



RESEARCH REPORT

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The Impact of IXL on Math and ELA Learning in Pennsylvania

Christina Schonberg, Ph.D.

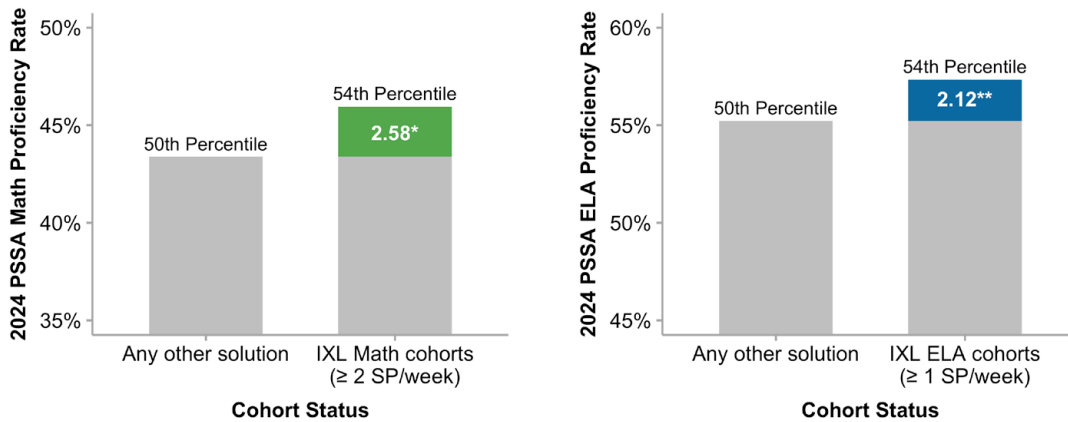
IXL LEARNING 777 Mariners Island Blvd., Suite 600, San Mateo, CA 94404
650-372-4040 | www.ixl.com

Executive Summary

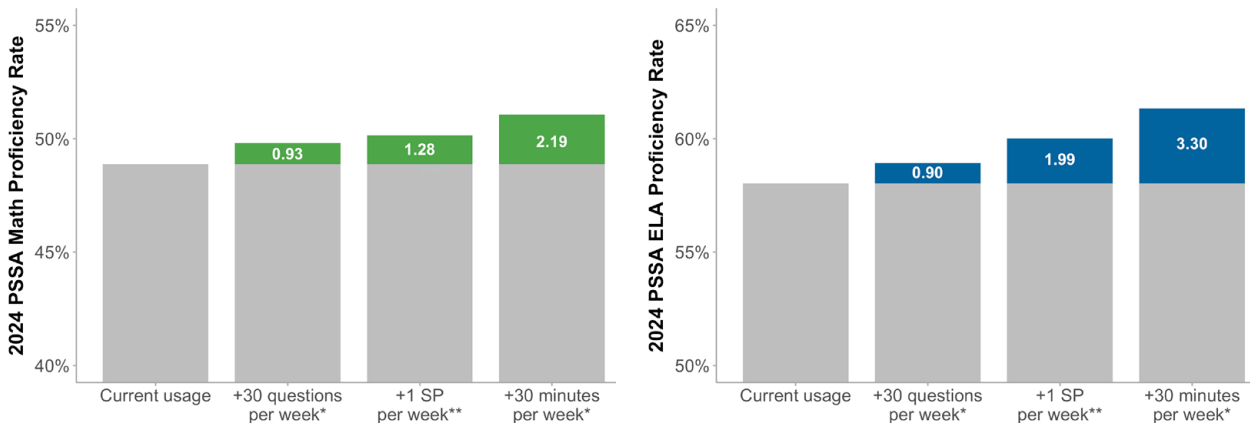
IXL is an end-to-end teaching and learning solution that engages learners in Pre-K through 12th grade with a comprehensive curriculum, first-of-its-kind assessment suite, and personalized recommendations for meeting learning goals. Previous research, including a randomized controlled trial (Copeland et al., 2023), has shown that IXL can have a significant positive impact on students' academic performance (Bashkov, 2021; Empirical Education, 2013).

The goal of this study was to examine IXL usage among students in Pennsylvania and its impact on math and English language arts (ELA) achievement, as measured by the Pennsylvania System of School Assessment (PSSA). Using a pretest-posttest design, we found¹:

- IXL implementation improves student achievement.** Grade cohorts that used IXL performed better on the PSSA than grade cohorts that used any other solution. Specifically, the proficiency rate² was about 2.6 percentage points higher for IXL Math cohorts and about 2.1 percentage points higher for IXL ELA cohorts, relative to cohorts that used any other solution.



- Higher levels of IXL usage are related to larger achievement gains.** Students performed better on the PSSA in both math and ELA when they answered more questions, reached proficiency in more skills (SP)³, and/or spent more time on IXL.



¹ In all figures, * indicates statistical significance at the $p < .05$ level, and ** indicates $p < .01$.

² Proficiency rate: percentage of students in a cohort classified as "proficient" or "advanced" on the PSSA.

³ Skill proficiency on IXL is indicated by a SmartScore of 80+.

The Impact of IXL on Math and ELA Learning in Pennsylvania

Background

IXL is an end-to-end teaching and learning solution that engages learners in Pre-K through 12th grade with a comprehensive curriculum, first-of-its-kind assessment suite, and personalized recommendations for meeting learning goals. It includes five core subject areas: mathematics, English language arts (ELA), science, social studies, and Spanish. As of this writing, IXL is used by 1 in 3 students in Pennsylvania and by more than 15 million students across the U.S. IXL is grounded in learning sciences research (see Bashkov et al., 2021) and engages each student with a personalized learning experience tailored to their working level. This ensures that students tackle problems that are neither too easy nor too difficult, which in turn supports their self-efficacy and motivation for continued learning (An & Schonberg, 2024).

