RESEARCH REPORT

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The Impact of IXL on Math Achievement in a Florida School District

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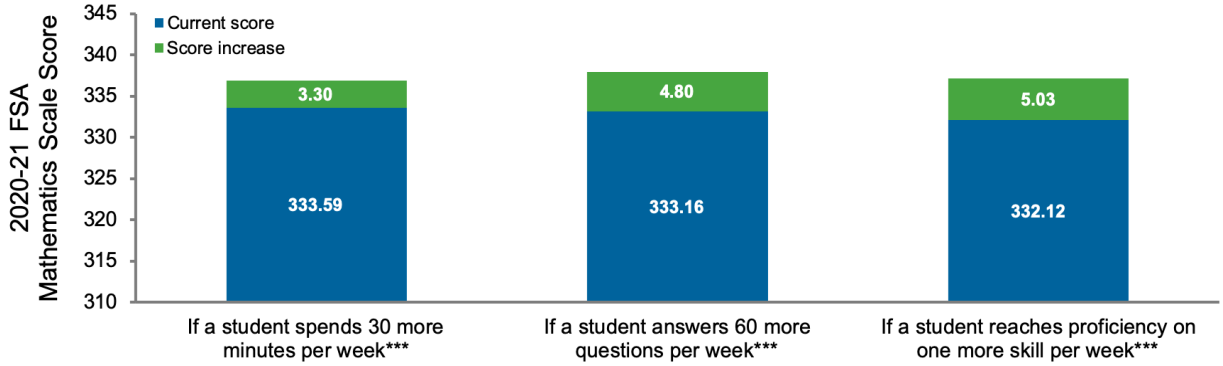
Executive Summary

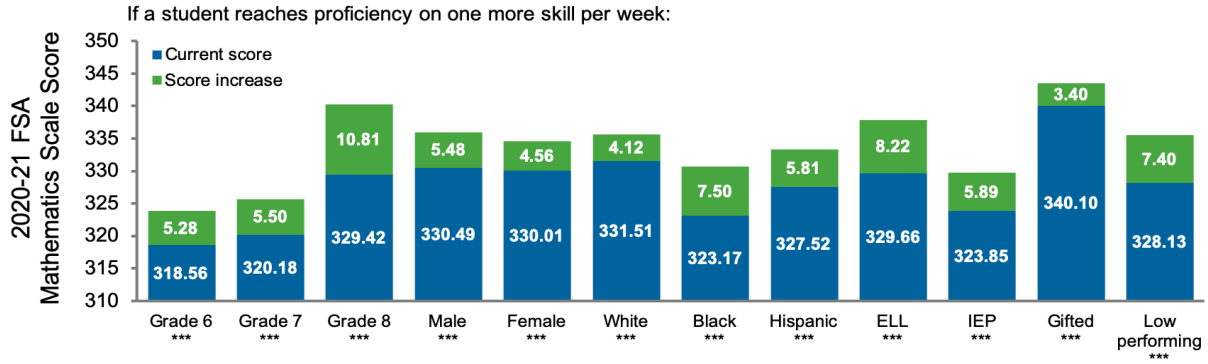
IXL is a personalized learning platform designed to help students in grades PreK-12 build academic skills in core subjects including math and English language arts. IXL has been shown to have a significant positive impact on students' academic performance (e.g., Bashkov, 2021; Empirical Education, 2013; IXL Learning, 2017).

To further evaluate the impact of IXL Math, especially among middle school students and student subgroups, we studied 11,669 students in grades 6 to 8 from 20 public schools in a large city school district in Florida. Using multilevel linear regression models to control for students' school membership, baseline performance in 2019, and demographic background, we found statistically significant and positive effects of IXL Math on students' 2021 Florida Standards Assessments (FSA) performance in math. Key findings include[1]:

- **More IXL Math practice is associated with better math performance.** Students performed significantly better on the 2021 FSA Mathematics test when they spent more time practicing on IXL, answering more questions, and reaching proficiency in more skills.



- **IXL supports a variety of student subgroups.** We found similar or even larger usage effects among different student subgroups, including groups by grade, gender, and race/ethnicity, as well as English language learners, special education students, gifted students, and low-performing students.



