RESEARCH REPORT

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# The Impact of IXL on Math and ELA Learning in Washington

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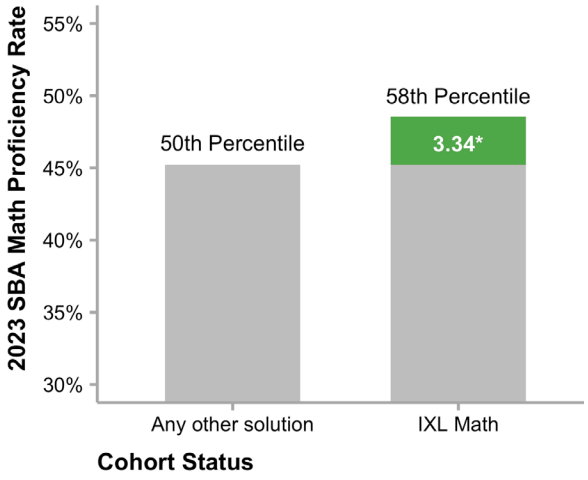
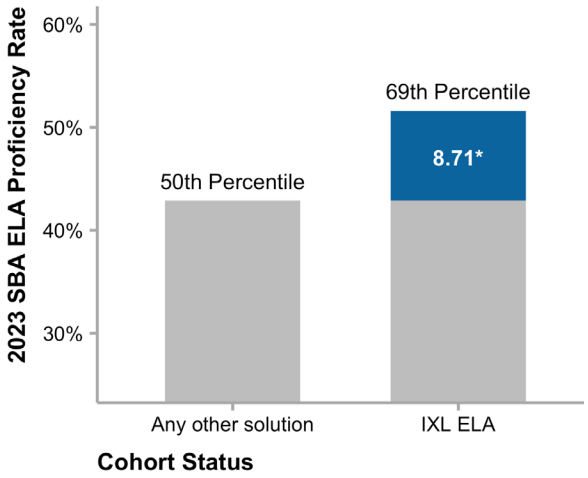
## Executive Summary

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 has a positive impact on students' academic performance (An, 2022, 2023; Bashkov, 2021; Empirical Education, 2013; IXL Learning, 2018; Schonberg, 2022a).

The goal of this study was to examine IXL usage among 3rd- through 8th-grade students in Washington and its impact on math and ELA achievement, as measured by the Smarter Balanced Assessments (SBA). Key finding[1]:

- **IXL implementation improves student achievement.** For both math and ELA, grade cohorts that used IXL performed better on the SBA than grade cohorts that did not use IXL. Specifically, the proficiency rate[2] was more than three percentage points higher for IXL Math cohorts and more than eight percentage points higher for IXL ELA cohorts compared to cohorts using any other solution, controlling for prior achievement and demographics.




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

2 *Proficiency rate: percentage of students in a cohort classified as "Met Standard" or "Exceeded Standard" on the SBA.*

# The Impact of IXL on Math and ELA Learning in Washington

## 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. As of this writing, 1 in 4 students in the U.S. and over 14.5 million students worldwide use IXL. 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 of this personalization, students can work through problems that are neither too easy nor too difficult, which in turn supports their self-efficacy and motivation for continued learning.

Previous research has demonstrated benefits for students using IXL in Idaho, Oregon, and California (Hargis, 2023; IXL Learning, 2018), among many other states. While earlier studies have also shown that Washington students who used IXL outperformed those who did not (An, 2021; IXL Learning, 2018), a changing educational landscape brought on by the COVID-19 pandemic highlights the importance of reassessing IXL's impact on students' learning.

The goal of the present study was to examine the efficacy of IXL across public schools in Washington. We investigated the efficacy of IXL by comparing Smarter Balanced Assessment proficiency rates in math and ELA among grade-level cohorts that used IXL to those of comparable grade-level cohorts that did not use IXL.

## Study Design and Methodology

### DATA SOURCES

#### *Assessment Data*

All assessment and demographic data were obtained from the Washington Office of Superintendent of Public Instruction. Math and ELA performance at pretest (2022) and posttest (2023) were measured using the Smarter Balanced Assessment (SBA), a summative assessment program that includes end-of-grade assessments in math and ELA for students in grades 3 through 8. The outcome measure was the percentage of students within a grade-level cohort reaching proficiency in SBA math or ELA, respectively (i.e., the proficiency rates on the math and ELA assessments). More information about the assessments can be found on the Washington Office of Superintendent of Public Instruction website.

