RESEARCH REPORT

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The Impact of IXL ELA on Early Literacy Development

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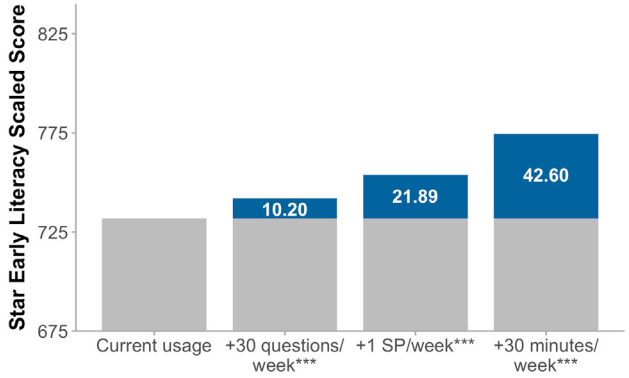
Executive Summary

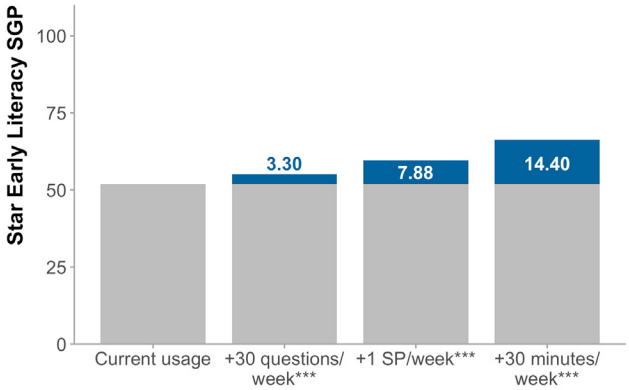
IXL is an end-to-end teaching and learning solution that engages learners in grades Pre-K through 12 with a comprehensive curriculum and personalized recommendations for meeting learning goals. Previous research has shown that IXL can have a significant positive impact on students' academic performance (Bashkov, 2021; Empirical Education, 2013), including early literacy (Schonberg, 2022).

The goal of this study was to examine IXL ELA usage among early elementary students (kindergarten through grade 3) in a large, suburban Oklahoma school district and its impact on their literacy development, as measured by the Star Early Literacy Assessment. Using a pretest-posttest design, we found that:

- **Higher IXL ELA usage was associated with better Star Early Literacy performance.** Students performed better on the assessment when they answered more questions, reached proficiency in more skills (SP), and/or spent more time on IXL[1].



- **Higher IXL ELA usage was associated with greater literacy growth.** Students who used IXL more showed larger gains in Star Early Literacy student growth percentile (SGP).



[1] *Note.* In all figures, *** indicates statistical significance at the $p < .001$ level. SP = skills proficient (i.e., SmartScore of 80+)

Background

IXL is an end-to-end teaching and learning solution that engages learners in grades Pre-K through 12 with a comprehensive curriculum and personalized recommendations for meeting learning goals. It covers four main subject areas: mathematics, English language arts (ELA), science, and social studies. Currently, IXL is used by 24% 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. 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.

IXL ELA AND THE SCIENCE OF READING

Decades of reading science research have shown what students need in order to become strong readers. In 2000, the National Reading Panel released a comprehensive report that reviewed the empirical evidence in five key areas for producing strong readers: phonemic awareness, explicit and systematic phonics instruction, fluency, vocabulary, and comprehension. IXL's ELA curriculum provides strong support in each of these areas.

Phonemic Awareness

IXL ELA for the youngest grades (Pre-K through 2) emphasizes phonemic awareness, which is critical for learning to read (Ball & Blachman, 1991; Rice et al., 2022). Before beginning to read, children must develop an understanding of the different sounds of English. Phonemic awareness specifically involves understanding the sounds that make up individual words. As such, phonemic awareness is strongly related to the development of the alphabetic principle—being able to link phonemes and letters (e.g., Castles et al., 2009; Castles & Coltheart, 2004; Hulme et al., 2012). To support the development of phonemic awareness, IXL includes skills that teach students how to hear and identify individual sounds in words as well as how to blend sounds together to create a word. For example, one kindergarten skill in IXL ELA asks students to identify words that start with a given sound (e.g., /b/). In a later skill, students are asked to listen to a word said aloud and identify the consonant blend that it starts with (e.g., /dr/).

