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

Introduction

Our researchers know that IXL can have significant impact at an individual school or district (Empirical Education, 2013). In this particular study, we explore IXL usage across an entire state. Including a wider collection of schools allows us to measure whether IXL schools perform better than non-IXL schools, as well as understand how usage of IXL can improve students' proficiency on state exams.

Abstract

This study investigated thousands of public schools in the state of California that used IXL mathematics and English language arts (ELA) between 2012 and 2015. We examined the impact of IXL Math and IXL ELA as measured by the California Assessment of Student Performance and Progress (CAASPP). Analysis required that schools have both pretest and posttest scores, so only schools with valid 2013 Academic Performance Index (API) and 2015 CAASPP test scores were included. 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. Our researchers found, even with the wide range in usage, strong positive correlation between IXL usage and schools' performance on the CAASPP in both math and ELA. These findings are statistically significant.

Key Findings

IXL schools performed better than non-IXL schools in both math and ELA.
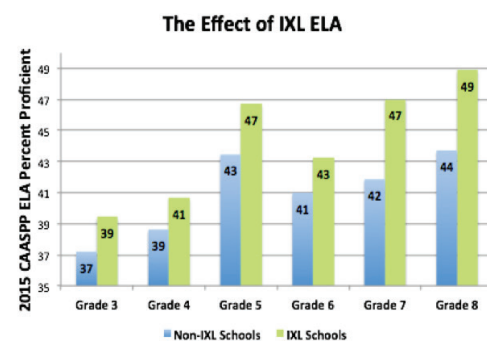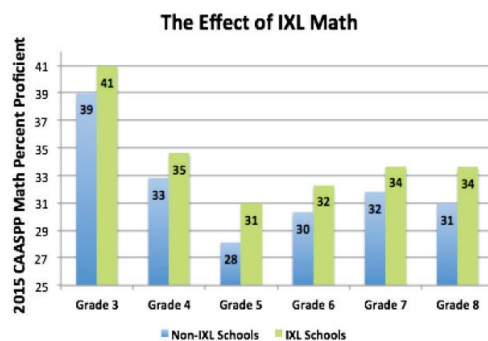
Mastery matters. One additional skill mastered per student, per week, results in a nearly 10-point increase on a school's percent proficiency on the CAASPP.
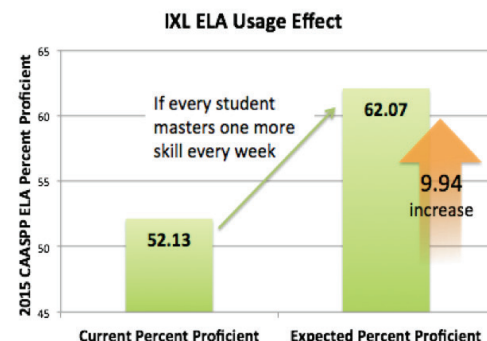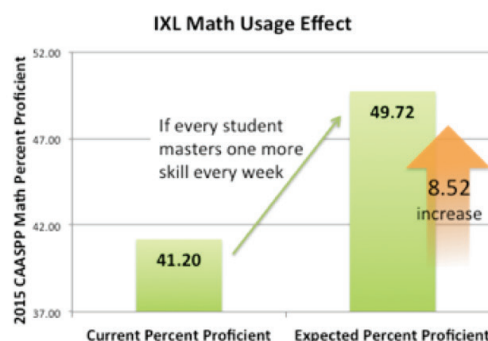
Study Design