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

The Impact of IXL on Math Achievement in a Florida School District

Background

IXL is a powerful, flexible educational technology platform that provides personalized learning for students in grades PreK-12. It covers four main subject areas: mathematics, English language arts, science, and social studies. Currently, IXL is used by 22% of students in the U.S. and by over 13 million students worldwide. Deeply rooted in learning sciences research (see Bashkov et al., 2021), IXL engages each student in a personalized learning experience tailored to their working level. Numerous studies have consistently demonstrated the positive effects of IXL on student learning outcomes at various grade levels in different subjects (see https://www.ixl.com/research).

Study Design and Methodology

This study analyzed data from a total of 13,601 middle schoolers who used IXL Math during the 2020-21 school year. The students were attending 20 public schools from a large city school district in Florida, which serves more than 90,000 PreK-12 students. Data from four sources were used in this study: students' state math assessment data, their demographic data, their IXL Math practice data, and school-level demographic data.

DATA SOURCES

Student Assessment Data

The district provided the 2018-19 and 2020-21 state assessment data in math as well as the demographic background data for students. Every spring, the Florida Standards Assessments (FSA) are administered to students in grades 3 to 8. Both scale scores and performance levels are reported for the FSA Mathematics assessments. Performance levels range from 1 to 5, with Level 5 being the highest. For all assessments, Level 3 indicates satisfactory performance, with the minimum scale score in this level serving as the passing score for each assessment (see Understanding Florida Statewide Assessment Reports (2021-2022) for more details). In this study, Level 3 and above was used to indicate student proficiency.

As the Spring 2020 FSAs were canceled due to the COVID-19 pandemic, Spring 2019 FSA Mathematics was used as the pretest to control for students' baseline math performance before using IXL Math. Students' performance on the Spring 2021 FSA Mathematics served as the posttest and was used to examine the impact of IXL Math. This study design required students with both pretest and posttest scores available. Thus, 1,743 students missing pretest scores were excluded from the analysis, leaving a sample of 11,858.

Student Demographic Data

Demographic background information provided by the district included student grade, gender, race/ethnicity, English language learner (ELL) status, special education status, and gifted status. Among the 11,858 students, 4,900 (41%) were 6th grade students, 4,661 (39%) were 7th grade students, and 2,297 (19%) were 8th grade students. In terms of gender, 5,885 (50%) were female. About half of the students were White, 22% were Black, and 20% were Hispanic. There were 799 (7%) English language learners, 1,631 (14%) students with disabilities and 1,557 (13%) gifted students.

Student IXL Math Usage Data

Students' IXL Math usage data from the 2020-21 school year were retrieved from IXL's database[2]. IXL Math usage indicators included the amount of time spent on IXL Math (in minutes), the number of questions answered, and the number of skills in which students reached proficiency (i.e., skills proficient). See Table 1 for detailed information on weekly average IXL Math usage across the 2020-21 school year. There was a wide range of usage among the 11,858 students. For example, time spent on IXL Math ranged from 0 minutes to over 4 hours per week; the number of skills proficient ranged from 0 to over 16 skills per week.

Table 1. **IXL Math Usage**

Weekly IXL usage	*M*	*SD*	Min	Max
Time Spent (in minutes)	26.64	24.02	0.00	264.54
Questions answered	45.30	41.85	0.00	1700.21
Skills proficient	1.01	1.03	0.00	16.64

Using three standard deviations from the mean (i.e., 1.01+1.03*3 = 4.10 skills proficient per week), we identified 189 IXL "super-users." Compared to the whole sample, these super-users had better academic performance, with more students from 6th grade, more girls, and more white students. The super-user subgroup also contained fewer ELL and Special Education students, and more gifted students. Given these disparate sample characteristics, we treated the 189 super-users as outliers and removed them from the original sample in order to obtain a more accurate and generalizable estimate of the IXL effect. So the following analysis is based on the remaining 11,669 students.

