RESEARCH REPORT

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The Impact of IXL on Math Learning in Miami-Dade County Public Schools

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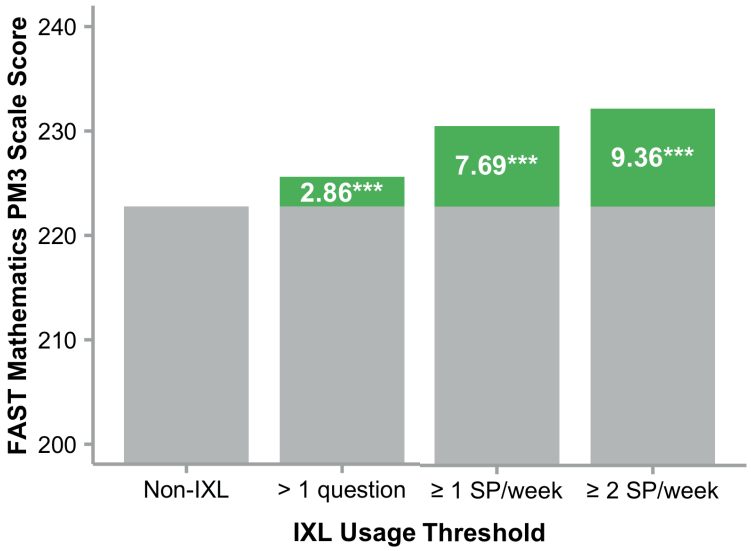
Executive Summary

IXL is an end-to-end teaching and learning solution that engages learners in Pre-K through 12th grade with a comprehensive curriculum 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 Miami-Dade County Public Schools and its impact on math achievement, as measured by the end-of-year (PM3) Florida Assessment of Student Thinking (FAST) Mathematics assessment. Using a pretest-posttest design, we found[1]:

- **Using IXL (especially with fidelity) improves student achievement.** Students who used any amount of IXL scored significantly higher on the FAST Mathematics assessment than their peers who did not use IXL at all. These effects were even larger for students who reached proficiency[2] in at least one or at least two IXL Math skills per week (SP/week).



- **More IXL usage is associated with better academic performance.** Students performed significantly better on the FAST Mathematics assessment when they answered more questions, reached proficiency in more skills, and spent more time practicing on IXL Math.

- **All students benefit from IXL.** We found that students from a variety of subgroups—including grade level, race/ethnicity, special education, ELL, socioeconomically disadvantaged, gifted, and FAST PM1 Level 1/Level 2—performed better on the FAST math assessment when they used IXL more.

[1] *In all figures: *** indicates statistical significance at the p < .001 level.*

[2] *Note. Skill proficiency is indicated by a SmartScore of 80+*

The Impact of IXL on Math Learning in Miami-Dade County Public Schools

Background

IXL is an end-to-end teaching and learning solution that engages learners in Pre-K through 12th grade with a comprehensive curriculum and personalized recommendations for meeting learning goals. It covers five main subject areas: mathematics, English language arts (ELA), science, social studies, and Spanish. As of this writing, IXL is used by 34% of students in Florida and more than 15 million students worldwide. IXL is deeply rooted in learning sciences research (see Bashkov et al., 2021) and engages each student in a personalized learning experience tailored to their working level. As a result, students work through 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 reported significant positive effects of IXL on student learning. The goal of the present study was to examine the efficacy of IXL Math among 3rd- through 8th-grade students in Miami-Dade County Public Schools. Specifically, we investigated the efficacy of IXL by comparing Florida Assessment of Student Thinking (FAST) Mathematics assessment scores of students who used IXL to those of students who did not use IXL. We also investigated the cumulative usage effects of IXL by examining the relationship between students' amount of IXL usage and their FAST Mathematics assessment performance, both across the entire district as well as within specific grade levels and student subgroups.

RESEARCH QUESTIONS

In two sets of analyses, we aimed to answer the following research questions:

1. **Overall efficacy and implementation fidelity of IXL Math:** Controlling for baseline performance and demographics, how did students who used IXL perform on the FAST Mathematics assessment compared to students who did not use IXL? What was the impact of using IXL with moderate (≥1 SP/week) or high fidelity (≥2 SP/week)?
2. **Usage effects of IXL Math:** Controlling for baseline performance and demographics, how does the amount of IXL Math usage (e.g., time spent per week) relate to students' scores on the FAST Mathematics assessment? To what extent do these findings hold across grade levels and student subgroups?

Study Design and Methodology

DATA SOURCES

Assessment and Demographic Data

Miami-Dade County Public Schools provided student-level demographic information and FAST Mathematics assessment data from the three test administrations during the 2023-24 school year: PM1 (beginning-of-year), PM2 (mid-year), and PM3 (end-of-year). Students in 3rd through 10th grade complete the FAST ELA assessment three times per year, and students in 3rd through 8th grade complete the FAST Mathematics assessment on the same schedule. The focus of this study was on growth between PM1 and PM3. For more information about FAST, see the Florida Department of Education FAST assessments 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).