Our researchers wanted to determine the effect of using IXL on student achievement at school level, as measured by 1) the average score on state standardized assessments, and 2) 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 adopted a 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 adjusting for their performance on the pretest. The treatment group included schools that started using IXL in the 2013–14 or 2014–15 school years. The control group consisted of schools that did not use IXL in the 2012–13, 2013–14, or 2014–15 school years.
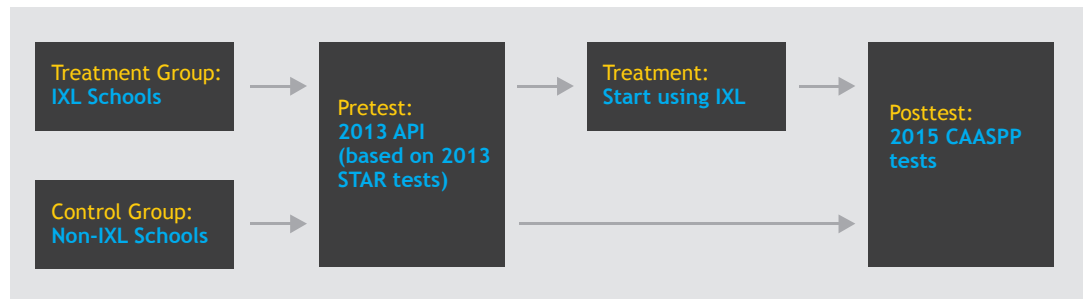
The 2013 Academic Performance Index (API), calculated based on the 2013 Standardized Testing and Reporting (STAR) test, was used as the pretest to provide a performance baseline for all schools. STAR was the California state standardized test for elementary and middle school students from 1998 to 2013. The API is a single number, ranging from 200 to 1000, which reflects a school's academic performance level.

CAASPP replaced STAR in Spring 2015 and was used as the posttest for this study. It includes a number of assessments. This study only looked at school performance on the Smarter Balanced Summative Assessments, which evaluate student progress on the California standards in math and ELA, often referred to as the Common Core. The CAASPP tests for math and ELA were given to students in grades 3 through 8 and grade 11.

Methods

The study analyzed pretest and posttest results for 10,966 public schools (including both traditional public schools and charter schools) in California with valid 2013 API and 2015 CAASPP test results. A total of 1,663 California public schools used IXL Math and/or IXL ELA between 2012 and 2015. As the number of students who practiced on IXL within a school ranged from one single classroom to the entire school, this study counted a school as an "IXL school" if the school had an active IXL account for at least half of a school year and at least half of its students practiced on IXL (See Appendix A for details on school selection and classification). As a result, the analysis included 461 schools using IXL Math and 172 schools using IXL ELA. IXL schools were comparable to non-IXL schools in percentage of English Language Learners (ELL), percentage of students qualifying for free/reduced lunch, and other key demographics (See Appendix C, Table 1 for details).

Our researchers obtained school performance data from the California Department of Education and Institute of Education Science. They then used a linear regression model to calculate IXL effect—i.e., the performance difference between IXL schools and non-IXL schools on the 2015 CAASPP, controlling for factors such as prior performance, school size, and location. To further examine the impact of IXL, our researchers evaluated IXL usage data for IXL schools, including the number of students who practiced on IXL and the number of skills that they mastered during the 2013–14 and 2014-15 school years. They applied another linear regression model to determine how different levels of IXL usage impact achievement results. (See Appendix B for an explanation of the analytical methods.)

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

- Is the IXL effect statistically significant? In other words, is there a low probability that the IXL effect was achieved by chance?

- What is the percentile gain? That is, what change in percentile rank would have been expected for an average non-IXL school if they had used IXL?

- What is the association between IXL usage and school performance? That is, if an average IXL school had increased usage, how much improvement would be expected?

Results

Analysis of the data showed that both IXL Math and IXL ELA produced positive and statistically significant effects on student performance, indicating there is a high probability that similar schools using IXL would achieve similar results. Measurable percentile gains were also achieved by schools using IXL Math or IXL ELA. The results of the analysis also showed a positive correlation between IXL usage and school performance. In particular, one additional skill mastered per student, per week, would result in a nearly 10-point increase on a school's percent proficiency on the 2015 CAASPP.

The Efficacy of IXL ELA

The use of IXL ELA showed a statistically significant effect on the percent of students scoring "proficient" or higher on the 2015 CAASPP ELA tests at Grade 3, 4, 5, 7, and 8. We also found statistically a significant effect on the average scale scores of the 2015 CAASPP ELA tests at Grade 3, 5, and 8. (See Appendix C for details.)