[Prior research](#), including an independent randomized controlled trial (Copeland et al., 2023), has consistently demonstrated significant positive effects of IXL on student learning. Studies on more than 77,000 schools across all 50 states show that IXL schools perform better on state assessments than comparable schools using any other solution.

Study Purpose

The goal of the present study was to examine the efficacy of IXL across public schools in Pennsylvania. Specifically, we investigated the efficacy of IXL by comparing proficiency rates on the Pennsylvania System of School Assessment (PSSA) in math and ELA among grade cohorts that used IXL to the proficiency rates of cohorts that did not use IXL but likely used a combination of other products. Additionally, we examined the cumulative effects of IXL usage by exploring the continuous relationship between cohorts' amount of IXL usage and their PSSA performance.

Study Design and Methodology

DATA SOURCES

Assessment Data

All assessment and demographic data were obtained from the Pennsylvania Department of Education and the National Center for Education Statistics. Math performance at pretest (Spring 2022) and posttest (Spring 2024) was measured using the PSSA, Pennsylvania's summative assessment. The PSSA is administered in elementary and middle school (3rd through 8th grade). The outcome measure was the percentage of students within a grade cohort reaching proficiency (i.e., classified as "proficient" or "advanced") on the PSSA in math and ELA. More information about the PSSA can be found on the Pennsylvania Department of Education [PSSA homepage](#).

IXL Usage Data

We obtained IXL usage data from IXL’s database. When students use IXL, they complete practice problems organized within “skills,” or specific topic areas within a subject. IXL uses a proprietary *SmartScore* to indicate a student’s proficiency within a skill. The SmartScore ranges from 0-100 and increases as students answer questions correctly. However, it is not a percent correct score; a SmartScore of 100 is always possible. A SmartScore of 80 indicates proficiency in a skill, and a SmartScore of 100 indicates mastery. IXL recommends that students should aim to reach proficiency in at least two on-grade-level skills per week (SP/week; An et al., 2022).

OVERALL EFFICACY

Study Design

In this study, we used a quasi-experimental pretest-posttest control group design to compare the proficiency rates of grade-level cohorts that used IXL during the 2022-23 and 2023-24 school years to the proficiency rates of cohorts that did not use IXL (but likely used other education technology products); see Figure 1.

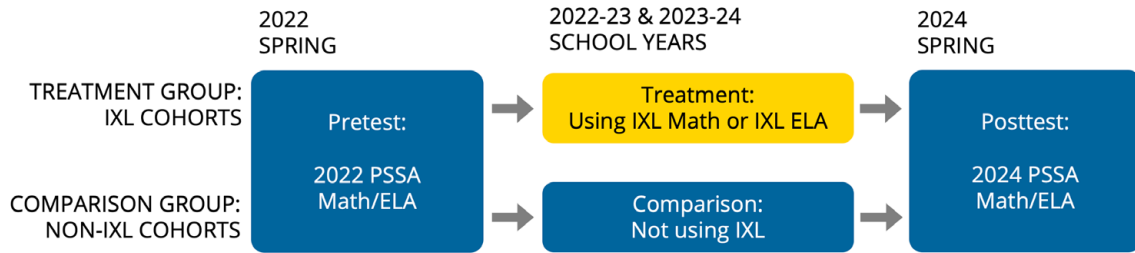


Figure 1. Study design

Participants

We defined IXL cohorts based on student IXL usage rates—specifically, the number of skills in which students reached proficiency, or “skills proficient,” per week (SP/week). IXL Math cohorts were those in which students, on average, met IXL’s high-fidelity usage criterion of 2 SP/week during the study period (i.e., the 2022-23 and 2023-24 school years). Because usage in ELA was lower than math, we maximized sample size by choosing a slightly lower criterion for defining ELA cohorts: IXL ELA cohorts were defined as those in which students met the moderate-fidelity usage criterion of 1 SP/week. We defined comparison cohorts as those in which students did not use IXL at all during the study period but likely used a combination of other edtech products. Using these criteria, we obtained a sample of 4,005 study cohorts for math (treatment $n = 119$, comparison $n = 3,886$) and 4,217 study cohorts for ELA (treatment $n = 223$, comparison $n = 3,994$). Descriptive statistics of treatment cohorts’ IXL usage during the study period can be found in Table 1, and demographic information for all cohorts can be found in Appendix A.

Table 1. IXL Math and IXL ELA Usage During the Study Period

Weekly IXL usage	IXL Math (<i>n</i> = 119)				IXL ELA (<i>n</i> = 223)			
	<i>M</i>	<i>SD</i>	Min	Max	<i>M</i>	<i>SD</i>	Min	Max
Questions answered	84.64	28.95	54.40	228.20	63.30	25.79	27.51	211.22
Time spent (in minutes)	32.86	14.10	14.04	90.84	21.18	10.88	6.74	94.90
Skills proficient	2.66	0.88	2.00	8.18	1.52	0.65	1.00	7.05

Analysis

For each subject separately, we specified and tested a multilevel model to account for clustering at the school and district levels (i.e., grade cohorts within a school tend to be more similar to each other than grade cohorts in other schools; similarly, schools within a district tend to be more similar to each other than schools in other districts). In this model, we regressed 2024 PSSA grade-level proficiency rate on IXL cohort status (treatment or comparison) and covariates (baseline performance, grade level, percentage of White students, percentage of male students, percentage of English language learners (ELLs), percentage of economically disadvantaged students, school size, student-teacher ratio, school Title I status, and school location).