School Demographic Data

School-level demographics, including school location, school size, school Title I status, student-teacher ratio, and percent of economically disadvantaged students, were retrieved from the website of the National Center for Education Statistics (https://nces.ed.gov/ccd/schoolsearch/). Half of the 20 schools are located in the city while the other half are in the suburbs. The average enrollment was 1,012, with a standard deviation of 230. Seventeen were Title I schools. On average, the student-

[2] Although the district officially adopted IXL Math in the 2020-21 school year, some individual schools or students used IXL in the 2019-20 school year. However, their usage was extremely low; on average, students spend less than 3 minutes on IXL per week. Therefore, we opted to focus only on the IXL usage and its impact in the 2020-21 school year.

teacher ratio was close to 19:1. About half of the students qualified for free- or reduced-price lunch. See Appendix A for more details on students' math performance, student demographics, and school-level demographics.

RESEARCH QUESTIONS

This study aimed to answer two research questions:

Research Question 1. What were the usage effects of IXL Math on students' 2021 FSA Mathematics performance, controlling for 2019 baseline math performance and demographic background? More specifically, what changes in performance would be expected with additional IXL Math usage?

Research Question 2. Were there similar usage effects of IXL Math on FSA Mathematics performance among student subgroups defined by grade, gender, and race/ethnicity, as well as ELLs, special education students, gifted students, and low-performing students?

ANALYTIC APPROACH

Multilevel linear regression models were used to examine the usage effect of IXL Math. These models specify students (Level 1) as clustered within schools (Level 2) and account for any shared variability among students attending the same school. At Level 1 (i.e., the student level), the outcome variable was students' scale scores on the 2021 FSA Mathematics assessment, controlling for the students' prior math performance in 2019 (i.e., scale scores on the 2019 FSA Mathematics assessment) and student demographic background, including student grade (i.e., Grade 6, Grade 7, or Grade 8), gender (i.e., Female or Male), race/ethnicity (i.e., Black, Hispanic, Other/Multiracial, or White), ELL status, special education (IEP) status, and gifted status. At Level 2 (i.e., the school level), we accounted for clustering and controlled for school-level demographics, including school location (i.e., City or Suburb), school Title I status, student-teacher ratio, and percent of economically disadvantaged students. All predictors were either dummy coded or grand mean-centered (see Appendices B and C).

Research Question 1. To examine the overall usage effects of IXL Math, three IXL Math usage indicators (amount of time spent on IXL Math, number of questions answered, and number of skills proficient) were added at Level 1 one at a time. Testing the predictive utility of each usage indicator exclusively helped avoid multicollinearity issues due to the strong correlations among these indicators (e.g., students who spent more time on IXL also practiced more skills).

Research Question 2. To evaluate the effects of IXL Math among student subgroups, we used similar multilevel linear regression models as described above with the number of skills proficient as the main and only predictor of interest. This set of analyses was conducted separately for each target subgroup with only students from that subgroup being analyzed, and the corresponding subgroup variable being removed from the related analysis as a covariate.

Following What Works Clearinghouse guidelines (WWC, 2020), each effect is accompanied by a statistical significance test with a probability (p) value. The p-value is the probability of observing the current or more extreme data, assuming the tested effect is zero (Cohen, 1994). As such, the smaller

the *p*-value, the less likely it is that the observed result occurred at random, with *p*-values less than .05 considered statistically significant. As there was no control or comparison group, Hedges' *g* is not applicable; however, we report a standardized regression coefficient to gauge the practical significance of IXL usage in terms of relative predictive utility among the covariates.

Results

THE USAGE EFFECT OF IXL MATH AMONG ALL STUDENTS

We calculated intraclass correlation coefficients (ICCs) to determine the degree of clustering, as students were nested within schools. The ICC was .163 for 2021 FSA Mathematics scores, justifying the use of multilevel linear regression models.

Overall results showed positive and statistically significant associations between all three IXL usage indicators and 2021 FSA Mathematics performance: the amount of time spent on IXL Math, the number of questions answered, and the number of skills proficient were all significant predictors of 2021 FSA Mathematics scale scores (all *p* values < .001). See Tables B1, B2, and B3 in Appendix B for the full regression results. The results indicated that the more a student practiced on IXL Math, the better he or she performed on the 2021 FSA Mathematics assessment. Figure 1 shows the expected improvement in FSA Mathematics scale scores with additional IXL Math usage during the school year.