PARTICIPANTS

We included data from students with any amount of IXL usage in the 2023-24 school year as well as non-missing pretest and posttest data. In the analyses for Research Question 1, we compared the FAST Mathematics performance of students who did not use IXL at all (n = 9,898) to that of students who met one of three criteria: answered at least one question on IXL during the school year (n = 80,169), reached an average of at least 1 SP/week throughout the school year (n = 23,423), or reached an average of at least 2 SP/week throughout the school year (n = 8,642). Prior to the analyses for Research Question 2, we identified students with IXL usage more than 3 *SD* above the mean on any metric (time spent, questions answered, or skills proficient) as outliers and excluded them from analysis (n = 2,824, or 3.5% of the initial sample), resulting in a final sample of 77,345 students. Sample sizes for each subgroup in the subgroup analyses are presented in Table A9 (Appendix).

Overall, the student sample was 27.6% English language learners (ELLs), 61.1% economically disadvantaged, 15.0% gifted, and 15.9% receiving special education services. The racial/ethnic makeup of the sample was as follows: 73.2% Hispanic, 19.2% Black, 6.0% White, and <5% any other race. Descriptive statistics of students' IXL usage are reported in Table 1, and descriptive statistics of students' pretest performance and demographic characteristics by group are presented in Table A1 (Appendix).

Table 1. Students' IXL Math Usage During the 2023-24 School Year

Weekly IXL usage	IXL Math (*n* = 80,169)			
	M	*SD*	Min	Max
Questions correct	25.55	34.71	0.00	1187.84
Time spent (in minutes)	15.66	18.13	0.00	728.88
Skills proficient	0.86	1.19	0.00	35.87

ANALYSIS

For each research question, we specified and tested multilevel linear regression models to account for the clustering of students within schools. Each model regressed FAST Mathematics PM3 score on an IXL predictor and the following covariates: FAST Mathematics PM1 score (i.e., baseline performance), grade level, race, ELL status, gifted status, special education status, and economically disadvantaged status.

In the three models for Research Question 1, we used binary IXL predictor variables that indicated whether a student was a member of the control group (i.e., did not use IXL at all) or a treatment group (i.e., answered at least one question on IXL; reached an average of at least 1 SP/week on IXL; or reached an average of at least 2 SP/week on IXL). For Research Question 2, we ran a separate model for each usage indicator (questions per week, time per week, and SP/week) because these indicators were highly correlated (smallest $r = .75$, all ps $< .001$). In addition to the overall analyses of all students, we also conducted a usage analysis within each grade level and within each of the following student subgroups: Black students, Hispanic students, White students, ELLs, gifted students, students enrolled in special education programs, economically disadvantaged students, and students who performed below grade level at pretest (i.e., FAST Level 1 or Level 2). For simplicity, we report only the SP/week usage model results for these analyses.

Following What Works Clearinghouse (WWC) guidelines (2022), each effect is accompanied by a test of statistical significance using a probability (p) value and a measure of 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, with p-values less than .05 considered statistically significant. For the models from Research Question 1, 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). Because the models for Research Question 2 do not include a control group, Hedges' g is not applicable; instead, we report a standardized regression coefficient (β) to gauge the practical significance of IXL usage relative to the effects of the covariates.

Results

RESEARCH QUESTION 1: OVERALL EFFICACY AND IMPLEMENTATION FIDELITY

Controlling for baseline performance and covariates, we found that students who used IXL Math performed significantly better on the FAST Mathematics assessment than students who did not use IXL (Figure 1). Specifically, students who used any amount of IXL Math (i.e., answered at least one question) scored nearly three points higher than students who did not use IXL (b = 2.86, p < .001); the effect size (Hedges' g) was .12. Using IXL Math with fidelity resulted in even larger gains: students who met or exceeded the 1 SP/week (moderate fidelity) threshold scored about eight points higher than students who did not use IXL (b = 7.69, p < .001, g = .31), and students who met or exceeded the 2 SP/week (high fidelity) threshold scored more than nine points higher than students who did not use IXL (b = 9.36, p < .001, g = .37). Full model results are presented in Tables A2-A4 (Appendix A). In addition, a summary of efficacy models by grade level can be found in Table A5 (Appendix A).