Following What Works Clearinghouse guidelines (WWC, 2022), each effect is accompanied by a test of statistical significance (i.e., a *p*-value) and a measure of practical significance (i.e., effect size). The *p*-value is the probability of observing the current or more extreme data, assuming the effect is zero (Cohen, 1994). The smaller the *p*-value, the less likely it is that the result occurred at random; *p*-values less than .05 are considered statistically significant. Effect size is reported using Hedges' *g* and indicates the difference between treatment and control groups on an outcome measure in standard deviation units. For broad-scope educational assessments, moderate effect sizes range from about 0.05–0.20, and effect sizes of about 0.20 or higher are considered large (Kraft, 2020; Lipsey et al., 2012). We also report percentile gain, which is the expected change in IXL cohorts' percentile rank relative to non-IXL cohorts at the 50th percentile. Percentile gain is based on the effect size. Given that these analyses are at the grade cohort level, the effect sizes should be interpreted at the grade cohort level as well.

USAGE EFFECTS

The goal of the second set of analyses was to investigate the relationship between increased IXL usage and PSSA performance. We specifically examined cohorts' average IXL usage as measured by three metrics: questions answered per week, SP/week, and time spent per week.

Participants

In these analyses, we included all grade-level cohorts with any amount of IXL usage during the study period. Prior to analysis, we identified cohorts that had IXL usage further than ± 3 *SD* from the mean on any usage metric as outliers and removed them from the sample (math outlier *n* = 36 cohorts, or 2.2% of the initial sample; ELA outlier *n* = 33 cohorts, or 2.2% of the initial sample). The final samples consisted of 1,601 grade-level cohorts for the math analysis and 1,495 grade-level cohorts for the ELA analysis.

Analysis

Because the three IXL usage indicators were highly intercorrelated within each subject (smallest $r = .87$), we specified and tested separate regression models using each indicator (questions answered correctly, skills proficient, and time spent). We used a multilevel model in each analysis to account for the clustering of grade cohorts within schools and of schools within districts. The outcome variable (2024 PSSA proficiency rate) and covariates were the same as those of the previous analyses. As there was no control or comparison group, Hedges' g is not applicable; however, we report a standardized regression coefficient for each analysis to gauge the practical significance of IXL usage relative to the effects of the covariates. As with the previous analyses, effects should be interpreted at the grade cohort level.

Results

OVERALL EFFICACY

Math

We found that grade cohorts that used IXL performed better on the 2024 PSSA in math than cohorts using any other solution. Specifically, the proficiency rate for cohorts using IXL Math at ≥ 2 SP/week was more than two percentage points higher than that of comparable cohorts not using IXL (Figure 2). The estimated treatment effect for IXL Math was positive and statistically significant ($b = 2.58$, $p = .016$; see Table B1 in Appendix B for full model results). The effect size (Hedges' g) was 0.11, which corresponds to a percentile gain of four points.

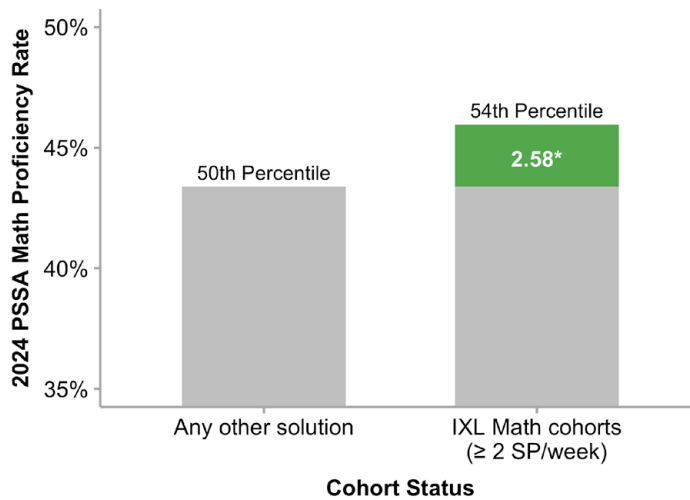


Figure 2. The efficacy of IXL Math

ELA

Similar to math, we found that grade cohorts that used IXL performed better on the 2024 PSSA in ELA than cohorts using any other solution. Specifically, the proficiency rate for cohorts using IXL ELA at ≥ 1 SP/week was more than two percentage points higher than that of comparable cohorts not using IXL (Figure 3). The estimated treatment effect for IXL ELA was positive and statistically significant ($b = 2.12, p = .008$; see Table B2 in Appendix B for full model results). The effect size (Hedges' g) was 0.10, which corresponds to a percentile gain of four points.