#### *IXL Usage Data*

We obtained IXL usage data from IXL's database. When students use IXL, they practice problems organized within "skills," or specific topic areas within a subject. IXL uses a proprietary *SmartScore* to measure a student's progress toward proficiency and mastery 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 skills per week (SP/week; An et al., 2022).

## OVERALL EFFICACY

### *Study Design*

The purpose of this study was to evaluate the impact of IXL on student performance in Washington. The study adopted a quasi-experimental pretest-posttest control group design (see Figure 1). Specifically, we evaluated the impact of IXL by comparing the performance of the treatment group (IXL grade cohorts) and the comparison group (non-IXL grade cohorts) at posttest, accounting for pretest performance and key demographic variables. To control for pretest performance and demographic characteristics, we used one-to-one propensity score matching (described in more detail below) to match each IXL cohort to a similar cohort that did not use IXL.

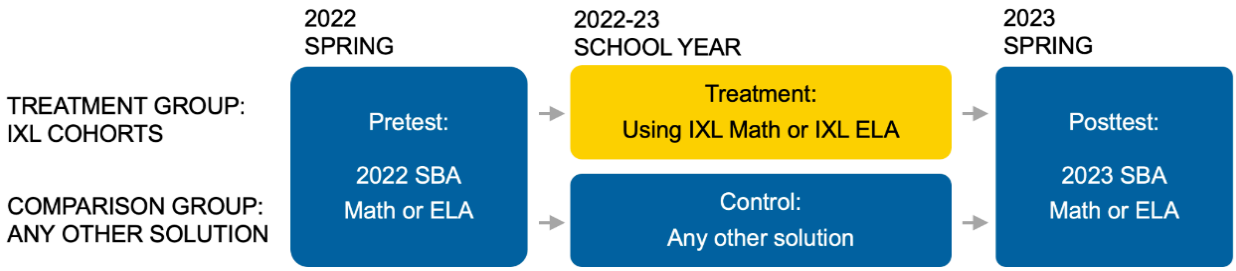



*Figure 1. Study design*

### *Participants*

We defined IXL cohorts broadly in order to maximize the generalizability of our findings. Our criteria were based on student IXL usage rates—specifically, the number of skills in which students reached proficiency or "skills proficient" per week (SP/week). IXL cohorts were those in which students, on average, met the usage criterion of 1 SP/week (math) or 0.75 SP/week (ELA) during the study period (i.e., the 2022-23 school year). As ELA usage is typically lower than math usage, we used a slightly lower threshold for ELA in order to maximize our sample size. We defined comparison cohorts as those in which students did not use IXL at all during the study period. Using these criteria, we obtained a sample of 164 study cohorts for the math analysis (treatment $n$ = 82, comparison $n$ = 82) and 52 study cohorts for the ELA analysis (treatment $n$ = 26, comparison $n$ = 26) after propensity score matching. See Appendix A for details on proficiency rates and demographic background of each sample. Descriptive statistics for treatment cohorts' IXL usage during the study period can be found in Table 1.

**Table 1.** **Average IXL Usage During the 2022-23 School Year**

| Weekly IXL usage | IXL Math (*n* = 82) | | | | IXL ELA (*n* = 26) | | | |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | Min | Max | *M* | *SD* | Min | Max |
| Time spent (in minutes) | 22.57 | 9.11 | 7.95 | 48.15 | 21.82 | 21.20 | 2.94 | 90.74 |
| Questions answered | 53.27 | 15.16 | 28.44 | 102.16 | 61.46 | 38.64 | 23.81 | 173.89 |
| Skills proficient | 1.52 | 0.42 | 1.01 | 2.73 | 1.47 | 1.00 | 0.75 | 4.49 |