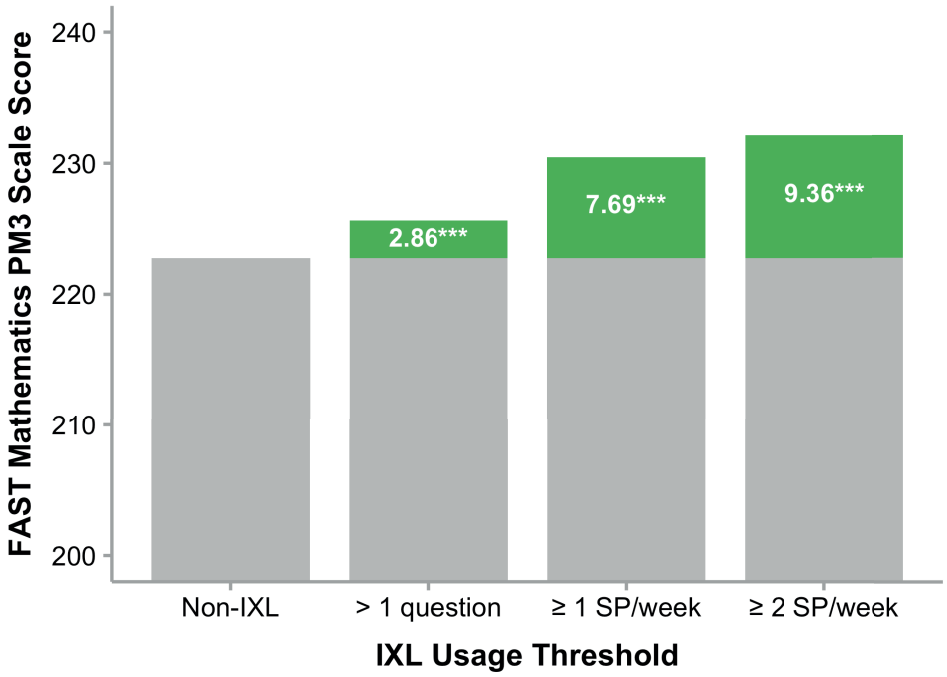


Figure 1. Effects of IXL Math when used at any amount, ≥ 1 SP/week, or ≥ 2 SP/week

Note: SP/week = skills proficient per week

RESEARCH QUESTION 2: CUMULATIVE USAGE EFFECTS AND STUDENT SUBGROUPS

Overall Analyses

All IXL Math usage metrics were positively and statistically significantly associated with Spring 2024 FAST Mathematics scores, controlling for baseline performance and demographics (see Tables A6-A8 in the Appendix for full model results). Based on model coefficients and typical usage amounts, a student's FAST Mathematics score would be expected to increase by 3.6 points for every additional 30 questions they answer on IXL each week (β = 0.10, $p < .001$), 4.06 points for each additional skill they reach proficiency in each week (β = 0.13, $p < .001$), or 5.4 points for every additional 30 minutes they spend using IXL each week (β = 0.10, $p < .001$; see Figure 2).

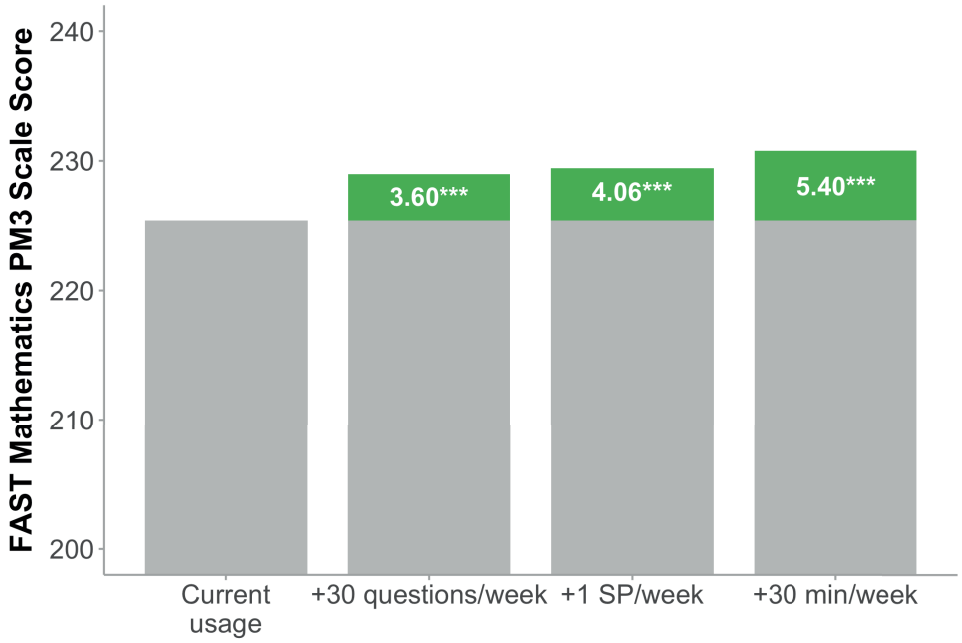


Figure 2. Predicted usage effects of IXL Math

Note: SP/week = skills proficient per week

Student Subgroups

As in the overall analyses, we found significant positive effects of increased IXL usage (i.e., SP/week) on Spring 2024 FAST Mathematics scores among all student subgroups that we examined (see Figures 3 and 4). Standardized regression coefficients ranged from β = 0.11 (for gifted students) to β = 0.20 (for students in 7th and 8th grade, respectively); these results are summarized in Table A9 (Appendix).