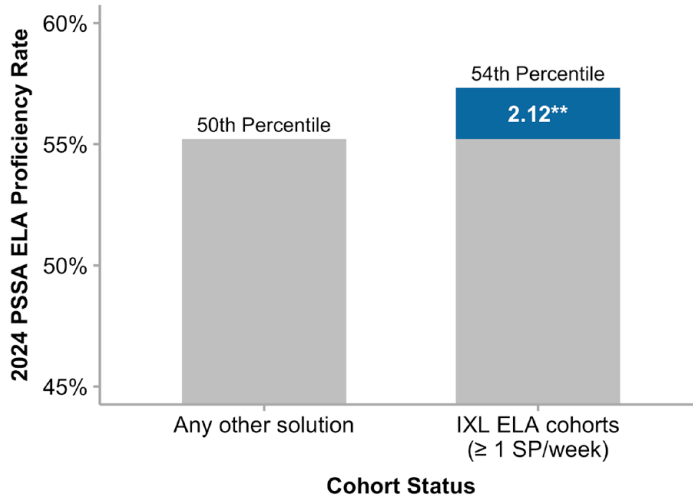


Figure 3. The efficacy of IXL ELA

USAGE EFFECTS

Math

Controlling for baseline performance and demographics, we found statistically significant positive effects of all IXL Math usage indicators on PSSA math proficiency rate. Specifically, a typical cohort's PSSA math proficiency rate is expected to increase by approximately one percentage point for every additional 30 questions students answer correctly on IXL each week ($\beta = 0.03, p = .012$), more than one percentage point for each additional skill students reach proficiency in each week ($\beta = 0.03, p = .002$), or more than two percentage points for each additional 30 minutes students spend using IXL Math each week ($\beta = 0.03, p = .014$; see Figure 4). Full model results are reported in Tables B3-B5 in Appendix B.

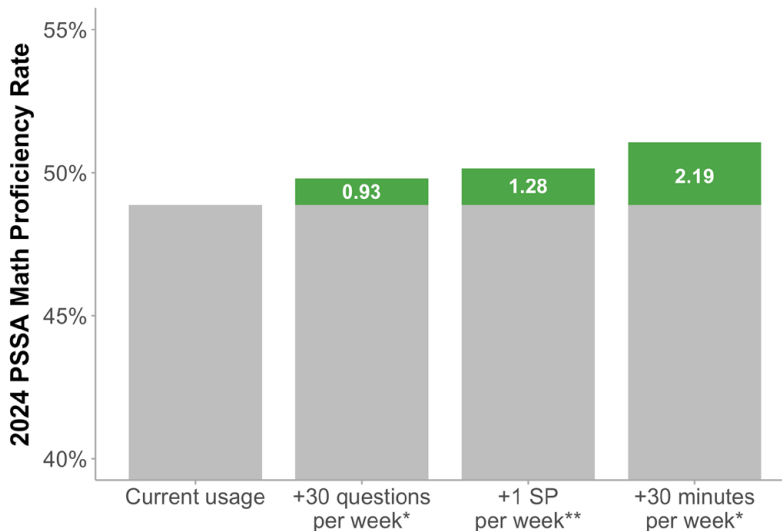


Figure 4. Predicted usage effects of IXL Math
 Note: SP/week = skills proficient per week

ELA

Similar to math, we found statistically significant positive effects of all IXL ELA usage indicators on PSSA ELA proficiency rate, controlling for baseline performance and demographics. Specifically, a typical cohort’s PSSA ELA proficiency rate is expected to increase by approximately one percentage point for every additional 30 questions students answer correctly on IXL each week ($\beta = 0.03$, $p = .023$), two percentage points for each additional skill students reach proficiency in each week ($\beta = 0.04$, $p = .002$), or more than three percentage points for each additional 30 minutes students spend using IXL ELA each week ($\beta = 0.03$, $p = .011$; see Figure 5). Full model results are reported in Tables B6-B8 in Appendix B.

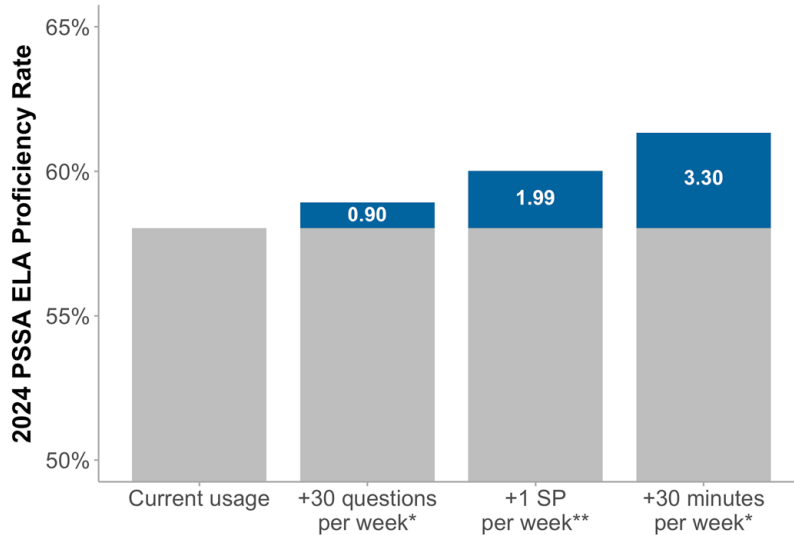


Figure 5. Predicted usage effects of IXL ELA
 Note: SP/week = skills proficient per week

Discussion and Recommendations

In this study, we investigated the impact of IXL on math and ELA achievement in public schools in Pennsylvania. Controlling for baseline performance and key demographic characteristics, we found that IXL Math and IXL ELA cohorts performed better on the PSSA in math and ELA, respectively, than cohorts using any other solution. Furthermore, we found that increased IXL usage was associated with larger achievement gains. These results add to the large body of work showing that IXL is a highly effective way to boost student learning (e.g., An, 2023a, 2024; Bashkov, 2021; Cao & Schonberg, 2024; Copeland et al., 2023; Hargis, 2023, 2024; IXL Learning, 2017; Liu, 2024; Xiong, 2022), corroborating findings that personalized learning can both help students close existing knowledge gaps and improve future learning outcomes (Kaffenberger, 2021).