After adjusting for schools' prior performance and characteristics, the mean percent proficient was 40.43 for non-IXL schools and 42.65 for IXL schools. The 2.22 point difference in percent proficient corresponds to a percentile gain of 4.49 points in school rankings. That is, if an average non-IXL school (at the 50th percentile) had used IXL ELA, this school's percent proficient would be expected to increase by 2.22 points, putting them at the 54.49 percentile.
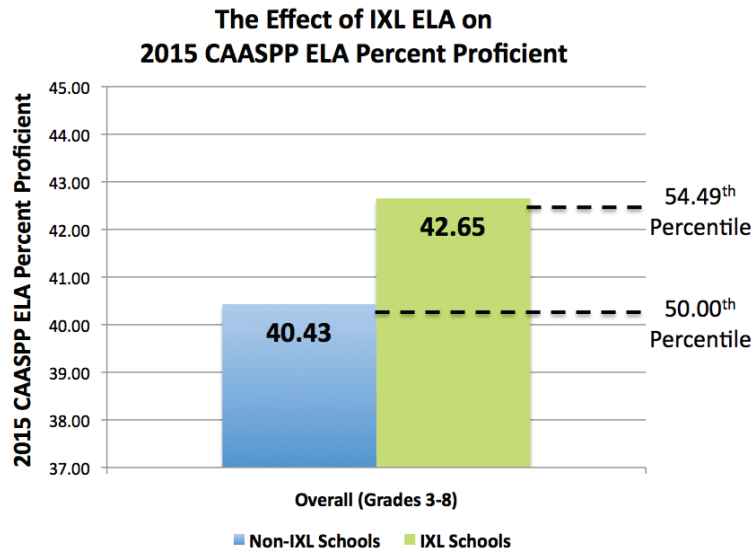

Figure 2. Overall Effect of IXL ELA

Figure 3 shows the association between the usage of IXL ELA and 2015 CAASPP ELA test performance. In this study, the usage of IXL ELA is measured by the averaged number of ELA skills mastered by each student every week. The analysis suggested that, for IXL schools, if every student mastered just one more IXL ELA skill each week, the school could expect to see a 9.94 point increase on the percent proficient on the 2015 CAASPP ELA tests. Although the effect was not statistically significant, the results still suggested a positive relationship between IXL usage and school performance.
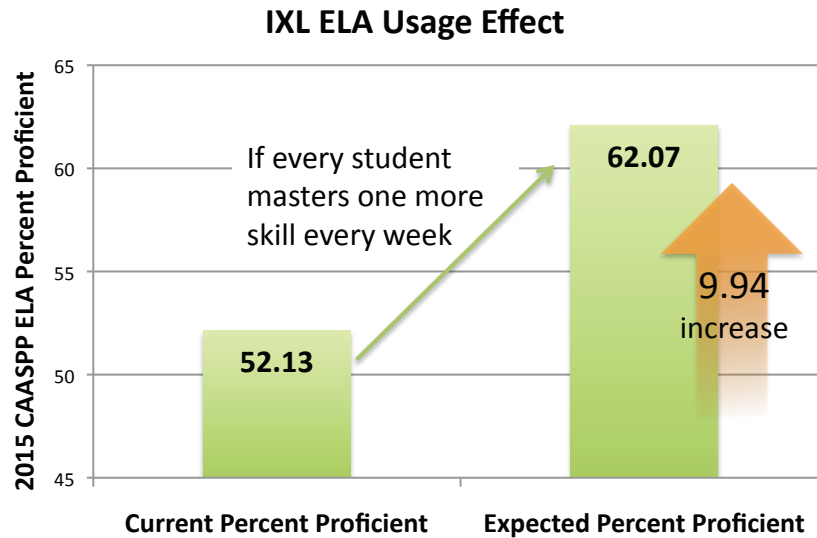
IXL ELA Usage Effect

Figure 3. IXL ELA usage effect on 2015 CAASPP ELA Percent Proficient

The Efficacy of IXL Math

The use of IXL Math showed a statistically significant effect on the percent proficient of the 2015 CAASPP math test at Grade 3, 4, 5, 6, and 8. The effect was also statistically significant on the 2015 CAASPP average math scale scores at Grade 3, 4, 5, and 8. (See Appendix C for details.)