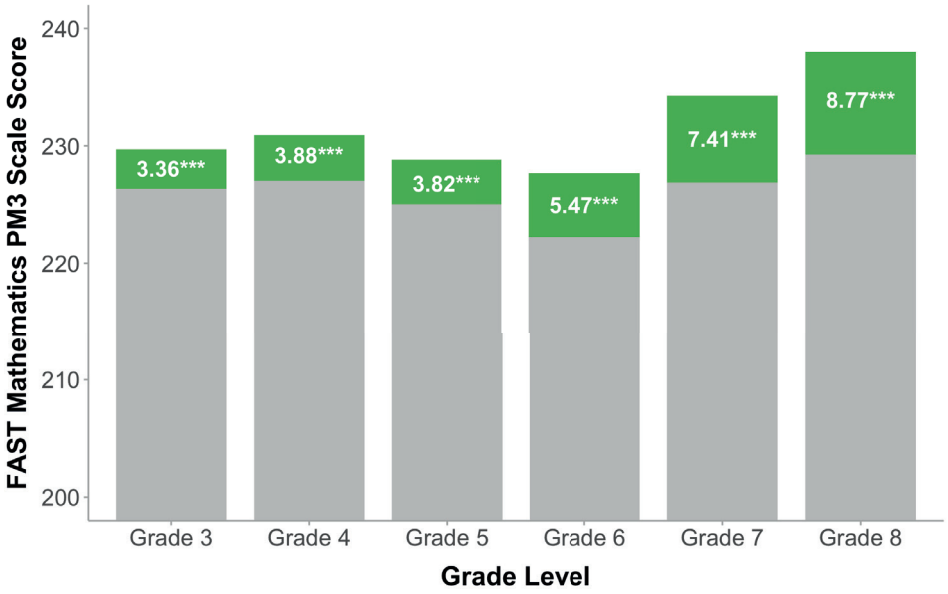


Figure 3. Predicted usage effects of IXL Math among grade levels

Note: Each coefficient indicates the predicted impact of an additional 1 SP/week

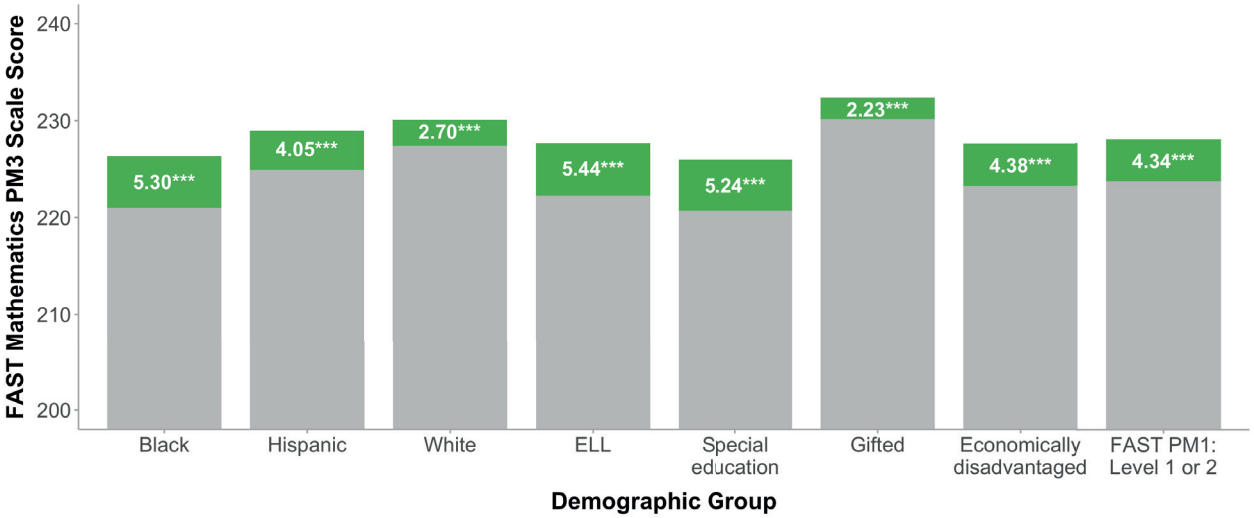


Figure 4. Predicted usage effects of IXL Math among student subgroups

Note: Each coefficient indicates the predicted impact of an additional 1 SP/week

Discussion and Recommendations

In this study, we investigated how IXL Math usage among 3rd- through 8th-grade students in Miami-Dade County Public Schools related to students' performance on the FAST Mathematics assessment at the end of the 2023-24 school year (PM3). Controlling for baseline performance and demographics, we found that students who used IXL outperformed those who did not, and these effects were even more pronounced for students who used IXL with moderate or high fidelity. In addition, we found that increased IXL usage was associated with larger achievement gains among all students as well as within student subgroups by grade, race/ethnicity, English proficiency, ability, socioeconomic status, and prior performance. These results add to the body of work showing that IXL boosts student achievement (e.g., An, 2023; Bashkov, 2021; Copeland et al., 2023; Hargis, 2023; Schonberg, 2022; Xiong, 2022).

In this district, students' average usage of IXL Math was slightly lower than IXL's recommendation of reaching proficiency in two skills per week (An et al., 2022). Nonetheless, we found that students who used any amount of IXL performed significantly better than students who did not use IXL, showing that IXL is a powerful learning tool. The impact of IXL among students who met or exceeded a moderate (1 SP/week) or high-fidelity (2 SP/week) usage threshold was even larger, with effect sizes greater than .30. These findings are consistent with prior research, which has shown that interventions are more effective when they are carried out with fidelity (see Finney et al., 2021; Noell et al., 2002). We recommend that educators in Miami-Dade County Public Schools continue their implementation of IXL Math and support increased usage by encouraging students to reach proficiency in at least two skills per week.