Explicit and Systematic Phonics Instruction

Hundreds of studies have shown that phonics instruction is the best way to support early literacy development, and specifically, this instruction needs to be both explicit and systematic (for review, see Castles et al., 2018; National Reading Panel, 2000). Explicit instruction means that phonics instruction is purposeful and focused, rather than incidental; students need to be taught the associations between letters and sounds and cannot be expected to develop this understanding organically. Systematic instruction means that the instruction follows a logical progression from easier concepts, such as consonant sounds, to more difficult ones, such as diphthongs and r-controlled vowels. IXL ELA offers a robust set of phonics skills for early readers in its content for

grades Pre-K through 2, and the skills progress in exactly this systematic manner. Through IXL's interactive platform, students have the opportunity to apply what they are learning and practice on appropriate examples. See https://www.ixl.com/ela/phonics for a deeper look into IXL's phonics curriculum.

Fluency

Learning how to decode (i.e., sound out) written words is an essential skill for students to develop, but it is only the beginning of becoming a strong reader. Developing fluency is the next step: students need to be able to read text quickly and accurately, and fluency brings students from word recognition to word comprehension (National Institute for Literacy, 2016; Stanovich & West, 1989). Fluent readers no longer need to spend time decoding each word they encounter; thus, word recognition is an important part of developing fluency. Correspondingly, students practice with the same words across multiple skills in IXL's phonics curriculum. For example, in the "short a" set of phonics skills, students may encounter the word *cat* multiple times in the skills "Choose the short a word that matches the picture," "Complete the short a word," and "Choose the short a sentence that matches the picture," which helps build word recognition. IXL ELA also provides students with ample practice in learning high-frequency sight words. Finally, IXL ELA supports fluency through its read-alone informational and literary texts, which encourage independent reading and give students the opportunity to practice their skills on varied passages of connected text (National Institute for Literacy, 2016).

Vocabulary

In order to understand what they are reading, students need to develop their vocabularies alongside other reading skills. There is a strong relationship between vocabulary and reading comprehension (Wagner et al., 2007), and the National Reading Panel (2000) highlighted vocabulary development as a critical part of developing literacy. IXL ELA explicitly teaches students generalizable strategies for learning new words, such as breaking words into parts and attending to context clues. This type of explicit instruction has been shown to effectively support vocabulary growth (e.g. Lesaux et al., 2014; Regan & Berkeley, 2012; for review, see National Institute for Literacy, 2016). Even before students become fluent readers, IXL begins to boost their vocabularies by introducing new words with image and audio support in other settings (e.g., a phonics skill in which students sound out the word "gown", which may be an unfamiliar word to a young reader).

Comprehension

Ultimately, the goal of learning to read is to understand any type of written text one encounters. Therefore, it is essential for beginning readers to build comprehension skills even as they are still learning to decode text and developing fluency. In IXL ELA skills for kindergarten and first grade, students build comprehension through read-along texts in which each word is highlighted as a narrator reads the text aloud in a professional-quality recording. Across all grade levels, IXL ELA contains texts that incorporate syntactic variety, include rich vocabulary, and are designed to build content knowledge—which is strongly related to reading comprehension (e.g., Cabell & Hwang, 2020; Hwang et al., 2022; Willingham, 2006)—at the same time as they build other reading skills. As students read informational passages, they are able to both practice reading and learn more about

content in other areas, such as science, history, geography, and more.

In sum, IXL's ELA curriculum uses an approach grounded in the science of reading to support young readers. For more information on the design of IXL ELA, see Bashkov et al. (2021).

THE PRESENT STUDY

The primary goal of this study was to examine the impact of IXL ELA on early literacy development. Literacy development in younger students (e.g., grades K-3) is often difficult to systematically investigate at scale because the majority of state-administered standardized ELA assessments do not begin until the end of third grade. At the same time, understanding how best to support young learners' literacy development is critically important because literacy is foundational to all other academic skills.

To achieve our research goal, we partnered with a large, suburban school district in Oklahoma and obtained performance data on a widely-used, nationally-normed assessment designed for young learners: the Star Early Literacy assessment. We examined IXL ELA usage among early elementary students in this district and its impact on their end-of-year Star Early Literacy performance.