After adjusting for schools' prior performance and characteristics, the mean percent proficient was 33.18 for non-IXL schools and 35.31 for IXL schools. The 2.13 point difference corresponds to a 4.22 point percentile gain. That is, if an average non-IXL school (at the 50th percentile) had used IXL Math, this school's percent proficient would be expected to increase by 2.13 points, putting them at the 54.22 percentile.

The Effect of IXL Math on 2015 CAASPP Math Percent Proficient
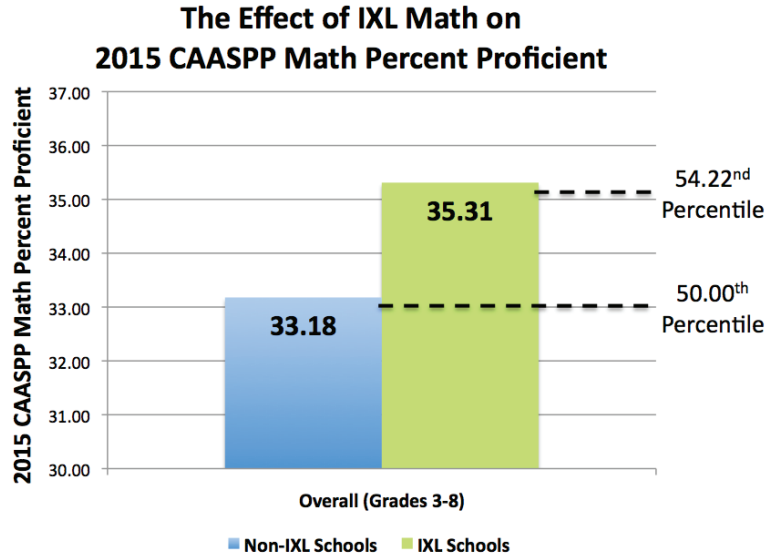
Figure 4. Overall Effect of IXL Math

Figure 4 shows the association between the usage of IXL Math and 2015 CAASPP math performance. In this study, the usage of IXL Math is measured by the averaged number of math skills mastered by each student every week. The analysis suggested that, for IXL schools, if every student mastered one more IXL Math skill each week, the school could expect to see a 8.52 point increase on the percent proficient on the 2015 CAASPP math test. The 8.52 point difference is statistically significant.

IXL Math Usage Effect
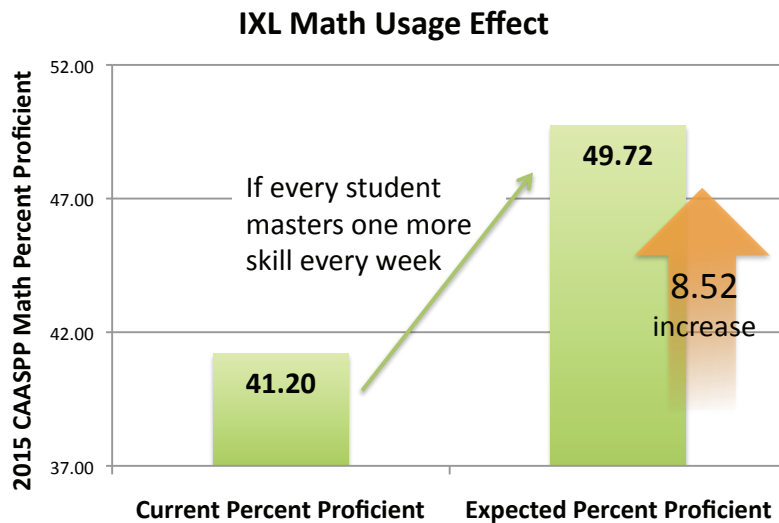
Figure 5. IXL Math usage effect on 2015 CAASPP Math Percent Proficient

Conclusions

IXL Math and IXL ELA produced measurable benefits for schools at all grade levels tested. The effects at most grade levels were statistically significant. And the results appear to be "dose dependent"; that is, the more students use IXL, the greater the benefit seen.