Taken together, these results show that IXL is a powerful education platform that significantly boosts student learning. IXL's personalized approach is especially important as students continue to recover from the educational impacts of the COVID-19 pandemic, as personalized learning can both help students close existing knowledge gaps and improve future learning outcomes (Kaffenberger, 2021). To optimize students' personalized skill recommendations, we highly recommend that students regularly complete the IXL LevelUp™ Math Assessment, both in Real-Time mode and their assigned Benchmark windows, to pinpoint knowledge levels in key math strands. The IXL LevelUp™ Math Assessment integrates seamlessly with IXL's comprehensive curriculum by generating personalized action plans based on students' performance, providing them with a list of the exact skills they should work on next. 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: Descriptives and Full Regression Analysis Results

Table A1. Student Pretest Performance and Demographic Characteristics by Group

	Non-IXL	≥ 1 question	≥ 1 SP/week	≥ 2 SP/week
Baseline performance	*n* = 9,898	*n* = 80,169	*n* = 23,423	*n* = 8,642
2023 PM1 scale score	199.53 (25.14)	200.69 (25.36)	207.40 (24.88)	205.31 (24.44)
Student characteristics				
Race				
Black	1,862 (19%)	15,433 (19%)	2,580 (11%)	768 (9%)
Hispanic	7,294 (74%)	58,658 (73%)	18,315 (78%)	6,819 (79%)
White	594 (6%)	4,831 (6%)	1,972 (8%)	786 (9%)
Grade level				
3	1,954 (20%)	15,348 (19%)	4,683 (20%)	2,445 (28%)
4	1,233 (12%)	15,783 (20%)	5,185 (22%)	2,374 (27%)
5	2,053 (21%)	14,807 (18%)	3,442 (15%)	1,390 (16%)
6	1,866 (19%)	14,232 (18%)	5,275 (23%)	1,328 (15%)
7	1,559 (16%)	12,737 (16%)	3,631 (16%)	816 (9%)
8	1,233 (12%)	7,262 (9%)	1,207 (5%)	289 (3%)
Special education	1,779 (18%)	12,521 (16%)	2,648 (11%)	823 (10%)
Gifted	1,222 (12%)	12,309 (15%)	5,786 (25%)	2,684 (31%)
English language learner	2,790 (28%)	22,072 (28%)	5,144 (22%)	1,686 (20%)
Economically disadvantaged	5,860 (59%)	49,180 (61%)	12,586 (54%)	4,436 (51%)

Note. PM1 scale scores are presented as *M* (*SD*).

Table A2. Full Model Predicting Spring 2024 FAST Mathematics Assessment Scale Score from Use of IXL Math and Covariates

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	223.22	0.34	222.56 – 223.88	-0.08	661.88	<.001
PM1 Mathematics score[1]	0.78	0.00	0.78 – 0.79	0.80	270.72	<.001
Grade 4[2]	0.62	0.15	0.32 – 0.91	0.02	4.11	<.001
Grade 5[2]	-2.11	0.17	-2.43 – -1.79	-0.08	-12.77	<.001
Grade 6[2]	-0.91	0.23	-1.36 – -0.47	-0.04	-4.05	<.001
Grade 7[2]	-0.21	0.24	-0.69 – 0.27	-0.01	-0.85	.396
Grade 8[2]	2.41	0.26	1.89 – 2.93	0.10	9.22	<.001
Economically disadvantaged[3]	-0.86	0.10	-1.05 – -0.67	-0.02	-8.73	<.001
Special education[4]	-4.12	0.13	-4.37 – -3.87	-0.06	-32.37	<.001
Gifted[5]	4.33	0.14	4.05 – 4.61	0.06	30.07	<.001
English language learner[6]	-1.94	0.12	-2.17 – -1.71	-0.03	-16.45	<.001
Race: Black[7]	-1.32	0.16	-1.63 – -1.01	-0.02	-8.43	<.001
Race: White[7]	0.67	0.21	0.26 – 1.08	0.01	3.20	.001
Race: Multi./Other[7]	1.63	0.36	0.91 – 2.34	0.01	4.46	<.001
Used any IXL Math	**2.86**	**0.17**	**2.54 – 3.19**	**0.12**	**17.17**	**<.001**

Note. Dependent variable: Spring 2024 FAST PM3 assessment scale score in math. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient, PM = progress monitoring

[1] Grand-mean centered
[2] Dummy coded; grade 3 as reference group
[3] Dummy coded; non-economically disadvantaged students as reference group
[4] Dummy coded; non-special education students as reference group
[5] Dummy coded; non-gifted students as reference group
[6] Dummy coded; non-ELL students as reference group
[7] Dummy coded; Hispanic students as reference group

Table A3. Full Model Predicting Spring 2024 FAST Mathematics Assessment Scale Score from Use of IXL Math at ≥ 1 SP/week and Covariates

