RESEARCH REPORT

November 2023

The Impact of IXL on Maths Learning in a Northamptonshire Primary School

Christina Schonberg, Ph.D.

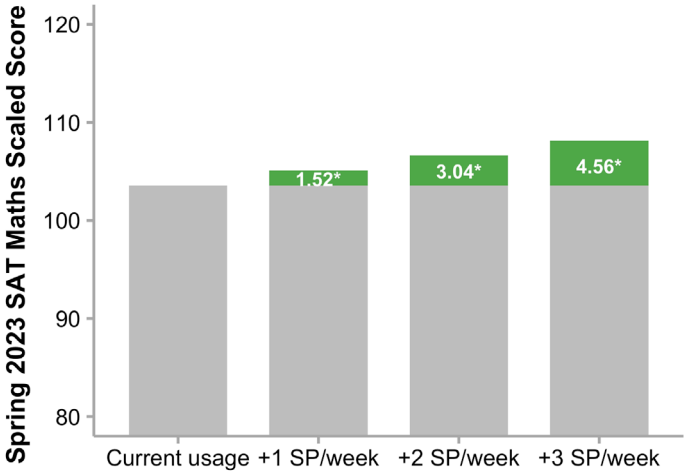
IXL LEARNING 777 Mariners Island Blvd., Suite 600, San Mateo, CA 94404
650-372-4040 | www.ixl.com

Executive Summary

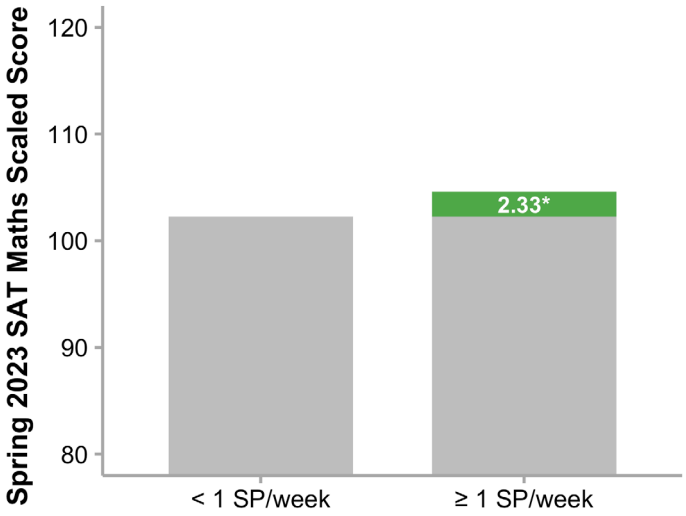
IXL is an end-to-end teaching and learning solution that engages learners in Reception through Year 13 with a comprehensive curriculum and personalised recommendations for meeting learning goals. Previous research has shown that IXL can have a significant positive impact on pupils' academic performance (Bashkov, 2021; Empirical Education, 2013).

The goal of this study was to examine the impact of IXL usage on Key Stage 2 Standard Assessment Test (KS2 SAT) maths achievement among Year 6 pupils in one primary school in Northamptonshire, England. Using a pretest-posttest design, we found

- **Higher IXL Maths usage was associated with better KS2 SAT maths performance.** Pupils performed better on the assessment when they reached proficiency in more skills on IXL.



- **Using IXL Maths with fidelity was associated with better KS2 SAT maths performance.** Pupils who reached proficiency in at least 1 IXL Maths skill per week (SP/week) outperformed pupils who did not meet this threshold.



[1] *Note*. In all figures, * indicates statistical significance at the $p < .05$ level. SP = skills proficient (i.e., SmartScore of 80+)

The Impact of IXL on Maths Learning in a Northamptonshire Primary School

Background

IXL is an end-to-end teaching and learning solution that engages learners in Reception through Year 13 with a comprehensive curriculum and personalised recommendations for meeting learning goals. IXL's UK edition provides adaptive skill practice in both mathematics and English. As of this writing, IXL is used by about 100,000 pupils in the UK and more than 14 million pupils worldwide. IXL is deeply rooted in learning science research (see Bashkov et al., 2021) and engages each pupil in a personalised learning experience tailored to their working level. As a result, pupils work through problems that are neither too easy nor too difficult, which in turn supports their self-efficacy and motivation for continued learning.