These results indicate IXL is a highly effective program for schools seeking to raise student achievement in math and ELA.

The Effect of IXL Math

The Effect of IXL ELA

Figure 6. Effect of IXL ELA and IXL Math on 2015 CAASPP tests

Reference

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

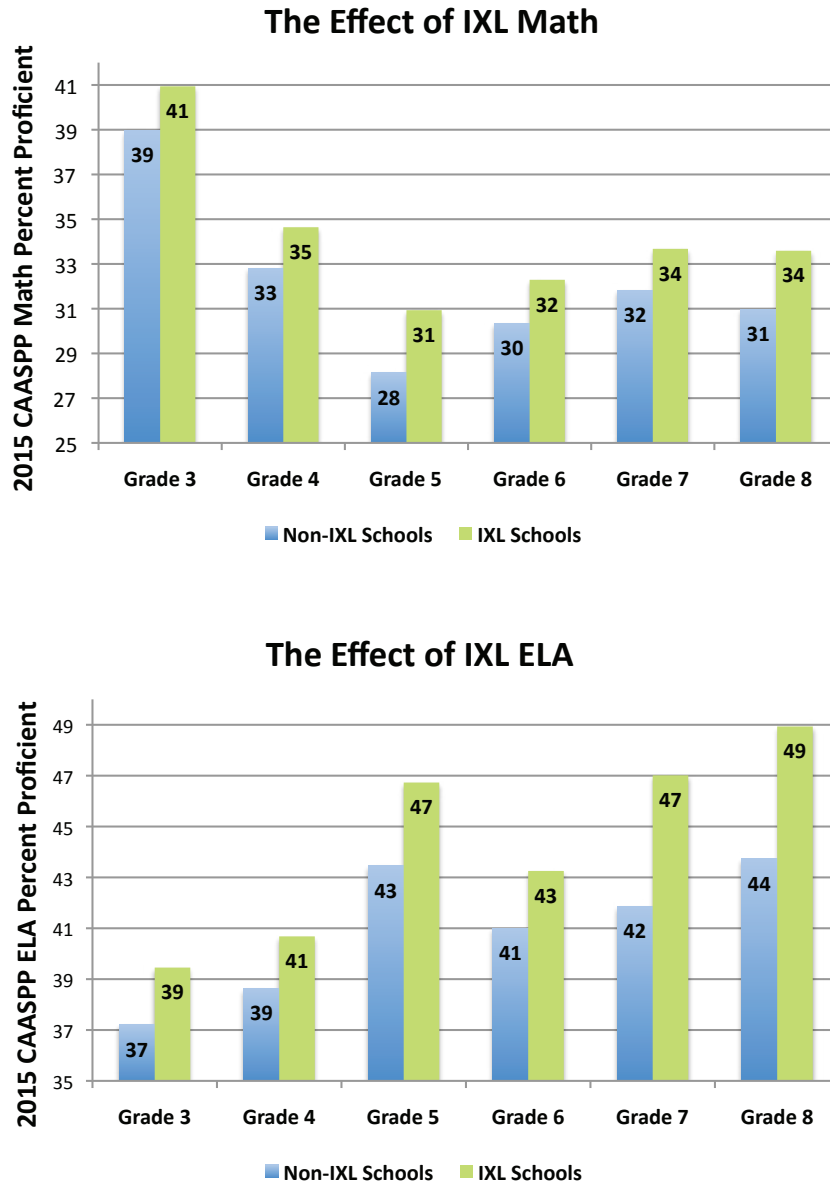What Works Clearinghouse (2014). What Works Clearinghouse procedures and standards handbook (Version 3.0). Retrieved from http://ies.ed.gov/ncee/wwc/pdf/reference_resources/wwc_procedures_v3_0_standards_handbook.pdf