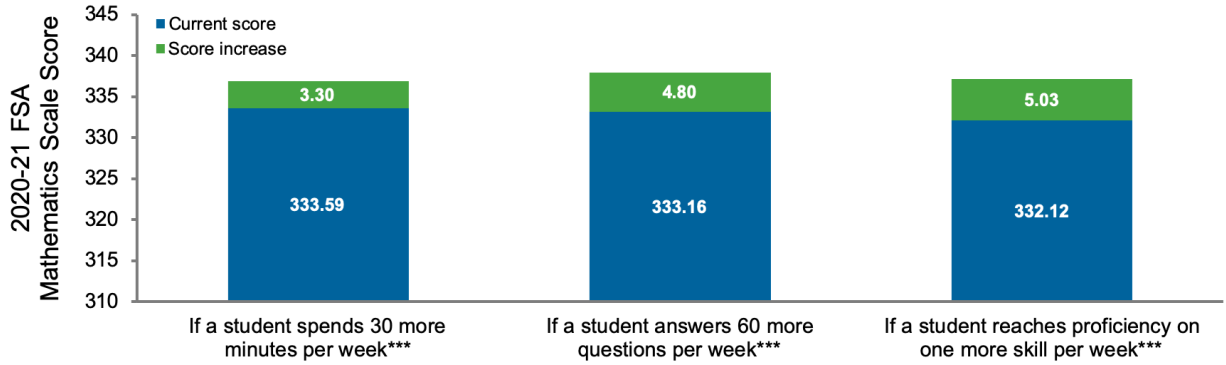


Figure 1. The Usage Effect of IXL Math[3]

Specifically, with each additional minute spent on IXL Math per week, an average student's FSA Mathematics scale score is expected to increase by 0.11 points. For example, if a student practiced for 30 more minutes per week, their math score would increase by 3.30 points. For each additional question answered per week, a student's FSA Mathematics scale score is expected to increase by 0.08 points. In other words, if a student answered 60 more questions per week, their math score would increase by 4.80 points. Finally, reaching proficiency in one additional IXL Math skill a week was associated with an expected increase of 5.03 points.

[3] Current score is the average scale score after adjusting for prior performance and demographic characteristics in the model. It is the intercept in the models presented in Appendix B.

THE USAGE EFFECT OF IXL MATH AMONG STUDENT SUBGROUPS

We evaluated the usage effect of IXL Math for a variety of student subgroups, using the number of skills proficient as the main predictor of interest. The target subgroups that we tested included groups by grade, gender, and race/ethnicity, as well as English language learners, special education students, gifted students, and low-performing students.

In sum, we found similar or even larger usage effects for all the student subgroups that we tested (all *p* values < .001). The results indicated that the more a student practiced on IXL, the better they performed on the 2021 FSA Mathematics compared to his or her peers. See Table C in Appendix C for more detail. Figure 2 shows the expected improvement in FSA Mathematics scale scores with reaching proficiency in each additional skill.

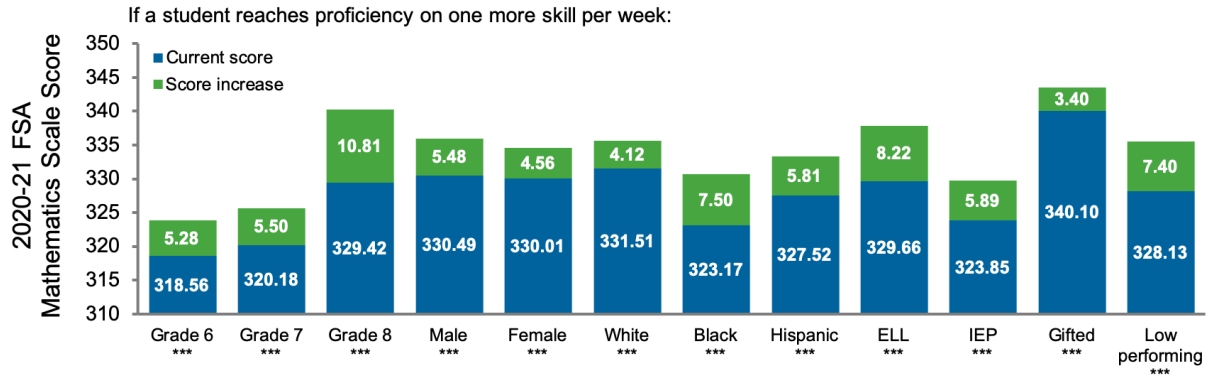


Figure 2. The Usage Effect of IXL Math Among Student Subgroups[4]