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	222.47	0.39	221.71 – 223.24	-0.20	569.77	<.001
PM1 Mathematics score[1]	0.77	0.00	0.76 – 0.78	0.79	167.15	<.001
Grade 4[2]	0.49	0.23	0.03 – 0.95	0.02	2.07	.038
Grade 5[2]	-1.78	0.27	-2.31 – -1.25	-0.07	-6.56	<.001
Grade 6[2]	-2.16	0.35	-2.86 – -1.47	-0.09	-6.12	<.001
Grade 7[2]	-0.53	0.38	-1.29 – 0.23	-0.02	-1.38	.167
Grade 8[2]	2.54	0.44	1.66 – 3.41	0.10	5.74	<.001
Economically disadvantaged[3]	-0.55	0.15	-0.84 – -0.27	-0.01	-3.77	<.001
Special education[4]	-3.84	0.21	-4.26 – -3.43	-0.05	-18.31	<.001
Gifted[5]	3.40	0.20	3.02 – 3.79	0.06	17.32	<.001
English language learner[6]	-1.32	0.19	-1.69 – -0.96	-0.02	-7.06	<.001
Race: Black[7]	-1.35	0.26	-1.86 – -0.84	-0.02	-5.19	<.001
Race: White[7]	0.28	0.28	-0.27 – 0.84	0.00	1.00	.317
Race: Multi./Other[7]	0.70	0.48	-0.24 – 1.63	0.00	1.46	.144
IXL Math: ≥ 1 SP/week	**7.69**	**0.23**	**7.25 – 8.13**	**0.31**	**34.01**	**<.001**

Note. Dependent variable: Spring 2024 FAST PM3 assessment scale score in math. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient, PM = progress monitoring

[1] Grand-mean centered
[2] Dummy coded; grade 3 as reference group
[3] Dummy coded; non-economically disadvantaged students as reference group
[4] Dummy coded; non-special education students as reference group
[5] Dummy coded; non-gifted students as reference group
[6] Dummy coded; non-ELL students as reference group
[7] Dummy coded; Hispanic students as reference group

Table A4. Full Model Predicting Spring 2024 FAST Mathematics Assessment Scale Score from Use of IXL Math at ≥ 2 SP/week and Covariates

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	222.63	0.48	221.68 – 223.57	-0.17	464.10	<.001
PM1 Mathematics score[1]	0.77	0.01	0.76 – 0.78	0.76	120.30	<.001
Grade 4[2]	0.48	0.32	-0.15 – 1.10	0.02	1.50	.135
Grade 5[2]	-1.29	0.37	-2.02 – -0.57	-0.05	-3.50	<.001
Grade 6[2]	-2.39	0.50	-3.39 – -1.39	-0.09	-4.73	<.001
Grade 7[2]	-0.79	0.56	-1.90 – 0.31	-0.03	-1.42	.157
Grade 8[2]	1.90	0.63	0.65 – 3.13	0.07	3.02	.003
Economically disadvantaged[3]	-0.71	0.21	-1.11 – -0.31	-0.01	-3.44	.001
Special education[4]	-4.02	0.29	-4.59 – -3.45	-0.05	-13.90	<.001
Gifted[5]	2.95	0.28	2.40 – 3.49	0.05	10.58	<.001
English language learner[6]	-1.65	0.26	-2.16 – -1.14	-0.03	-6.31	<.001
Race: Black[7]	-0.81	0.35	-1.50 – -0.11	-0.01	-2.28	.022
Race: White[7]	0.50	0.40	-0.28 – 1.29	0.01	1.26	.209
Race: Multi./Other[7]	0.56	0.65	-0.71 – 1.82	0.00	0.86	.390
IXL Math: ≥ 2 SP/week	**9.36**	**0.33**	**8.73 – 10.00**	**0.37**	**28.76**	**<.001**

Note. Dependent variable: Spring 2024 FAST PM3 assessment scale score in math. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient, PM = progress monitoring

[1] Grand-mean centered

[2] Dummy coded; grade 3 as reference group

[3] Dummy coded; non-economically disadvantaged students as reference group

[4] Dummy coded; non-special education students as reference group

[5] Dummy coded; non-gifted students as reference group

[6] Dummy coded; non-ELL students as reference group

[7] Dummy coded; Hispanic students as reference group

Table A5. Summary of Grade Level Models Predicting Spring 2024 FAST Mathematics Assessment Scale Score from Use of IXL Math and Covariates

Grade	≥ 1 question	≥ 1 SP/week	≥ 2 SP/week
all	2.86*** (IXL *n* = 80,169; control *n* = 9,898)	7.69*** (IXL *n* = 23,423; control *n* = 9,898)	9.36*** (IXL *n* = 8,642; control *n* = 9,898)
3	3.06*** (IXL *n* = 15,348; control *n* = 1,954)	7.89*** (IXL *n* = 4,683; control *n* = 1,954)	9.87*** (IXL *n* = 2,445; control *n* = 1,954)
4	2.62*** (IXL *n* = 15,783; control *n* = 1,233)	7.93*** (IXL *n* = 5,185; control *n* = 1,233)	9.68*** (IXL *n* = 2,374; control *n* = 1,233)
5	1.58*** (IXL *n* = 14,807; control *n* = 2,053)	6.59*** (IXL *n* = 3,442; control *n* = 2,053)	7.85*** (IXL *n* = 1,390; control *n* = 2,053)
6	3.03*** (IXL *n* = 14,232; control *n* = 1,866)	8.07*** (IXL *n* = 5,275; control *n* = 1,866)	8.95*** (IXL *n* = 1,328; control *n* = 1,866)
7	4.89*** (IXL *n* = 12,737; control *n* = 1,559)	12.97*** (IXL *n* = 3,631; control *n* = 1,559)	15.47*** (IXL *n* = 816; control *n* = 1,559)
8	3.41*** (IXL *n* = 7,262; control *n* = 1,233)	12.55*** (IXL *n* = 1,207; control *n* = 1,233)	17.94*** (IXL *n* = 289; control *n* = 1,233)