RESEARCH QUESTIONS

We aimed to answer the following research questions:

1. **Usage effects of IXL ELA on Star Early Literacy scaled score:** Controlling for baseline performance and grade level, how does the amount of IXL ELA usage (e.g., questions answered per week) relate to students' overall performance on the Star Early Literacy assessment, as measured by their scaled score?

2. **Usage effects of IXL ELA on Star Early Literacy relative growth:** Controlling for grade level, how does the amount of IXL ELA usage (e.g., questions answered per week) relate to students' literacy growth (relative to students with similar prior performance), as measured by Star Early Literacy student growth percentile?

Study Design and Methodology

DATA SOURCES

Assessment Data

The participating school district in Oklahoma provided student-level Star Early Literacy assessment scores from the beginning-of-year (Fall 2021) and end-of-year (Spring 2022) administrations of the assessment; student-level demographic data were not available. The Star Early Literacy assessment is designed for students in grades K-3 who are learning to read and are not yet ready for the more advanced Star Reading assessment. The assessment is a computer-adaptive test (CAT) and covers a

range of early literacy skills, including phonological awareness, phonics and word recognition, print concepts, fluency, and vocabulary. For more information about Star Early Literacy, see https://www.renaissance.com/products/star-early-literacy/.

IXL Usage Data

IXL usage data were obtained 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's usage recommendation is that students should aim to reach proficiency in at least two skills per week (SP/week; An et al., 2022).

PARTICIPANTS

We included data from students with any amount of IXL usage in the 2021-22 school year. The base sample size for these analyses was 3,040 students in grades K-3 across 25 schools. Prior to analysis, we identified any students with usage greater than 3 *SD* from the mean on any metric (e.g., questions answered per week) as outliers and excluded them from analysis (*n* outliers = 81, or 2.7% of the initial sample). The final sample size was 2,959 students. See Table 1 for descriptive statistics of students' IXL usage. Participants' grade distributions as well as mean pretest and posttest scores are presented in Table A (Appendix A).

Table 1. IXL ELA usage

Weekly IXL usage	IXL ELA (*n* = 2,959)			
	M	*SD*	Min	Max
Time spent (in minutes)	9.20	7.95	0.02	37.63
Questions answered	34.57	31.02	0.03	155.81
Skills proficient	0.86	0.78	0.00	3.75

ANALYSIS

Outcome Measures and Covariates

Performance at pretest (beginning-of-year) and posttest (end-of-year) was measured using the Star Early Literacy assessment. Several outcome measures are provided by the assessment; in this study, we focus on two: scaled score and student growth percentile (SGP). Scaled score is determined by the number of items a student answers correctly and the difficulty of those items. By analyzing scaled score, we were able to examine the impact of IXL ELA on students' absolute growth from the beginning to the end of the year. The second measure, SGP, is a relative measure of performance

that incorporates achievement history: it is a percentile ranking of growth relative to students with similar past achievement. By analyzing SGP, we were able to assess the impact of IXL ELA on students' growth relative to what would be predicted based on their prior performance. For more information about Star Early Literacy SGP, see https://www.renaissance.com/resources/student-growth-percentile/.

In the models that examined the impact of IXL usage on students' scaled scores, we included baseline performance (i.e., beginning-of-year Star scaled score) and grade level as covariates, as recommended by What Works Clearinghouse (WWC) guidelines (WWC, 2020). In the models that examined the impact of IXL usage on students' SGP, we included only grade level as a covariate because prior performance is accounted for as part of the SGP calculation.

Model Specification

Students from 25 schools participated in the study; therefore, we specified and tested multilevel regression models to account for clustering at the school level. We specified and tested a separate model for each IXL ELA usage metric due to the fact that the usage metrics were significantly intercorrelated (range: $r = .85$ to $r = .92$).

For each dependent variable separately (i.e., scaled score and SGP), we regressed the end-of-year Star outcome on the covariates named above and one IXL usage metric at a time: average number of questions answered correctly per week, average number of skills proficient (SP) per week, or average time spent (in minutes) per week.

Following WWC guidelines (WWC, 2020), each effect is accompanied by a test of statistical significance using a probability (p) value, a measure of effect size, and corresponding percentile gain where applicable. 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. As there was no control or comparison group, we report standardized regression coefficients to gauge the practical significance of IXL usage relative to the effects of the covariates.