Appendix A: School Selection and Classification

Because schools may choose to use IXL only at a few grade levels, this study determined if a school is an IXL school at each grade level rather than at school level. For example, if a K-6 school only uses IXL in 5th grade, this school will be classified as an IXL school at grade 5 and a non-IXL school at other grade levels.

For a certain grade level, a school is classified as an IXL school if the school 1) did not use IXL within the 2012–13 school year, and 2) used IXL within the 2013-14 school year and/or within the 2014-15 school year. For a certain grade level, a school is classified as a non-IXL school if the school did not use IXL within the 2012–13, 2013–14, or 2014-15 school years. These classification criteria guaranteed that: 1) both IXL schools and non-IXL schools did not use IXL before the pretest, and 2) only IXL schools used IXL between the pretest and the posttest. In this way, the effect of IXL can be accurately estimated.

During the classification, we needed to determine if a school used IXL within a certain school year. In this study, a school is considered to be using IXL within a school year if 1) the school has an active IXL account for at least half of the time within this school year (i.e., at least 150 days including weekends and holidays), and 2) at least 50% of the enrolled students at this grade level used IXL within this school year. Schools that did not meet both of the two criteria were considered as not using IXL within that school year.

Appendix B: Analytical Methods

A linear regression model was used to estimate IXL effect (i.e., the performance difference between IXL schools and non-IXL schools), after adjusting for schools' prior academic performance (i.e., 2013 API), school size (i.e., the number of enrolled students), percentage of English language learners, charter school or not, and school location (i.e., city, suburb, town, or rural). To assist in the interpretation of 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 (i.e., less than 0.05) indicates strong evidence that the IXL effect is not zero. Effect size is the mean difference in standard deviation units and is known as Hedges' *g*. In this study, effect size is computed using adjusted mean and unadjusted standard deviations. Percentile gain is the expected change in percentile rank for an average non-IXL school if the school had used IXL. It is calculated based on the effect size. More details about these analytical methods can be found in What Works Clearinghouse (2014).

We also used a linear regression model to estimate the strength of association between IXL usage and school performance. This regression model was very similar to the one described above, but with the inclusion of the IXL usage (i.e., the averaged number of skills a student mastered per week) in the model and exclusion of non-IXL schools in the sample.

Appendix C: Data Tables

Table 1 presents the background information for all public schools in California and for IXL schools. A total of 172 and 461 schools were identified as IXL schools for IXL ELA and IXL Math, respectively. Based on 2013 API and 2015 CAASPP percent proficient, IXL schools showed higher academic performance than the state average. Percentage of English language learners, school location, and percentage of charter schools were comparable between IXL schools and the state average.

Table 1. Background information for state and IXL schools

	State	IXL Schools IXL ELA	IXL Schools IXL Math
# of schools	10,966	172	461
Average 2013 API	790	839	828
2015 CAASPP ELA percent proficient	42%	52%	–
2015 CAASPP Math percent proficient	33%	–	41%
% of English language learners	22%	21%	23%
% of free/reduced price meal	59%	48%	53%
% of schools in cities	39%	33%	36%
% of schools in suburbs	40%	42%	43%
% of schools in towns	9%	11%	9%
% of schools in rural areas	12%	13%	11%
% of charter schools	14%	15%	14%

Table 2 breaks down the effect of IXL ELA for each grade level. The second and third rows of Table 2 show the number of IXL schools and non-IXL schools, respectively. Because IXL did not launch middle school skills for ELA until 2014, fewer schools were identified as IXL schools at the middle school level (e.g., Grades 6, 7, and 8).