Note. This table summarizes the results of the regressions reported in the main text (grade "all") as well as follow-up regressions conducted for each grade level separately. All follow-up regressions included the same covariates as those reported in the main paper. Here, we report the unstandardized *b* coefficient for the effect of IXL; *** indicates $p < .001$.

Table A6. Full Model Predicting Spring 2024 FAST Mathematics Assessment Scale Score from IXL Math Questions Answered and Covariates

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	225.13	0.30	224.54 – 225.72	0.00	751.99	<.001
PM1 Mathematics score[1]	0.76	0.00	0.76 – 0.77	0.79	248.35	<.001
Grade 4[2]	0.86	0.16	0.54 – 1.17	0.03	5.39	<.001
Grade 5[2]	-0.81	0.18	-1.16 – -0.46	-0.03	-4.55	<.001
Grade 6[2]	-0.23	0.24	-0.71 – 0.24	-0.01	-0.97	.332
Grade 7[2]	1.03	0.26	0.52 – 1.54	0.04	4.01	<.001
Grade 8[2]	3.61	0.28	3.06 – 4.16	0.15	12.98	<.001
Economically disadvantaged[3]	-0.70	0.10	-0.90 – -0.49	-0.01	-6.70	<.001
Special education[4]	-3.86	0.13	-4.12 – -3.59	-0.06	-28.68	<.001
Gifted[5]	4.27	0.15	3.97 – 4.57	0.06	27.97	<.001
English language learner[6]	-2.08	0.12	-2.32 – -1.84	-0.04	-16.76	<.001
Race: Black[7]	-1.41	0.16	-1.73 – -1.09	-0.02	-8.60	<.001
Race: White[7]	0.61	0.22	0.18 – 1.05	0.01	2.75	.006
Race: Multi./Other[7]	1.35	0.39	0.59 – 2.12	0.01	3.46	.001
IXL Math questions answered[1,8]	**0.12**	**0.00**	**0.11 – 0.12**	**0.10**	**44.90**	**<.001**

Note. Dependent variable: Spring 2024 FAST PM3 assessment scale score in math. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient, PM = progress monitoring

[1] Grand-mean centered
[2] Dummy coded; grade 3 as reference group
[3] Dummy coded; non-economically disadvantaged students as reference group
[4] Dummy coded; non-special education students as reference group
[5] Dummy coded; non-gifted students as reference group
[6] Dummy coded; non-ELL students as reference group
[7] Dummy coded; Hispanic students as reference group
[8] Average weekly amount

Table A7. Full Model Predicting Spring 2024 FAST Mathematics Assessment Scale Score from IXL Math Skills Proficient and Covariates

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	224.61	0.30	224.02 – 225.20	-0.02	751.47	<.001
PM1 Mathematics score[1]	0.75	0.00	0.74 – 0.75	0.77	241.33	<.001
Grade 4[2]	1.13	0.16	0.82 – 1.44	0.05	7.14	<.001
Grade 5[2]	-0.21	0.18	-0.56 – 0.13	-0.01	-1.20	.230
Grade 6[2]	0.39	0.24	-0.08 – 0.86	0.02	1.64	.101
Grade 7[2]	1.77	0.26	1.26 – 2.28	0.07	6.89	<.001
Grade 8[2]	4.51	0.28	3.96 – 5.06	0.18	16.25	<.001
Economically disadvantaged[3]	-0.62	0.10	-0.82 – -0.42	-0.01	-5.99	<.001
Special education[4]	-3.78	0.13	-4.04 – -3.51	-0.06	-28.28	<.001
Gifted[5]	4.05	0.15	3.75 – 4.35	0.06	26.71	<.001
English language learner[6]	-1.94	0.12	-2.18 – -1.70	-0.04	-15.74	<.001
Race: Black[7]	-1.32	0.16	-1.64 – -1.00	-0.02	-8.09	<.001
Race: White[7]	0.56	0.22	0.13 – 0.99	0.01	2.54	.011
Race: Multi./Other[7]	1.23	0.39	0.47 – 1.99	0.01	3.18	.001
IXL Math skills proficient[1,8]	**4.06**	**0.07**	**3.91 – 4.20**	**0.13**	**56.42**	**<.001**

Note. Dependent variable: Spring 2024 FAST PM3 assessment scale score in math. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient, PM = progress monitoring