The goal of the present study was to examine the impact of IXL usage on maths achievement among Year 6 pupils in one primary school in Northamptonshire, England. Specifically, we examined the relationship between the amount of IXL Maths usage and pupil performance on the Key Stage 2 Standard Assessment Tests (KS2 SATs) in maths.

RESEARCH QUESTIONS

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

1. **Usage effects of IXL Maths:** Controlling for baseline performance and demographics, how did the amount of IXL Maths usage (i.e., skills proficient per week) relate to pupils' scores on the KS2 SATs in maths?
2. **Implementation fidelity of IXL Maths:** Controlling for baseline performance and demographics, did pupils who met an IXL usage threshold of one skill proficient per week perform significantly better on the KS2 SATs in maths compared to pupils who did not meet this usage threshold?

Study Design and Methodology

DATA SOURCES

Assessment and Demographic Data

The participating primary school in Northamptonshire shared pupil-level demographic data as well as Spring 2023 KS2 SAT scaled scores in maths. KS2 SAT scaled scores range from 80 to 120, and a score of 100 or higher indicates that a pupil has met the expected standard. In this sample, pupils' average maths score was 101.84 (*SD* = 8.70). For more information about the KS2 SATs, see the UK Standards & Testing Agency's national curriculum assessments website.

IXL Usage Data

IXL usage data were obtained from IXL's database. When pupils use IXL, they complete practice problems organised within "skills," or specific topic areas within a subject. IXL uses a proprietary *SmartScore* to indicate a pupil's proficiency within a skill. The SmartScore ranges from 0-100 and increases as pupils 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 pupils should aim to reach proficiency in at least two skills per week (SP/week; An et al., 2022). Pupils' average IXL Maths usage during the 2022-23 school year is presented in Table 1.

Table 1. **Pupils' IXL Maths Usage During the 2022-23 School Year**

Weekly IXL usage	IXL Maths (*n* = 58)			
	M	*SD*	Min	Max
Questions answered	62.12	32.96	6.47	175.22
Skills proficient	1.29	0.69	0.24	3.15
Time spent (in minutes)	15.73	5.80	2.04	29.49

IXL Real-Time Diagnostic data were also obtained from IXL's database. When a pupil completes a sufficient number of questions in a subject (maths or English) in IXL's Diagnostic, they receive a pinpointed score that indicates their overall year-level proficiency in that subject. For example, a score of 550 indicates that the pupil has acquired about 50% of Year 5 material, whereas a score of 600 indicates that the pupil is ready to learn Year 6 material. Pupils' IXL Diagnostic maths scores from the beginning of the 2022-23 academic year were used as a measure of baseline performance in the analysis.

PARTICIPANTS

We included data from pupils with any amount of IXL usage in the 2022-23 school year as well as non-missing pretest and posttest data, resulting in a sample size of 58 pupils. Overall, the sample was 51.7% boys, 6.9% children eligible for free meals, 8.6% children learning English as an additional language (EAL), and 13.8% children with special educational needs (SEN). The ethnic makeup of the sample was as follows: 6.9% Asian, 6.9% multiracial or other ethnic group, 1.7% White or Black Caribbean, and 84.5% White (British or any other background).

[2] Data from one additional pupil were obtained but excluded due to their status as an outlier. Specifically, this pupil scored above year-level on IXL's Diagnostic in maths at both the beginning and the end of the school year, but they received the lowest possible KS2 SAT maths score.

ANALYSIS

For each research question, we specified and tested a linear regression model. Following What Works Clearinghouse (WWC) guidelines (WWC, 2022), each model regressed KS2 SAT maths scaled score on an IXL predictor and the following covariates: beginning-of-year IXL Diagnostic maths score (i.e., baseline performance), gender, ethnicity, EAL status, and SEN status. In the model for Research Question 1, the IXL predictor was pupils' SP/week. In the model for Research Question 2, the IXL predictor was a binary variable that indicated whether a pupil had or had not met a usage threshold of 1 SP/week. Here, we used a slightly lower threshold (i.e., 1 SP/week) to indicate implementation fidelity, as the sample's overall mean usage was less than 2 SP/week (see An et al., 2022).