Results

SCALED SCORE

All usage metrics were positively and significantly associated with performance on the end-of-year Star Early Literacy assessment (see Appendix B for full results of each model). Based on these model coefficients and typical usage amounts, a student's Star Early Literacy scaled score would be expected to increase by 10.2 points for every additional 30 questions they answered correctly in IXL each week ($\beta = .11$, $p < .001$), 21.9 points for each additional skill they reached proficiency in each week ($\beta = .17$, $p < .001$), or 42.6 points for every additional 30 minutes they spent using IXL each week ($\beta = .11$, $p < .001$; see Figure 1).

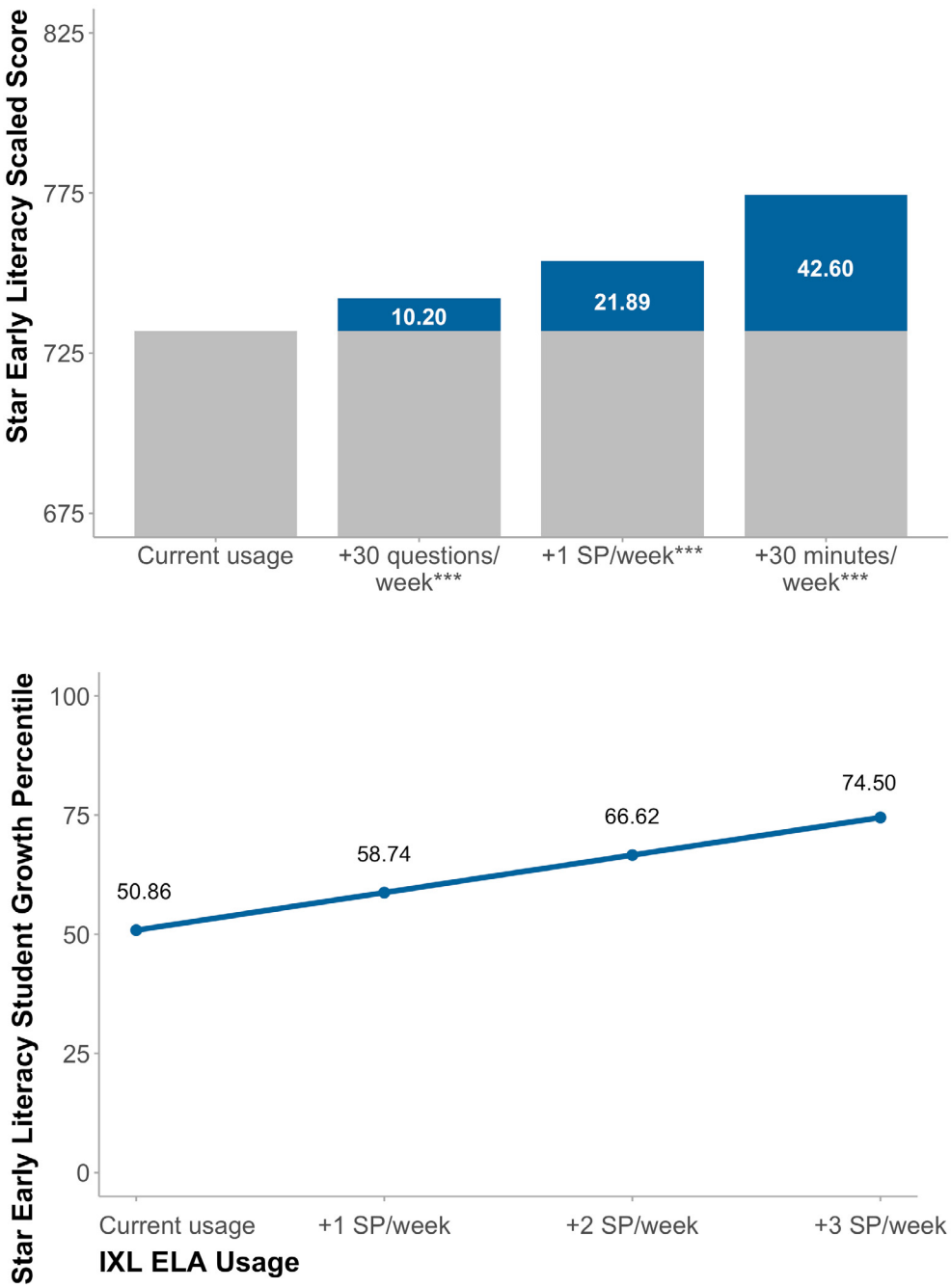


Figure 1. Expected usage effects of IXL ELA on Star Early Literacy scaled score.