In line with previous studies showing that interventions are more effective when they are carried out with high fidelity (see Finney et al., 2021; Noell et al., 2002), we found that cohorts using IXL Math with high fidelity (2 SP/week) outperformed cohorts using any other solution. We also found that cohorts using IXL ELA with moderate fidelity (1 SP/week) outperformed cohorts using any other solution. We anticipate that students using IXL ELA would experience even greater gains when IXL

ELA is implemented following IXL's high-fidelity usage recommendation (i.e., 2 SP/week; An et al., 2022). One way to increase implementation fidelity is through professional development programs. Prior research shows that IXL's professional development is especially effective in boosting teacher engagement and student learning (IXL Learning, 2020; An, 2023b).

In sum, these results show that IXL is a powerful learning platform that significantly boosts student growth. As an end-to-end teaching and learning solution, IXL provides personalized guidance and a first-of-its-kind assessment suite, identifying content areas where students may be struggling and engaging them with material at the appropriate level. By meeting students where they are, IXL can help students "catch up" by closing knowledge gaps with material they've missed or forgotten. With IXL's personalized support, students can confidently unlock their academic potential and fully prepare for every learning milestone along the way.

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Appendix A: Sample Achievement and Demographics

	Math		ELA	
	IXL Cohorts	Non-IXL Cohorts	IXL Cohorts	Non-IXL Cohorts
Pretest and posttest	<i>n</i> = 119	<i>n</i> = 3,886	<i>n</i> = 223	<i>n</i> = 3,994
2022 PSSA % proficient	44.71 (21.24)	34.81 (24.29)	58.36 (21.26)	51.57 (22.17)
2024 PSSA % proficient	50.67 (20.97)	40.35 (24.62)	57.64 (20.99)	50.85 (21.61)
School demographics				
Title I school (<i>n</i> cohorts)	90	3,307	189	3,397
Locale (<i>n</i> cohorts)				
City	24	1,173	43	1,160
Suburb	57	1,818	123	1,925
Town	10	268	14	271
Rural	28	627	43	638
Grade level (<i>n</i> cohorts)				
3	25	891	39	913
4	33	870	50	891
5	21	815	39	823
6	20	495	42	507
7	12	382	36	406
8	8	433	17	454
School size (<i>n</i> students)	509 (267)	566 (762)	540 (312)	570 (753)
Student-teacher ratio	13.24 (1.85)	13.52 (2.49)	13.28 (2.17)	13.51 (2.47)
Race: % White	65.24 (28.14)	56.09 (30.91)	63.64 (28.97)	56.23 (30.70)
Gender: % male	51.75 (6.58)	51.54 (6.39)	50.66 (6.44)	51.55 (6.33)
% Economically disadvantaged	46.34 (21.64)	54.90 (25.65)	47.69 (22.54)	54.57 (25.75)
% English language learners	4.83 (7.00)	6.18 (8.85)	5.84 (8.91)	6.13 (8.65)

Note. Numbers in parentheses show standard deviations.

Appendix B: Efficacy and Usage Analysis Results

Table B1. Full Model Predicting 2024 PSSA Math Proficiency Rate from Use of IXL Math (≥ 2 SP/week vs. Non-IXL) and Covariates

Predictor	<i>b</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	43.38	1.05	41.32 – 45.44	0.11	41.38	<.001
Pretest math % proficient ¹	0.54	0.01	0.52 – 0.57	0.54	39.10	<.001
Grade: 4 ²	0.61	0.39	-0.15 – 1.38	0.03	1.57	.116
Grade: 5 ²	-1.96	0.43	-2.81 – -1.12	-0.08	-4.54	<.001
Grade: 6 ²	-5.19	0.51	-6.20 – -4.18	-0.21	-10.08	<.001
Grade: 7 ²	-6.18	0.59	-7.34 – -5.03	-0.25	-10.50	<.001
Grade: 8 ²	-8.61	0.60	-9.79 – -7.43	-0.35	-14.33	<.001
Race: % White ¹	0.08	0.02	0.05 – 0.11	0.10	5.05	<.001
% English learners ¹	0.05	0.03	0.00 – 0.10	0.02	2.08	.038
Gender: % male ¹	0.02	0.02	-0.03 – 0.06	0.00	0.81	.415
% Economically disadvantaged ¹	-0.34	0.02	-0.37 – -0.31	-0.35	-20.70	<.001
Student-teacher ratio ¹	0.18	0.08	0.02 – 0.34	0.02	2.27	.024
School size (<i>n</i> students) ¹	0.00	0.00	0.00 – 0.00	-0.04	-3.80	<.001
Locale: suburb ³	-2.05	0.99	-4.00 – -0.11	-0.08	-2.07	.039
Locale: town ³	-2.09	1.33	-4.69 – 0.52	-0.08	-1.57	.116
Locale: rural ³	-3.06	1.14	-5.29 – -0.82	-0.12	-2.69	.007
Title I school ⁴	1.14	0.59	-0.02 – 2.30	0.05	1.93	.054
Used IXL Math	2.58	1.06	0.49 – 4.66	0.10	2.42	.016

Note. Dependent variable: percentage of students reaching proficiency on the Spring 2024 PSSA math assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient

¹ Grand-mean centered

² Dummy coded; grade 3 as reference group

³ Dummy coded; city schools as reference group

⁴ Dummy coded; non-Title I schools as reference group

Table B2. Full Model Predicting 2024 PSSA ELA Proficiency Rate from Use of IXL ELA (≥ 1 SP/week vs. Non-IXL) and Covariates