Following WWC (2022) guidelines, 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. 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 0.10–0.20, and effect sizes of about 0.20 or higher are considered large (Kraft, 2020; Lipsey et al., 2012).

Results

RESEARCH QUESTION 1: USAGE EFFECTS OF IXL

Controlling for baseline performance and demographics, we found a positive, statistically significant effect of IXL Maths usage (as measured by SP/week) on KS2 SAT maths performance (b = 1.52, p = .045, β = 0.12). That is, based on model coefficients and typical usage amounts, reaching proficiency in one additional IXL Maths skill per week is associated with roughly a 1.5-point increase in a pupil's KS2 SAT maths scaled score (see Figure 1). Full model results are reported in Table A1 (Appendix).

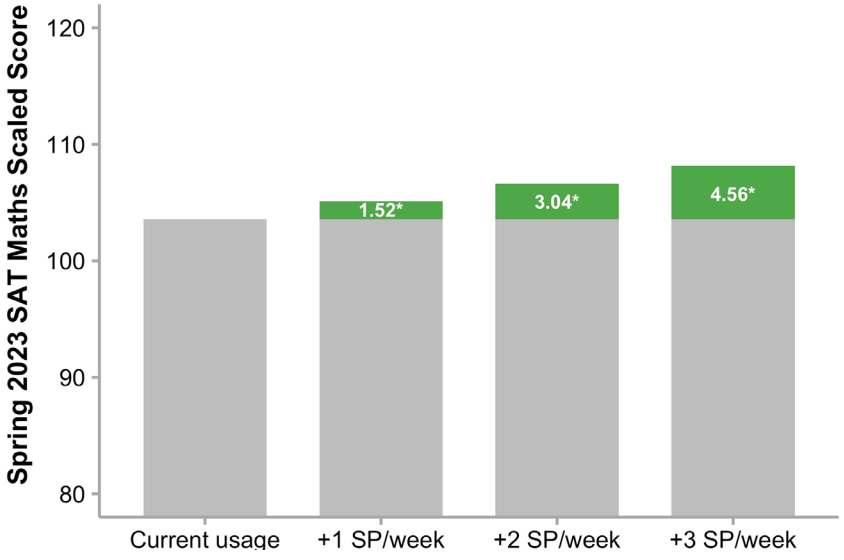


Figure 1. Expected usage effects of IXL Maths on KS2 SAT maths scaled score.
Note: SP/week = skills proficient per week.

RESEARCH QUESTION 2: IMPLEMENTATION FIDELITY OF IXL

We found that pupils who met or exceeded the 1 SP/week threshold (*n* = 36) outperformed pupils who used IXL but did not meet this threshold (*n* = 22). Controlling for baseline performance and covariates, pupils who met the 1 SP/week threshold had maths scaled scores about 2 points higher, on average, than pupils who did not meet this threshold (*b* = 2.33, *p* = .031); the effect size (Hedges' *g*) was .27. Full model results are reported in Table A2 (Appendix).

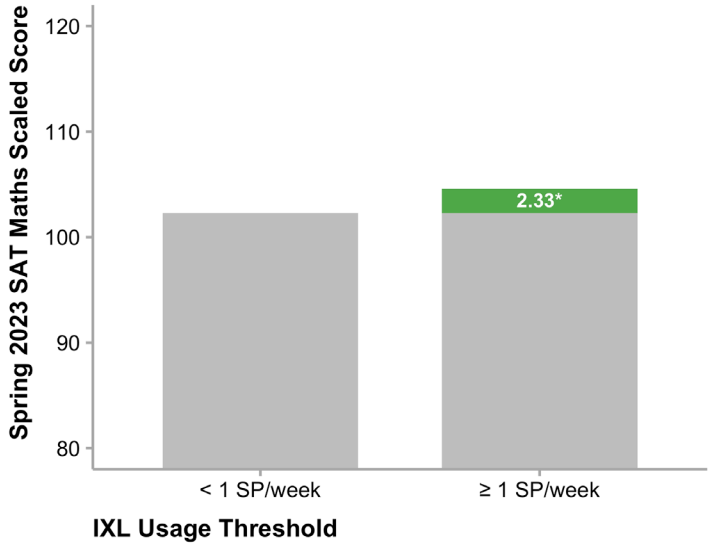


Figure 2. Effects of IXL Maths when implemented at < 1 SP/week vs. ≥ 1 SP/week.
Note: SP/week = skills proficient per week.