[1] Grand-mean centered
[2] Dummy coded; grade 3 as reference group
[3] Dummy coded; non-economically disadvantaged students as reference group
[4] Dummy coded; non-special education students as reference group
[5] Dummy coded; non-gifted students as reference group
[6] Dummy coded; non-ELL students as reference group
[7] Dummy coded; Hispanic students as reference group
[8] Average weekly amount

Table A8. Full Model Predicting Spring 2024 FAST Mathematics Assessment Scale Score from IXL Math Time Spent and Covariates

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	226.43	0.30	225.85 – 227.02	0.05	759.22	<.001
PM1 Mathematics score[1]	0.77	0.00	0.77 – 0.78	0.80	252.55	<.001
Grade 4[2]	0.33	0.16	0.02 – 0.64	0.01	2.07	.039
Grade 5[2]	-2.04	0.18	-2.38 – -1.69	-0.08	-11.54	<.001
Grade 6[2]	-2.02	0.24	-2.50 – -1.54	-0.08	-8.36	<.001
Grade 7[2]	-1.42	0.26	-1.94 – -0.91	-0.06	-5.49	<.001
Grade 8[2]	1.31	0.28	0.76 – 1.86	0.05	4.72	<.001
Economically disadvantaged[3]	-0.69	0.10	-0.90 – -0.49	-0.01	-6.66	<.001
Special education[4]	-3.85	0.13	-4.12 – -3.59	-0.06	-28.63	<.001
Gifted[5]	4.35	0.15	4.05 – 4.65	0.06	28.48	<.001
English language learner[6]	-2.07	0.12	-2.31 – -1.82	-0.04	-16.65	<.001
Race: Black[7]	-1.46	0.16	-1.78 – -1.14	-0.02	-8.90	<.001
Race: White[7]	0.69	0.22	0.25 – 1.13	0.01	3.10	.002
Race: Multi./Other[7]	1.56	0.39	0.80 – 2.33	0.01	4.00	<.001
IXL Math time spent[1,8]	**0.18**	**0.00**	**0.17 – 0.19**	**0.10**	**42.83**	**<.001**

Note. Dependent variable: Spring 2024 FAST PM3 assessment scale score in math. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient, PM = progress monitoring

[1] Grand-mean centered
[2] Dummy coded; grade 3 as reference group
[3] Dummy coded; non-economically disadvantaged students as reference group
[4] Dummy coded; non-special education students as reference group
[5] Dummy coded; non-gifted students as reference group
[6] Dummy coded; non-ELL students as reference group
[7] Dummy coded; Hispanic students as reference group
[8] Average weekly amount

Table A9. Summary of Student Subgroup Models Predicting Spring 2024 FAST Mathematics Assessment Scale Score from IXL Math Skills Proficient and Covariates

Predictor: IXL Math skills proficient	*b*	*SE*	95% CI	β	*t*	*p*
Models by Grade Level						
Grade 3[1,2,3]	3.36	0.14	3.08 – 3.64	0.14	23.57	<.001
Grade 4[1,2,4]	3.88	0.14	3.61 – 4.15	0.16	27.97	<.001
Grade 5[1,2,5]	3.82	0.17	3.49 – 4.15	0.14	22.69	<.001
Grade 6[1,2,6]	5.47	0.18	5.11 – 5.83	0.19	29.90	<.001
Grade 7[1,2,7]	7.41	0.28	6.86 – 7.95	0.20	26.90	<.001
Grade 8[1,2,8]	8.77	0.54	7.71 – 9.82	0.20	16.25	<.001
Models by Demographic Group						
English language learners[1,2,9]	5.44	0.17	5.11 – 5.77	0.16	32.12	<.001
Economically disadvantaged[1,2,10]	4.38	0.10	4.19 – 4.57	0.13	44.99	<.001
Gifted[1,2,11]	2.23	0.12	2.00 – 2.47	0.11	18.40	<.001
Special education[1,2,12]	5.24	0.23	4.78 – 5.69	0.14	22.66	<.001
FAST PM1: Level 1 or 2[,2,13]	4.34	0.08	4.18 – 4.50	0.14	52.70	<.001
Black[1,2,14]	5.30	0.21	4.89 – 5.70	0.14	25.77	<.001
Hispanic[1,2,15]	4.05	0.08	3.89 – 4.21	0.13	49.31	<.001
White[1,2,16]	2.70	0.23	2.24 – 3.15	0.10	11.60	<.001

Note. Dependent variable: Spring 2024 FAST PM3 assessment scale score in math. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient. This table summarizes the results of 14 regression models (6 by grade level; 8 by demographic group). Each row provides the estimated effect of IXL Math SP/week in the given subgroup, controlling for baseline performance and all other covariates.

[1] Grand-mean centered
[2] Average weekly amount
[3] *n* = 13,896
[4] *n* = 14,466
[5] *n* = 14,023
[6] *n* = 13,544
[7] *n* = 12,239
[8] *n* = 7,007
[9] *n* = 20,886
[10] *n* = 46,539
[11] *n* = 10,882
[12] *n* = 11,955
[13] *n* = 65,550
[14] *n* = 14,909
[15] *n* = 54,745
[16] *n* = 4,418