Predictor	<i>b</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	55.22	0.97	53.32 – 57.11	0.19	57.21	<.001
Pretest ELA % proficient ¹	0.47	0.01	0.44 – 0.50	0.48	34.56	<.001
Grade: 4 ²	-3.97	0.37	-4.70 – -3.25	-0.18	-10.78	<.001
Grade: 5 ²	-3.97	0.38	-4.72 – -3.21	-0.18	-10.32	<.001
Grade: 6 ²	-3.72	0.46	-4.62 – -2.83	-0.17	-8.16	<.001
Grade: 7 ²	-4.57	0.50	-5.55 – -3.59	-0.21	-9.14	<.001
Grade: 8 ²	-4.76	0.49	-5.72 – -3.81	-0.22	-9.78	<.001
Race: % White ¹	0.07	0.01	0.04 – 0.09	0.09	4.73	<.001
% English learners ¹	-0.04	0.02	-0.08 – 0.01	-0.02	-1.57	.117
Gender: % male ¹	0.00	0.02	-0.04 – 0.04	0.00	-0.03	.973
% Economically disadvantaged ¹	-0.36	0.02	-0.39 – -0.33	-0.42	-22.76	<.001
Student-teacher ratio ¹	0.24	0.07	0.09 – 0.39	0.03	3.23	.001
School size (<i>n</i> students) ¹	0.00	0.00	0.00 – 0.00	-0.04	-4.32	<.001
Locale: suburb ³	-2.92	0.91	-4.71 – -1.13	-0.13	-3.20	.001
Locale: town ³	-2.70	1.24	-5.12 – -0.27	-0.12	-2.18	.029
Locale: rural ³	-3.63	1.05	-5.69 – -1.57	-0.17	-3.46	.001
Title I school ⁴	1.19	0.54	0.13 – 2.26	0.06	2.21	.027
Used IXL ELA	2.12	0.79	0.57 – 3.68	0.10	2.68	.008

Note. Dependent variable: percentage of students reaching proficiency on the Spring 2024 PSSA ELA assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient

¹ Grand-mean centered

² Dummy coded; grade 3 as reference group

³ Dummy coded; city schools as reference group

⁴ Dummy coded; non-Title I schools as reference group

Table B3. Full Model Predicting 2024 PSSA Math Proficiency Rate from IXL Math Questions Answered and Covariates

Predictor	<i>b</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	48.79	1.37	46.11 – 51.47	0.35	35.74	<.001
Pretest math % proficient ¹	0.52	0.02	0.48 – 0.56	0.51	24.76	<.001
Grade: 4 ²	-1.05	0.61	-2.25 – 0.15	-0.05	-1.71	.087
Grade: 5 ²	-4.20	0.71	-5.59 – -2.81	-0.19	-5.93	<.001
Grade: 6 ²	-7.00	0.79	-8.54 – -5.45	-0.31	-8.88	<.001
Grade: 7 ²	-7.49	0.82	-9.09 – -5.89	-0.33	-9.18	<.001
Grade: 8 ²	-9.87	0.92	-11.66 – -8.07	-0.44	-10.78	<.001
Race: % White ¹	0.07	0.02	0.03 – 0.11	0.09	3.50	.001
% English learners ¹	-0.06	0.05	-0.16 – 0.05	-0.02	-1.08	.281
Gender: % male ¹	-0.01	0.04	-0.08 – 0.06	0.00	-0.38	.705
% Economically disadvantaged ¹	-0.30	0.02	-0.35 – -0.25	-0.31	-12.33	<.001
Student-teacher ratio ¹	0.31	0.15	0.02 – 0.60	0.03	2.11	.035
School size (<i>n</i> students) ¹	0.00	0.00	0.00 – 0.00	-0.10	-6.12	<.001
Locale: suburb ³	-2.21	1.11	-4.38 – -0.03	-0.10	-2.00	.047
Locale: town ³	-3.79	1.69	-7.12 – -0.46	-0.17	-2.24	.026
Locale: rural ³	-3.91	1.37	-6.60 – -1.23	-0.17	-2.86	.004
Title I school ⁴	-1.01	0.82	-2.61 – 0.59	-0.05	-1.24	.217
IXL Math questions answered^{1,5}	0.03	0.01	0.01 – 0.06	0.03	2.51	.012

Note. Dependent variable: percentage of students reaching proficiency on the Spring 2024 PSSA math assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient

¹ Grand-mean centered

² Dummy coded; grade 3 as reference group

³ Dummy coded; city schools as reference group

⁴ Dummy coded; non-Title I schools as reference group

⁵ Average weekly amount

Table B4. Full Model Predicting 2024 PSSA Math Proficiency Rate from IXL Math Skills Proficient and Covariates