Discussion and Recommendations

In this study, we investigated how IXL Maths usage among primary school pupils related to their performance on the KS2 SATs in maths. Controlling for baseline performance and demographics, we found that greater IXL usage was associated with larger performance gains. Furthermore, pupils who used IXL with fidelity outperformed those who did not. These results add to the body of work showing that IXL boosts academic achievement (e.g., An, 2023; Hargis, 2023; Schonberg, 2022; Xiong, 2022).

At this school, pupils' average usage of IXL was slightly lower than IXL's recommendation of reaching proficiency in two skills per week (An et al., 2022). Nevertheless, pupils who reached proficiency in at least one IXL Maths skill per week performed better than pupils who did not reach this threshold. As prior research has shown that interventions are more effective when they are carried out with fidelity (see Finney et al., 2021; Noell et al., 2002), we anticipate that pupils would experience even greater gains with increased usage. Thus, we recommend that teachers encourage pupils to reach proficiency in at least two skills per week.

Taken together, these results show that IXL is a powerful platform that significantly boosts pupils' learning. IXL's personalised approach is especially important as pupils continue to recover from the educational impacts of the COVID-19 pandemic, as personalised learning can both help pupils close existing knowledge gaps and boost future learning gains (Kaffenberger, 2021). To optimise pupils' personalised skill recommendations, we highly recommend that pupils regularly complete IXL's Real-Time Diagnostic, an interim assessment that pinpoints current knowledge levels in key strands of maths and English. The diagnostic integrates seamlessly with IXL's comprehensive curriculum: Upon completing the diagnostic, pupils receive personalised action plans based on their performance, providing them with a list of the exact skills they should practise next. With IXL's personalised support, pupils can confidently unlock their academic potential and fully prepare for every learning milestone along the way.

References

An, X. (2023). *The impact of IXL Math on middle and high school math learning in a Virginia school* district (pp. 1–17). https://www.ixl.com/materials/us/research/The_Impact_of_IXL_Math_on_Middle_and_High_School_Math_(VA).pdf

An, X., Schonberg, C., & Bashkov, B. M. (2022). *IXL implementation fidelity and usage recommendations* (pp. 1–17). https://www.ixl.com/materials/us/research/IXL_Implementation_Fidelity_and_Usage_Recommendations.pdf

Bashkov, B. M. (2021). *Assessing the impact of IXL Math over three years: A quasi-experimental study* (pp. 1–11). https://www.ixl.com/materials/us/research/IXL_Math_3-Year_QED_ESSA_Tier_2.pdf

Bashkov, B. M., Mattison, K., & Hochstein, L. (2021). *IXL design principles: Core features grounded in learning science research* (pp. 1–16). https://www.ixl.com/research/IXL_Design_Principles.pdf

Cohen, J. (1994). The earth is round ($p < .05$). *American Psychologist*, 49(12), 997–1003.

Empirical Education. (2013). *A study of student achievement, teacher perceptions, and IXL Math* (pp. 1–12). https://www.empiricaleducation.com/pdfs/IXLfr.pdf

Finney, S. J., Wells, J. B., & Henning, G. W. (2021). *The need for program theory and implementation fidelity in assessment practice and standards* (Occasional Paper No. 52; pp. 1–19). University of Illinois and Indiana University, National Institute for Learning Outcomes Assessment (NILOA).

Hargis, M. B. (2023). *The impact of IXL on Smarter Balanced Assessment performance in math and ELA* (pp. 1–12). https://www.ixl.com/materials/us/research/The_Impact_of_IXL_on_SBA_in_Math_and_ELA.pdf

Kaffenberger, M. (2021). Modelling the long-run learning impact of the Covid-19 learning shock: Actions to (more than) mitigate loss. *International Journal of Educational Development, 81,* 102326. https://doi.org/10.1016/j.ijedudev.2020.102326

Kraft, M. A. (2020). Interpreting effect sizes of education interventions. *Educational Researcher, 49*(4), 241–253. https://doi.org/10.3102/0013189X20912798