In Table 2, the fourth to eighth rows show the effect of IXL ELA on schools' percent proficient on the 2015 CAASPP ELA tests. For Grade 3, for instance, after adjusting for schools' prior performance and characteristics, an average IXL school had 39% of students at the Proficient level or above on the 2015 CAASPP ELA test, while an average non-IXL school had 37% of students at the Proficient level or above. The effect of using IXL ELA on the 2015 CAASPP ELA test percent proficient is 2.25 for Grade 3, and the effect is statistically significant at 0.05 level. The effect size of the 2.25 difference is 0.10 and the percentile gain is 4.14. Similar interpretations can be made for other grade levels.

The last five rows of Table 2 show the effect of IXL ELA on the 2015 CAASPP average ELA scale scores. For Grade 3, for instance, after adjusting for schools' prior performance and characteristics, the average ELA score was 2407 for IXL schools and 2403 for non-IXL schools. The effect of using IXL ELA at Grade 3 is 4.44, and it is statistically significant at 0.05 level. The effect size of the 4.44 difference is 0.05 and the percentile gain is 2.10. Similar interpretations can also be made for other grade levels.

Table 2. Effect of IXL ELA at each grade level on 2015 CAASPP ELA tests

Values		Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
# of IXL Schools		106	112	105	55	22	21
# of Non-IXL Schools		5081	5087	5067	3600	2271	2266
2015 CAASPP ELA Percent Proficient	IXL Effect	2.25*	2.06*	3.28***	2.27	5.16*	5.21*
	Effect Size	0.10	0.10	0.16	0.11	0.26	0.26
	Percentile Gain	4.14	3.97	6.35	4.56	10.13	10.40
	IXL Schools	39.45	40.68	46.73	43.25	47.01	48.93
	Non-IXL Schools	37.20	38.62	43.45	40.98	41.85	43.72
2015 CAASPP ELA Average Score	IXL Effect	4.44*	3.02	4.27*	3.44	7.99	13.04**
	Effect Size	0.05	0.07	0.09	0.08	0.18	0.30
	Percentile Gain	2.10	2.65	3.73	3.26	7.03	11.62
	IXL Schools	2407.05	2447.19	2488.81	2512.27	2536.61	2563.04
	Non-IXL Schools	2402.61	2444.17	2484.54	2508.82	2528.63	2550.00

*Note: *: significant at .05 level. **: significant at .01 level. ***: significant at .001 level.*

Table 3 breaks down the effect of IXL Math at each grade level. The second and third rows of Table 3 show the number of IXL schools and non-IXL schools, respectively. The five rows in the middle show the effect of IXL Math on the 2015 CAASPP Math test percent proficient. The last five rows show the effect on the 2015 CAASPP average math scale scores.

Table 3. Effect of IXL Math at each grade level on 2015 CAASPP math tests

Values		Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
# of IXL Schools		271	283	269	191	109	91
# of Non-IXL Schools		4697	4598	4602	3345	2036	2079
2015 CAASPP Math Percent Proficient	IXL Effect	1.97**	1.83**	2.80***	1.96*	1.87	2.61*
	Effect Size	0.09	0.09	0.14	0.10	0.09	0.13
	Percentile Gain	3.74	3.47	5.49	4.03	3.76	5.14
	IXL Schools	40.94	34.64	30.93	32.29	33.67	33.59
	Non-IXL Schools	38.97	32.82	28.13	30.33	31.81	30.98
2015 CAASPP Math Average Score	IXL Effect	3.38*	2.69*	4.41**	1.18	4.06	6.72*
	Effect Size	0.09	0.07	0.10	0.02	0.08	0.12
	Percentile Gain	3.45	2.61	3.85	0.98	3.14	4.70
	IXL Schools	2416.50	2453.32	2480.39	2500.63	2518.48	2535.58
	Non-IXL Schools	2413.12	2450.63	2475.98	2499.45	2514.42	2528.86

Note: *: significant at .05 level. **: significant at .01 level. ***: significant at .001 level.