Note: SP/week = skills proficient per week.

STUDENT GROWTH PERCENTILE (SGP)

As in the scaled score analyses, all usage metrics were positively and significantly associated with SGP at the end of the 2021-22 school year (see Appendix C for full results of each model). Based on these model coefficients and typical usage amounts, a student's Star Early Literacy growth percentile would be expected to increase by 3.3 points for every additional 30 questions they answered in IXL

each week (β = .12, $p < .001$), 7.9 points for each additional skill they reached proficiency in each week (β = .21, $p < .001$), or 14.4 points for every additional 30 minutes they spent using IXL each week (β = .13, $p < .001$; see Figure 2).

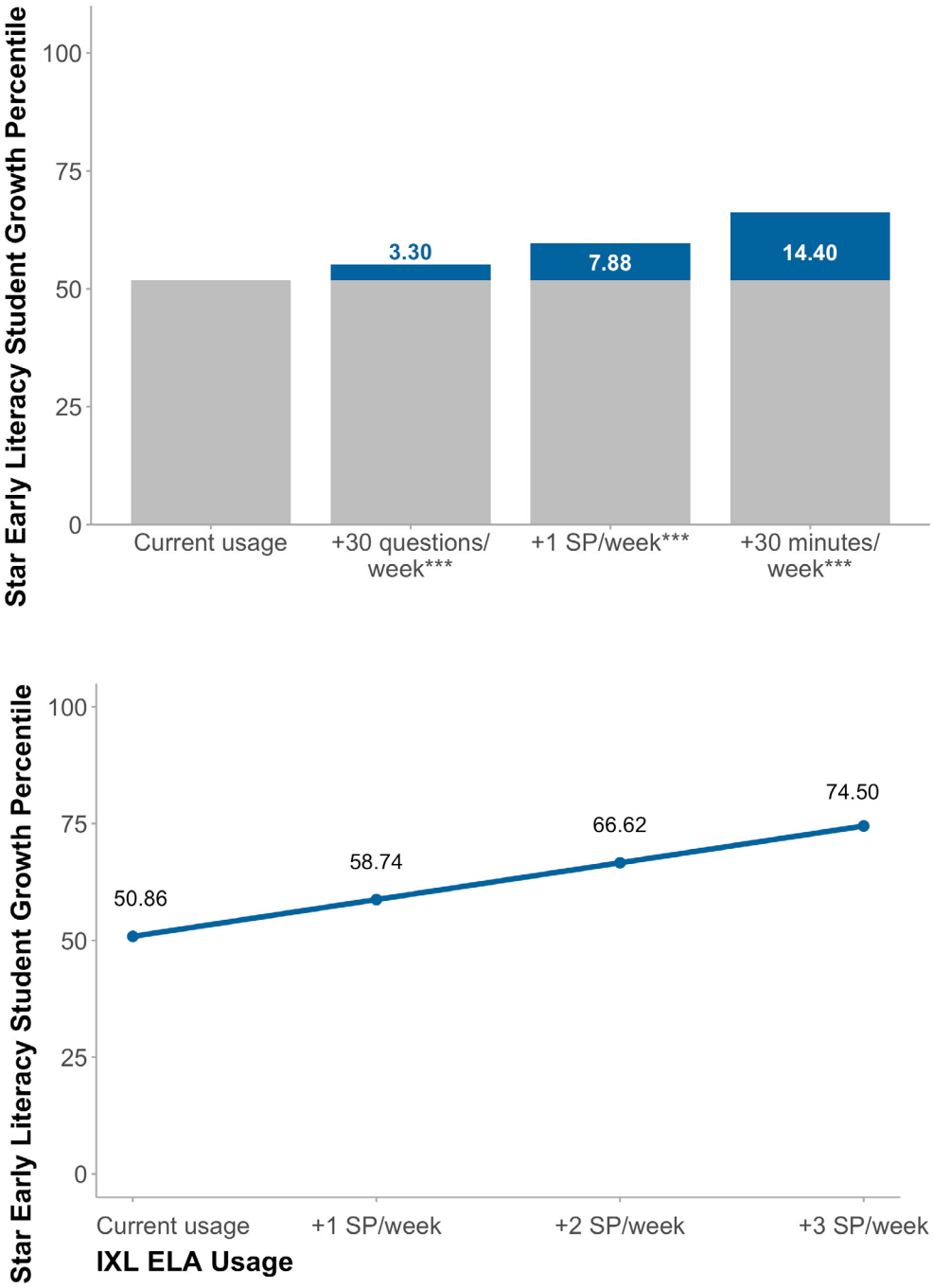


Figure 2. Expected usage effects of IXL ELA on Star Early Literacy student growth percentile.

