reading percent proficient	43%	-	45%
% of economically disadvantaged students	59%	59%	60%
% of students with limited English proficiency	19%	19%	16%
% of students in special education	9%	8%	9%
% of schools in cities	38%	30%	28%
% of schools in suburbs	25%	20%	17%
% of schools in towns	13%	15%	13%
% of schools in rural areas	24%	35%	42%

Appendix C: Analytical Methods

A three-level linear model was used to calculate the IXL effect on STAAR performance (i.e., the performance difference between IXL schools and non-IXL schools on the 2017 STAAR), after adjusting for schools' prior academic performance (i.e., 2014 STAAR percent met or mastered grade level), cohort size (i.e., the number of enrolled students in the grade level cohort), percentage of students with limited English proficiency, percentage of students served by special education, and school location (i.e., city, suburb, town, or rural as defined by the Institute of Education Science). The units of analysis of 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 low-income grade level cohorts only (i.e., cohorts with at least 59 percent economically disadvantaged students) and low-performing grade level cohorts only (i.e., cohorts that performed below the state average on the 2014 STAAR program) to calculate the IXL effect on these two types of schools separately. 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).

A different set of three-level linear models was used to calculate the IXL effect on accountability ratings (i.e., the difference between IXL schools and non-IXL schools on the 2017 performance indices 1, 2, 3, and 4), after adjusting for schools' prior index value (i.e., 2014 index value), school size (i.e., the number of enrolled students at the school), percentage of students with limited English proficiency, percentage of students served by special education, and school location. The units of analysis of this three-level model are schools (i.e., level 1). Schools are nested within districts (i.e., level 2), which are further nested within regions (i.e., level 3). We also reported statistical significance, effect size, and percentile gain to assist in the interpretation.

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). These models were very similar to the first model described in this appendix, but these models included the IXL usage group (i.e., fewer than or at least 15 questions answered) 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 every week and the average number of skills each student mastered (i.e., achieved a SmartScore of 100) every week.

Appendix D:
Data Tables

Table D1. The Effect of IXL Math on the 2017 STAAR Math (Grades 3-8)

Values	All schools			Low-income schools	Low-performing schools
	1-year	2-year	3-year		
Number of grade level cohorts at IXL schools	404	251	79	416	354
Number of grade level cohorts at non-IXL schools	15,878			9,778	7,771
The IXL effect	1.13	2.46*	5.23**	1.62*	2.37*
Effect size	0.06	0.13	0.28	0.10	0.17
Percentile gain	2%	5%	11%	4%	7%
Adjusted 2017 STAAR math percent met or mastered grade level for IXL schools	41.82%	43.15%	45.92%	36.59%	35.87%
Adjusted percent of students who showed typical or high growth at schools that adopted IXL	40.69%			34.97%	33.50%

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

Table D2. The Effect of IXL ELA on the 2017 STAAR Reading (Grades 3-8)

Values	All schools			Low-income schools	Low-performing schools
	1-year	2-year	3-year		
Number of grade level cohorts at IXL schools	270	75	16	207	154
Number of grade level cohorts at non-IXL schools	16,823			10,268	8,091
The IXL effect	0.10	3.76**	7.26**	2.10*	1.99
Effect size	0.01	0.22	0.43	0.17	0.18
Percentile gain	0%	9%	17%	7%	7%
Adjusted 2017 STAAR reading percent met or mastered grade level for IXL schools	39.84%	43.50%	47.00%	35.00%	33.64%
Adjusted 2017 STAAR reading percent met or mastered grade level for non-IXL schools	39.74%			32.90%	31.65%

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

Table D3. The Effect of IXL ELA on the 2017 STAAR Writing (Grades 4 and 7)

Values	All schools		Low-income schools	Low-performing schools
	1-year	2- or 3-year		
Number of grade level cohorts at IXL schools	107	142	85	74
Number of grade level cohorts at non-IXL schools	5,623		3,438	2,683
The IXL effect	2.71*	3.46	3.97*	2.62*
Effect size	0.17	0.21	0.31	0.26
Percentile gain	7%	8%	12%	10%
Adjusted 2017 STAAR writing percent met or mastered grade level for IXL schools	33.80%	34.55%	28.73%	25.75%
Adjusted 2017 STAAR writing percent met or mastered grade level for non-IXL schools	31.09%		24.76%	23.13%

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

Table D4. The Effect of IXL on the 2017 Accountability Ratings (Grades 3-8)

Values	Index 1		Index 2		Index 3		Index 4	
	1S	2S	1S	2S	1S	2S	1S	2S
Number of IXL schools	148	40	130	32	146	39	146	40
Number of non-IXL schools	5,355		4,936		5,329		5,322	
The IXL effect	0.45	2.64*	0.60	1.32	0.45	2.42*	1.38	3.57*
Effect size	0.04	0.22	0.08	0.17	0.05	0.25	0.08	0.20
Percentile gain	1%	9%	3%	7%	2%	10%	3%	8%
Adjusted 2017 index value for IXL schools	74.16	76.35	42.69	43.41	41.64	43.61	44.16	46.35
Adjusted 2017 index value for non-IXL schools	73.71		42.09		41.19		42.78	

Note: 1) 1S: 1-subject; 2S: 2-subject. 2) *: significant at .05 level

Table D5. The Usage Effect of IXL Math and ELA

Values	IXL schools - IXL Math	IXL schools - IXL ELA
Number of grade level cohorts with at least 15 questions answered per student per week	581	228
Number of grade level cohorts with fewer than 15 questions answered per student per week	184	166
Usage effect	2.57*	3.74**
Effect size	0.13	0.22
Adjusted 2017 STAAR percent met or mastered grade level for IXL schools with at least 15 questions answered per student per week	44.37%	44.68%
Adjusted 2017 STAAR percent met or mastered grade level for IXL schools with fewer than 15 questions answered per student per week	41.80%	40.94%

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