In sum, we found larger IXL usage effects among all students subgroups after dropping the super-users. Specifically, reaching proficiency in each additional IXL Math skill was associated with an expected increase in FSA Mathematics scale score of 5.28 points for students in Grade 6, 5.50 points for students in Grade 7, and 10.81 points for students in Grade 8. In terms of gender, the effects were similar for male and female students, with 5.48 points of increase for boys and 4.56 for girls. In terms of race/ethnicity, Black students had the largest expected improvement with additional IXL Math usage: a student's math score would increase by 7.50 points for each additional "skill proficient" (i.e., a SmartScore of 80 or higher) per week. The expected increase in scores was 5.81 for Hispanic students and 4.12 for White students.

We examined the efficacy of IXL Math among several more subgroups of students. With each additional skill proficient per week, an ELL student's math score would increase by 8.22 points, a special education student's math score would increase by 5.89 points, and a gifted student's math score would increase by 3.40 points. For low-performing students, defined as students who did not reach proficiency on the 2019 FSA Mathematics assessment, each additional IXL Math skill proficient per week is expected to help them gain 7.40 points on the FSA Mathematics assessment.

[4] Current score is the average scale score after adjusting for prior performance and demographic characteristics in the model. It is the intercept in each model.

Conclusion

This study found a positive and statistically significant association between IXL Math practice and 2021 FSA Mathematics performance. The amount of time spent on IXL, the number of questions answered, and the number of skills in which students reached proficiency were all statistically significant predictors of student scale scores on the 2021 FSA Mathematics test. Based on the present study and prior research, we expect our findings to generalize to other similar middle schools in Florida and in other states—the more students practice with IXL Math, the better they will perform on state math assessments. Importantly, the effects of IXL Math are cumulative, so schools seeking larger assessment gains in math should encourage additional practice with IXL Math. IXL recommends that students aim to reach proficiency in at least two IXL skills per week to see sizable gains in academic achievement.

Moreover, the usage effects found in the full sample applied to a variety of student subgroups, including groups by grade, gender, and race/ethnicity, as well as English language learners, special education students, gifted students, and low-performing students. Some of these effects were even larger for these subgroups, especially for students in Grade 8, Black students, English language learners, and low-performing students. In sum, IXL supports a variety of student subgroups and is a unique and highly effective solution for schools that are specifically targeting gains in achievement for students from diverse backgrounds.

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Appendix A: Student Demographic Characteristics

Table A. Student and school demographics

	n	Percentage	*M*	*SD*
Student demographics	**11,669**			
Pretest and posttest				
2019 Mathematics FSA scale score			317.59	22.89
2021 Mathematics FSA scale score			322.94	24.89
2019 Mathematics FSA proficiency	6,175	52.92%		
2021 Mathematics FSA proficiency	5,076	43.50%		
Grade				
6	4,771	40.89%		
7	4,602	39.44%		
8	2,296	19.68%		
Gender				
Female	5,783	49.56%		
Male	5,886	50.44%		
Race/Ethnicity				
Black	2,546	21.82%		
Hispanic	2,320	19.88%		
Other/Multi.	1,093	9.37%		
White	5,710	48.93%		
Status				
ELL	794	6.80%		
IEP	1,616	13.85%		
Gifted	1,502	12.87%		
School demographics	**20**			
Location				
City	10	50.00%		
Suburb	10	50.00%		
Title I	17	85.00%		
Enrollment			1012.05	230.34
Student-Teacher Ratio			19.08	0.99
% Economic Disadvantaged			48.72	16.29