Note: SP/week = skills proficient per week.

Discussion and Recommendations

In this study, we investigated how IXL ELA usage patterns among young learners (grades K-3) in one district related to their performance on the end-of-year Star Early Literacy assessment. Overall, we found that greater IXL usage was associated with larger performance gains, controlling for baseline performance and grade level.

Based on the results from these analyses, it is clear that any amount of weekly IXL usage is beneficial to students. However, skills proficient per week is likely a more informative metric compared to time spent or questions answered. The latter two measures show how much students are using IXL, but they do not provide information about how students are using IXL. For example, a student who answers 30 questions across 30 different IXL ELA skills has likely made little progress toward mastery of any specific content, whereas a student who answers 30 questions across two IXL ELA skills is much more likely to have improved their mastery of the content in those two skills.

As reaching proficiency in a skill is likely the best indicator of sustained practice, IXL's usage recommendation is that students aim to reach proficiency in two skills per week (2 SP/week). Correspondingly, we recommend that educators focus on setting skill proficiency goals when working with students. In this sample, students' IXL ELA usage was slightly below the recommended 2 SP/week, but still quite good (M = 0.86, SD = 0.78). The amount of usage variability in this sample allowed us to test the hypothesis that increased usage was correlated with higher Star scores, and this hypothesis was indeed borne out in the results: students with higher IXL usage experienced larger gains on the Star Early Literacy assessment.

Our findings with SGP provide strong support for the idea that IXL truly can help every student. SGP is a measure that compares a student to peers with a similar achievement history. The fact that we found significant effects of IXL usage indicators on SGP shows that across all achievement levels, students experienced more growth the more they used IXL. Students using IXL for grade-level practice, enrichment, or remediation all benefited from practicing ELA skills on IXL.

In sum, this study is an important addition to the growing body of research (e.g., Schonberg, 2022) showing that IXL helps the youngest learners in kindergarten through 3rd grade develop foundational literacy skills. These essential skills lay the groundwork for future academic growth, and with continued use of IXL, students will unlock their full potential for academic success.

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Appendix A: Descriptive Statistics

Table A. **Star Early Literacy performance and grade distribution**

	IXL ELA students
Pretest and posttest	*n* = 2,959
Fall 2021 scaled score	583.42 (121.73)
Spring 2022 scaled score	742.99 (99.80)
Spring 2022 SGP	50.90 (29.99)
Demographics (N students)	
Grade level	
K	1,272 (43.0%)
1	1,605 (54.2%)
2	73 (2.5%)
3	9 (0.3%)

Note. Numbers in parentheses for pretest and posttest show standard deviations. SGP = student growth percentile.

Appendix B: Full Results of Regression Analyses (Scaled Score as Outcome)

Table B1. Effects of IXL ELA questions answered on end-of-year Star Early Literacy scaled score

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	734.10	4.14	725.94 – 742.22	0.03	177.405	<.001
Grade: 1[1]	-3.52	3.50	-10.43 – 3.31	-0.04	-1.006	.314
Grade: 2[1]	-56.68	9.36	-75.13 – -38.40	-0.57	-6.056	<.001
Grade: 3[1]	-127.15	25.42	-177.02 – -77.41	-1.27	-5.002	<.001
Scaled score (pretest)[2]	0.47	0.01	0.45 – 0.50	0.58	34.955	<.001
Questions answered[3]	**0.34**	**0.06**	**0.23 – 0.45**	**0.11**	**6.210**	**<.001**

Note. Dependent variable: Scaled score on Spring 2022 Star Early Literacy assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient.
[1]Dummy coded; Kindergarten students as reference group; [2]Grand-mean centered; [3]Average weekly amount.