Predictor	<i>b</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	48.86	1.36	46.18 – 51.53	0.35	35.81	<.001
Pretest math % proficient ¹	0.52	0.02	0.48 – 0.56	0.51	24.62	<.001
Grade: 4 ²	-1.05	0.61	-2.25 – 0.15	-0.05	-1.71	.087
Grade: 5 ²	-4.21	0.71	-5.60 – -2.82	-0.19	-5.95	<.001
Grade: 6 ²	-7.05	0.79	-8.59 – -5.50	-0.31	-8.95	<.001
Grade: 7 ²	-7.57	0.82	-9.17 – -5.97	-0.34	-9.28	<.001
Grade: 8 ²	-9.89	0.91	-11.68 – -8.10	-0.44	-10.83	<.001
Race: % White ¹	0.07	0.02	0.03 – 0.11	0.08	3.45	.001
% English learners ¹	-0.06	0.05	-0.16 – 0.05	-0.02	-1.09	.274
Gender: % male ¹	-0.01	0.04	-0.08 – 0.06	0.00	-0.38	.707
% Economically disadvantaged ¹	-0.30	0.02	-0.34 – -0.25	-0.31	-12.32	<.001
Student-teacher ratio ¹	0.31	0.15	0.02 – 0.60	0.03	2.09	.038
School size (<i>n</i> students) ¹	0.00	0.00	0.00 – 0.00	-0.10	-6.10	<.001
Locale: suburb ³	-2.26	1.11	-4.44 – -0.09	-0.10	-2.05	.042
Locale: town ³	-3.90	1.69	-7.23 – -0.57	-0.17	-2.30	.022
Locale: rural ³	-3.95	1.37	-6.64 – -1.27	-0.18	-2.89	.004
Title I school ⁴	-0.99	0.81	-2.59 – 0.61	-0.04	-1.22	.224
IXL Math skills proficient^{1,5}	1.28	0.42	0.46 – 2.10	0.03	3.07	.002

Note. Dependent variable: percentage of students reaching proficiency on the Spring 2024 PSSA math assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient

¹ Grand-mean centered

² Dummy coded; grade 3 as reference group

³ Dummy coded; city schools as reference group

⁴ Dummy coded; non-Title I schools as reference group

⁵ Average weekly amount

Table B5. Full Model Predicting 2024 PSSA Math Proficiency Rate from IXL Math Time Spent and Covariates

Predictor	<i>b</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	48.97	1.37	46.28 – 51.65	0.36	35.81	<.001
Pretest math % proficient ¹	0.52	0.02	0.48 – 0.56	0.51	24.78	<.001
Grade: 4 ²	-1.10	0.61	-2.31 – 0.10	-0.05	-1.79	.073
Grade: 5 ²	-4.35	0.71	-5.75 – -2.96	-0.19	-6.13	<.001
Grade: 6 ²	-7.25	0.80	-8.81 – -5.69	-0.32	-9.10	<.001
Grade: 7 ²	-7.81	0.83	-9.44 – -6.19	-0.35	-9.43	<.001
Grade: 8 ²	-10.18	0.91	-11.97 – -8.39	-0.45	-11.14	<.001
Race: % White ¹	0.07	0.02	0.03 – 0.11	0.08	3.47	.001
% English learners ¹	-0.05	0.05	-0.16 – 0.05	-0.02	-1.03	.303
Gender: % male ¹	-0.01	0.04	-0.09 – 0.06	0.00	-0.40	.688
% Economically disadvantaged ¹	-0.30	0.02	-0.35 – -0.25	-0.31	-12.35	<.001
Student-teacher ratio ¹	0.31	0.15	0.02 – 0.60	0.03	2.11	.036
School size (<i>n</i> students) ¹	0.00	0.00	0.00 – 0.00	-0.10	-6.14	<.001
Locale: suburb ³	-2.20	1.10	-4.38 – -0.03	-0.10	-2.00	.047
Locale: town ³	-3.83	1.69	-7.16 – -0.50	-0.17	-2.26	.024
Locale: rural ³	-3.87	1.37	-6.56 – -1.19	-0.17	-2.84	.005
Title I school ⁴	-1.05	0.82	-2.65 – 0.56	-0.05	-1.28	.200
IXL Math time spent (min.)^{1,5}	0.07	0.03	0.01 – 0.13	0.03	2.46	.014

Note. Dependent variable: percentage of students reaching proficiency on the Spring 2024 PSSA math assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient

¹ Grand-mean centered

² Dummy coded; grade 3 as reference group

³ Dummy coded; city schools as reference group

⁴ Dummy coded; non-Title I schools as reference group

⁵ Average weekly amount

Table B6. Full Model Predicting 2024 PSSA ELA Proficiency Rate from IXL ELA Questions Answered and Covariates

Predictor	<i>b</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	57.99	1.37	55.30 – 60.67	0.28	42.44	<.001
Pretest ELA % proficient ¹	0.43	0.02	0.38 – 0.47	0.44	18.82	<.001
Grade: 4 ²	-4.48	0.60	-5.65 – -3.30	-0.23	-7.46	<.001
Grade: 5 ²	-3.83	0.65	-5.11 – -2.55	-0.19	-5.87	<.001
Grade: 6 ²	-4.16	0.70	-5.55 – -2.78	-0.21	-5.91	<.001
Grade: 7 ²	-4.57	0.71	-5.97 – -3.18	-0.23	-6.42	<.001
Grade: 8 ²	-4.03	0.75	-5.51 – -2.56	-0.20	-5.37	<.001
Race: % White ¹	0.05	0.02	0.01 – 0.09	0.07	2.41	.017
% English learners ¹	-0.09	0.05	-0.19 – 0.00	-0.04	-1.92	.056
Gender: % male ¹	-0.03	0.04	-0.10 – 0.04	-0.01	-0.97	.332
% Economically disadvantaged ¹	-0.34	0.03	-0.39 – -0.29	-0.40	-12.90	<.001
Student-teacher ratio ¹	0.18	0.16	-0.13 – 0.49	0.02	1.14	.255
School size (<i>n</i> students) ¹	0.00	0.00	0.00 – 0.00	-0.13	-6.28	<.001
Locale: suburb ³	-2.07	1.21	-4.46 – 0.32	-0.10	-1.71	.089
Locale: town ³	-4.03	1.85	-7.67 – -0.40	-0.20	-2.18	.030
Locale: rural ³	-4.16	1.47	-7.05 – -1.27	-0.21	-2.83	.005
Title I school ⁴	0.33	0.83	-1.31 – 1.97	0.02	0.39	.695
IXL ELA questions answered^{1,5}	0.03	0.01	0.00 – 0.06	0.03	2.28	.023