Appendix B: Usage Effects of IXL Math Among All Students

Table B1. Usage effects of IXL Math on 2021 Mathematics FSA: Time Spent

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	333.59	2.62	329.06 – 338.15	.00	127.11	< .001
Location: City[1]	-0.02	1.34	-2.33 – 2.28	.00	-0.02	.988
Title I[2]	-4.72	2.44	-8.93 – -0.51	-.06	-1.93	.074
Enrollment[3]	-0.01	0.00	-0.01 – 0.00	-.04	-1.94	.072
Student-teacher ratio[3]	2.08	0.61	1.03 – 3.13	.08	3.42	.004
% Economically disadvantaged[3]	-0.03	0.07	-0.14 – 0.08	-.02	-0.45	.661
Grade 6[4]	-10.91	0.38	-11.64 – -10.16	-.22	-28.83	< .001
Grade 7[4]	-6.59	0.38	-7.33 – -5.84	-.13	-17.25	< .001
Gender: male[5]	0.11	0.27	-0.42 – 0.64	.00	0.41	.682
Race: White[6]	-0.59	0.48	-1.54 – 0.35	-.01	-1.23	.219
Race: Black[6]	-5.90	0.55	-6.98 – -4.81	-.10	-10.65	< .001
Race: Hispanic[6]	-2.21	0.55	-3.27 – -1.13	-.04	-4.05	< .001
ELL[7]	-2.16	0.59	-3.30 – -0.99	-.02	-3.67	< .001
IEP[8]	-6.87	0.41	-7.66 – -6.06	-.10	-16.81	< .001
Gifted[9]	7.26	0.46	6.36 – 8.15	.10	15.87	< .001
2019 Mathematics FSA[3]	0.72	0.01	0.70 – 0.73	.66	98.09	< .001
IXL Math: time spent[10]	**0.11**	**0.01**	**0.09 – 0.12**	**.10**	**15.88**	**< .001**

Note. Dependent variable: Scaled score on 2021 Mathematics FSA. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient. [1] Dummy coded; Suburb as reference group; [2] Dummy coded; non-Title I as reference group; [3] Grand mean-centered; [4] Dummy coded: grade 8 as reference group; [5] Dummy coded; female as reference group; [6] Dummy coded; Other/Multi. as reference group; [7] Dummy coded; non-ELLs as reference group; [8] Dummy coded; non-disadvantaged students as reference group; [9] Dummy coded; non-gifted students as reference group; [10] Weekly average amount; time in minutes.

Table B2. Usage effects of IXL Math on 2021 Mathematics FSA: Questions Answered

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	333.16	2.72	328.46 – 337.87	.00	122.59	< .001
Location: City[1]	0.29	1.39	-2.11 – 2.68	.01	0.21	.839
Title I[2]	-4.60	2.53	-8.96 – -0.23	-.06	-1.82	.091
Enrollment[3]	-0.01	0.00	-0.01 – 0.00	-.04	-1.93	.073
Student-teacher ratio[3]	2.04	0.63	0.95 – 3.12	.08	3.23	.006
% Economically disadvantaged[3]	-0.05	0.07	-0.16 – 0.07	-.03	-0.69	.501
Grade 6[4]	-11.42	0.38	-12.16 – -10.66	-.23	-29.90	< .001
Grade 7[4]	-6.79	0.38	-7.53 – -6.03	-.13	-17.76	< .001
Gender: male[5]	-0.09	0.27	-0.62 – 0.44	.00	-0.33	.739
Race: White[6]	-0.63	0.48	-1.58 – 0.31	-.01	-1.31	.190
Race: Black[6]	-5.65	0.55	-6.73 – -4.57	-.09	-10.22	< .001
Race: Hispanic[6]	-2.01	0.54	-3.07 – -0.94	-.03	-3.70	< .001
ELL[7]	-2.30	0.59	-3.44 – -1.14	-.02	-3.92	< .001
IEP[8]	-6.83	0.41	-7.63 – -6.03	-.10	-16.76	< .001
Gifted[9]	7.36	0.46	6.47 – 8.26	.10	16.13	< .001
2019 Mathematics FSA[3]	0.71	0.01	0.70 – 0.73	.66	97.54	< .001
IXL Math: questions answered[10]	**0.08**	**0.00**	**0.07 – 0.08**	**.11**	**17.37**	**< .001**

Note. Dependent variable: Scaled score on 2021 Mathematics FSA. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient. [1] Dummy coded; Suburb as reference group; [2] Dummy coded; non-Title I as reference group; [3] Grand mean-centered; [4] Dummy coded: grade 8 as reference group; [5] Dummy coded; female as reference group; [6] Dummy coded; Other/Multi. as reference group; [7] Dummy coded; non-ELLs as reference group; [8] Dummy coded; non-disadvantaged students as reference group; [9] Dummy coded; non-gifted students as reference group; [10] Weekly average amount.