Lipsey, M. W., Puzio, K., Yun, C., Hebert, M. A., Steinka-Fry, K., Cole, M. W., Roberts, M., Anthony, K. S., & Busick, M. D. (2012). *Translating the Statistical Representation of the Effects of Education Interventions Into More Readily interpretable Forms* (NCSER 2013-3000; pp. 1–54). National Center for Special Education Research, Institute of Education Sciences. http://ies.ed.gov/ncser

Noell, G., Gresham, F., & Gansle, K. (2002). Does treatment integrity matter? A preliminary investigation of instructional implementation and mathematics performance. *Journal of Behavioral Education, 11*, 51–67.

Schonberg, C. (2022). *The impact of IXL on math and ELA learning in Georgia* (pp. 1–14). https://www.ixl.com/materials/us/research/The_Impact_of_IXL_in_Georgia_(2022).pdf

What Works Clearinghouse. (2022). *What Works Clearinghouse procedures and standards handbook, version 5.0*. U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance (NCEE). This report is available on the What Works Clearinghouse website at https://ies.ed.gov/ncee/wwc/Handbooks

Xiong, Y. (2022). *The impact of IXL on ELA learning in Iowa* (pp. 1–11). https://www.ixl.com/materials/us/research/Impact_of_IXL_in_Iowa.pdf

Appendix

Table A1. Full Model Predicting Spring 2023 KS2 SAT Mathematics Scaled Score from IXL Maths Skills Proficient and Covariates

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	103.58	1.51	100.54 – 106.62	0.00	68.419	<.001
EAL status[1]	-0.41	1.90	-4.23 – 3.40	-0.01	-0.218	.828
SEN status[2]	-4.69	1.56	-7.82 – -1.56	-0.19	-3.010	.004
Gender: male[3]	2.36	1.05	0.26 – 4.46	0.14	2.255	.028
Ethnicity: White[4]	-2.52	1.53	-5.60 – 0.56	-0.11	-1.643	.107
Autumn 2022 diagnostic score[5]	0.05	0.00	0.04 – 0.06	0.74	10.900	<.001
IXL Maths Skills Proficient[5,6]	**1.52**	**0.74**	**0.03 – 3.00**	**0.12**	**2.053**	**.045**

Note. Dependent variable: Spring 2023 KS2 SAT maths score. *b* = unstandardised regression coefficient, *SE* = standard error, CI = confidence interval, β = standardised regression coefficient.

[1] Dummy coded; non-EAL pupils as reference group.

[2] Dummy coded; non-SEN pupils as reference group.

[3] Dummy coded; female pupils as reference group.

[4] Dummy coded; non-White pupils as reference group.

[5] Grand-mean centred.

[6] Average weekly amount.

Appendix

Table A2. Full Model Predicting Spring 2023 KS2 SAT Mathematics Scaled Score from IXL Maths Usage Threshold (≥ 1 SP/week) and Covariates

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	102.27	1.59	99.08 – 105.46	-0.17	64.310	<.001
EAL status[1]	-0.58	1.89	-4.38 – 3.21	-0.02	-0.309	.759
SEN status[2]	-4.92	1.55	-8.04 – -1.80	-0.20	-3.169	.003
Gender: male[3]	2.56	1.05	0.46 – 4.66	0.15	2.445	.018
Ethnicity: White[4]	-2.75	1.53	-5.83 – 0.33	-0.12	-1.793	.079
Autumn 2022 diagnostic score[5]	0.05	0.00	0.04 – 0.06	0.73	10.711	<.001
≥ 1 SP/week[6]	**2.33**	**1.05**	**0.22 – 4.44**	**0.27**	**2.222**	**.031**

Note. Dependent variable: Spring 2023 KS2 SAT maths score. *b* = unstandardised regression coefficient, *SE* = standard error, CI = confidence interval, β = standardised regression coefficient.

[1] Dummy coded; non-EAL pupils as reference group.

[2] Dummy coded; non-SEN pupils as reference group.

[3] Dummy coded; female pupils as reference group.

[4] Dummy coded; non-White pupils as reference group.

[5] Grand-mean centred.

[6] Dummy coded; pupils reaching < 1 SP/week as reference group.