Table B2. Effects of IXL ELA skills proficient on end-of-year Star Early Literacy scaled score

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	728.51	4.03	720.58 – 736.41	0.04	180.947	<.001
Grade: 1[1]	-5.81	3.40	-12.52 – 0.83	-0.06	-1.709	.087
Grade: 2[1]	-59.38	9.24	-77.58 – -41.33	-0.59	-6.427	<.001
Grade: 3[1]	-129.21	25.13	-178.50 – -80.02	-1.29	-5.141	<.001
Scaled score (pretest)[2]	0.45	0.01	0.42 – 0.48	0.55	32.828	<.001
Skills proficient[3]	**21.89**	**2.15**	**17.68 – 26.12**	**0.17**	**10.170**	**<.001**

Note. Dependent variable: Scaled score on Spring 2022 Star Early Literacy assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient.
[1]Dummy coded; Kindergarten students as reference group; [2]Grand-mean centered; [3]Average weekly amount.

Table B3. Effects of IXL ELA usage time on end-of-year Star Early Literacy scaled score

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	733.03	4.17	724.82 – 741.21	0.03	175.973	<.001
Grade: 1[1]	-3.83	3.49	-10.73 – 2.99	-0.04	-1.098	.272
Grade: 2[1]	-57.91	9.37	-76.38 – -39.61	-0.58	-6.181	<.001
Grade: 3[1]	-129.48	25.42	-179.35 – -79.74	-1.30	-5.093	<.001
Scaled score (pretest)[2]	0.48	0.01	0.45 – 0.50	0.58	35.164	<.001
Time spent (min.)[3]	**1.42**	**0.22**	**1.00 – 1.85**	**0.11**	**6.551**	**<.001**

Note. Dependent variable: Scaled score on Spring 2022 Star Early Literacy assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient.
[1]Dummy coded; Kindergarten students as reference group; [2]Grand-mean centered; [3]Average weekly amount.

Appendix C: Full Results of Regression Analyses (SGP as Outcome)

Table C1. Effects of IXL ELA questions answered on end-of-year Star Early Literacy SGP

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	52.47	1.46	49.60 – 55.34	0.18	35.982	<.001
Grade: 1[1]	-9.61	1.22	-12.01 – -7.23	-0.32	-7.890	<.001
Grade: 2[1]	-19.46	3.58	-26.51 – -12.48	-0.65	-5.443	<.001
Grade: 3[1]	-22.94	9.74	-42.06 – -3.89	-0.76	-2.356	.019
Questions answered[2]	**0.11**	**0.02**	**0.07 – 0.16**	**0.12**	**5.514**	**<.001**

Note. Dependent variable: Student growth percentile (SGP) on Spring 2022 Star Early Literacy assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient.
[1]Dummy coded; Kindergarten students as reference group; [2]Average weekly amount.

Table C2. Effects of IXL ELA skills proficient on end-of-year Star Early Literacy SGP

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	50.86	1.37	48.16 – 53.56	0.22	37.100	<.001
Grade: 1[1]	-11.65	1.20	-14.01 – -9.31	-0.39	-9.723	<.001
Grade: 2[1]	-21.13	3.53	-28.09 – -14.24	-0.70	-5.987	<.001
Grade: 3[1]	-24.02	9.62	-42.91 – -5.20	-0.80	-2.496	.013
Skills Proficient[2]	**7.88**	**0.79**	**6.33 – 9.45**	**0.21**	**9.917**	**<.001**

Note. Dependent variable: Student growth percentile (SGP) on Spring 2022 Star Early Literacy assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient.
[1]Dummy coded; Kindergarten students as reference group; [2]Average weekly amount.

Table C3. Effects of IXL ELA usage time on end-of-year Star Early Literacy SGP

Predictor	*b*	*SE*	95% CI	β	*t*	*p*
(Intercept)	52.09	1.47	49.20 – 54.98	0.19	35.447	<.001
Grade: 1[1]	-9.66	1.21	-12.04 – -7.29	-0.32	-7.974	<.001
Grade: 2[1]	-19.84	3.58	-26.90 – -12.85	-0.66	-5.543	<.001
Grade: 3[1]	-23.71	9.74	-42.83 – -4.65	-0.79	-2.434	.015
Time spent (min.)[2]	**0.48**	**0.08**	**0.32 – 0.64**	**0.13**	**5.785**	**<.001**

Note. Dependent variable: Student growth percentile (SGP) on Spring 2022 Star Early Literacy assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, *β* = standardized regression coefficient.
[1]Dummy coded; Kindergarten students as reference group; [2]Average weekly amount.