Table B3. Usage effects of IXL Math on 2021 Mathematics FSA: Skill Proficient

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	330.23	3.18	324.74 – 335.75	.00	103.78	< .001
Location: City[1]	0.39	1.63	-2.43 – 3.20	.01	0.24	.816
Title I[2]	-2.70	2.98	-7.85 – 2.44	-.03	-0.91	.380
Enrollment[3]	-0.01	0.00	-0.01 – 0.00	-.06	-2.22	.042
Student-teacher ratio[3]	2.22	0.74	0.94 – 3.50	.08	2.98	.010
% Economically disadvantaged[3]	-0.03	0.08	-0.17 – 0.10	-.02	-0.42	.682
Grade 6[4]	-12.19	0.38	-12.91 – -11.44	-.24	-32.45	< .001
Grade 7[4]	-7.04	0.37	-7.77 – -6.30	-.14	-18.80	< .001
Gender: male[5]	-0.06	0.27	-0.58 – 0.46	.00	-0.21	.834
Race: White[6]	-0.60	0.47	-1.53 – 0.33	-.01	-1.26	.206
Race: Black[6]	-5.62	0.54	-6.68 – -4.56	-.09	-10.34	< .001
Race: Hispanic[6]	-1.85	0.54	-2.90 – -0.80	-.03	-3.46	.001
ELL[7]	-2.08	0.58	-3.20 – -0.94	-.02	-3.60	< .001
IEP[8]	-6.63	0.40	-7.41 – -5.84	-.09	-16.55	< .001
Gifted[9]	7.13	0.45	6.25 – 8.00	.10	15.93	< .001
2019 Mathematics FSA[3]	0.68	0.01	0.67 – 0.69	.62	92.24	< .001
IXL Math: skill proficient[10]	**5.03**	**0.19**	**4.64 – 5.38**	**.18**	**27.00**	**< .001**

Note. Dependent variable: Scaled score on 2021 Mathematics FSA. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient. [1] Dummy coded; Suburb as reference group; [2] Dummy coded; non-Title I as reference group; [3] Grand mean-centered; [4] Dummy coded: grade 8 as reference group; [5] Dummy coded; female as reference group; [6] Dummy coded; Other/Multi. as reference group; [7] Dummy coded; non-ELLs as reference group; [8] Dummy coded; non-disadvantaged students as reference group; [9] Dummy coded; non-gifted students as reference group; [10] Weekly average amount.

Appendix C: Usage Effects of IXL Math Among Student Subgroups

Table C. Usage effects of IXL Math on 2021 Mathematics FSA by student subgroup

Student subgroup	*b*	*SE*	95% CI	β	*t*	*p*
Grade 6	5.28	0.27	4.72 – 5.78	.19	19.67	< .001
Grade 7	5.50	0.30	4.84 – 6.03	.19	18.39	< .001
Grade 8	10.81	0.79	9.09 – 12.23	.24	13.67	< .001
Gender: male	5.48	0.28	4.89 – 5.99	.18	19.58	< .001
Gender: female	4.56	0.25	4.05 – 5.02	.17	18.57	< .001
Race: White	4.12	0.24	3.63 – 4.56	.17	17.42	< .001
Race: Black	7.50	0.56	6.32 – 8.52	.20	13.46	< .001
Race: Hispanic	5.81	0.44	4.84 – 6.59	.19	13.18	< .001
ELL	8.22	0.93	6.33 – 9.93	.25	8.80	< .001
IEP	5.89	0.65	4.49 – 7.07	.17	9.00	< .001
Gifted	3.40	0.38	2.57 – 4.09	.19	8.84	< .001
Low Performing	7.40	0.36	6.66 – 8.08	.22	20.44	< .001

Note. Dependent variable: Scaled score on 2021 FSA Mathematics. This table summarizes the estimates for the main predictor (i.e., reaching proficiency in one additional IXL Math skill per week) in each student subgroup one at a time, controlling for baseline performance and all other demographics.