Note. Dependent variable: percentage of students reaching proficiency on the Spring 2024 PSSA ELA assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient

¹ Grand-mean centered

² Dummy coded; grade 3 as reference group

³ Dummy coded; city schools as reference group

⁴ Dummy coded; non-Title I schools as reference group

⁵ Average weekly amount

Table B7. Full Model Predicting 2024 PSSA ELA Proficiency Rate from IXL ELA Skills Proficient and Covariates

Predictor	<i>b</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	57.94	1.36	55.26 – 60.62	0.28	42.46	<.001
Pretest ELA % proficient ¹	0.43	0.02	0.38 – 0.47	0.43	18.74	<.001
Grade: 4 ²	-4.44	0.60	-5.61 – -3.26	-0.22	-7.42	<.001
Grade: 5 ²	-3.75	0.65	-5.03 – -2.47	-0.19	-5.76	<.001
Grade: 6 ²	-4.10	0.70	-5.48 – -2.72	-0.21	-5.83	<.001
Grade: 7 ²	-4.48	0.71	-5.88 – -3.08	-0.23	-6.29	<.001
Grade: 8 ²	-3.91	0.75	-5.39 – -2.44	-0.20	-5.21	<.001
Race: % White ¹	0.05	0.02	0.01 – 0.09	0.07	2.39	.018
% English learners ¹	-0.09	0.05	-0.19 – 0.00	-0.04	-1.98	.049
Gender: % male ¹	-0.03	0.04	-0.10 – 0.04	-0.01	-0.89	.376
% Economically disadvantaged ¹	-0.34	0.03	-0.39 – -0.29	-0.39	-12.77	<.001
Student-teacher ratio ¹	0.18	0.16	-0.12 – 0.49	0.02	1.18	.239
School size (<i>n</i> students) ¹	0.00	0.00	0.00 – 0.00	-0.13	-6.23	<.001
Locale: suburb ³	-2.07	1.21	-4.46 – 0.31	-0.10	-1.71	.088
Locale: town ³	-4.05	1.84	-7.68 – -0.43	-0.20	-2.20	.029
Locale: rural ³	-4.13	1.47	-7.01 – -1.24	-0.21	-2.81	.005
Title I school ⁴	0.31	0.83	-1.33 – 1.95	0.02	0.37	.711
IXL ELA skills proficient^{1,5}	1.99	0.62	0.79 – 3.20	0.04	3.24	.001

Note. Dependent variable: percentage of students reaching proficiency on the Spring 2024 PSSA ELA assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient

¹ Grand-mean centered

² Dummy coded; grade 3 as reference group

³ Dummy coded; city schools as reference group

⁴ Dummy coded; non-Title I schools as reference group

⁵ Average weekly amount

Table B8. Full Model Predicting 2024 PSSA ELA Proficiency Rate from IXL ELA Time Spent and Covariates

Predictor	<i>b</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	58.15	1.37	55.46 – 60.83	0.29	42.52	<.001
Pretest ELA % proficient ¹	0.43	0.02	0.38 – 0.47	0.44	18.81	<.001
Grade: 4 ²	-4.52	0.60	-5.70 – -3.34	-0.23	-7.53	<.001
Grade: 5 ²	-3.93	0.65	-5.21 – -2.64	-0.20	-6.00	<.001
Grade: 6 ²	-4.33	0.71	-5.73 – -2.94	-0.22	-6.10	<.001
Grade: 7 ²	-4.77	0.72	-6.18 – -3.37	-0.24	-6.65	<.001
Grade: 8 ²	-4.21	0.75	-5.68 – -2.74	-0.21	-5.61	<.001
Race: % White ¹	0.05	0.02	0.01 – 0.09	0.07	2.38	.018
% English learners ¹	-0.09	0.05	-0.18 – 0.01	-0.03	-1.81	.070
Gender: % male ¹	-0.03	0.04	-0.10 – 0.04	-0.01	-0.96	.336
% Economically disadvantaged ¹	-0.34	0.03	-0.39 – -0.29	-0.40	-12.93	<.001
Student-teacher ratio ¹	0.18	0.16	-0.13 – 0.48	0.02	1.12	.261
School size (<i>n</i> students) ¹	0.00	0.00	0.00 – 0.00	-0.13	-6.24	<.001
Locale: suburb ³	-2.12	1.21	-4.50 – 0.27	-0.11	-1.75	.082
Locale: town ³	-4.09	1.85	-7.73 – -0.46	-0.21	-2.22	.027
Locale: rural ³	-4.21	1.47	-7.10 – -1.32	-0.21	-2.86	.004
Title I school ⁴	0.31	0.83	-1.33 – 1.95	0.02	0.37	.712
IXL ELA time spent (min.)^{1,5}	0.11	0.04	0.02 – 0.19	0.03	2.54	.011

Note. Dependent variable: percentage of students reaching proficiency on the Spring 2024 PSSA ELA assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient

¹ Grand-mean centered

² Dummy coded; grade 3 as reference group

³ Dummy coded; city schools as reference group

⁴ Dummy coded; non-Title I schools as reference group

⁵ Average weekly amount