***Propensity Score Matching***

We conducted one-to-one propensity score matching without replacement using the *MatchIt* package in R (Ho et al., 2011; R Core Team, 2021) as a pre-processing step prior to analysis. A *propensity score* is the probability that a school cohort would be assigned to the treatment (i.e., IXL) group over the comparison group and is calculated using a combination of demographic characteristics (i.e., covariates). In the absence of random assignment, propensity scores can be used to match comparison cohorts to treatment cohorts and create equivalent treatment and comparison groups. In a comparison of unmatched groups (e.g., IXL cohorts compared to all non-IXL cohorts), non-IXL cohorts could be very different from IXL cohorts on some dimensions. In contrast, using propensity score matching allows us to compare the performance of pairs of IXL and non-IXL cohorts that are very similar to each other. This comparison allows for a clearer attribution of the effect of IXL and broader generalization of the findings to other cohorts that are not yet using IXL. Comparison cohorts were identified from 3,836 non-treatment cohorts (math) and 4,110 non-treatment cohorts (ELA) in the state that had non-missing assessment and demographic data. After matching, the resulting treatment and comparison groups had extremely similar demographic characteristics (see Table A, Appendix A).

***Analysis***

We specified and tested a multilevel model to account for clustering at the school and district levels (i.e., grade cohorts within a school tend to be more similar to each other than to grade cohorts in other schools, and schools within a district tend to be more similar to each other than to schools in other districts). In these models, we regressed 2023 SBA grade-level proficiency rates on IXL cohort status (treatment or comparison) and covariates (baseline performance and demographic characteristics). We included covariates in the models because the absolute standardized mean differences (SMDs) for some covariates were greater than .05 after matching, indicating that these differences needed to be accounted for statistically. Specifically, we controlled for the following characteristics: grade, school Title I status, student-teacher ratio, total school enrollment, percentage of female students, percentage of White students, percentage of Black students, percentage of English language learners, percentage of students experiencing homelessness, and percentage of highly capable students. Covariates were either dummy coded or grand-mean centered.

Following What Works Clearinghouse guidelines (WWC, 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; *p*-values less than .05 are considered statistically significant. Effect size is reported using Hedges' *g* and indicates the difference between treatment and comparison groups on an outcome measure in standard deviation units. For broad-scope educational assessments, effect sizes in the 0.10–0.20 range are considered moderate (Kraft, 2020; Lipsey et al., 2012). We also report percentile gain, which is the expected change in IXL cohorts' percentile rank relative to non-IXL cohorts at the 50th percentile and is based on the effect size. Given that these analyses are at the grade cohort level, the effect sizes should be interpreted at the grade cohort level as well.

## Results

### MATH

We found that grade-level cohorts that used IXL Math outperformed comparable non-IXL cohorts on the 2023 SBA math assessment. Specifically, the proficiency rate was more than three percentage points higher for IXL Math cohorts relative to cohorts not using IXL (Figure 2). The estimated treatment effect for IXL Math was positive and statistically significant (*b* = 3.34, *p* = .044; see Table B1 in Appendix B for full model results). The effect size (Hedges' *g*) was 0.20, which corresponds to a percentile gain of eight points.

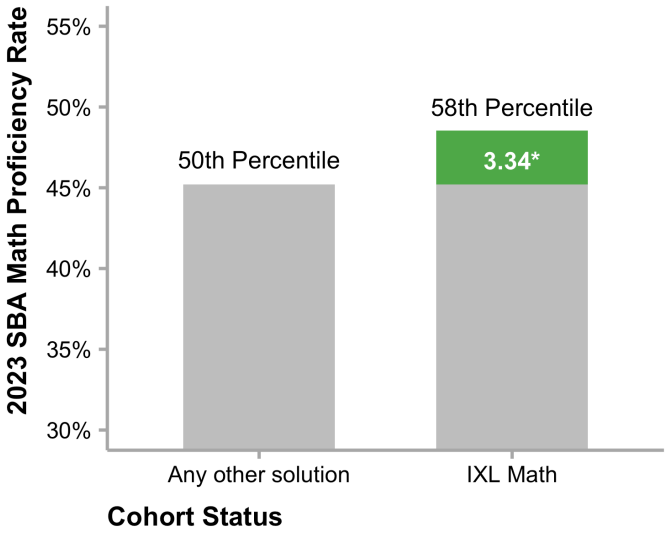



*Figure 2. The efficacy of IXL Math*

**ELA**

We found that grade-level cohorts that used IXL ELA outperformed comparable non-IXL cohorts on the 2023 SBA ELA assessment. Specifically, the proficiency rate was more than eight percentage points higher for IXL ELA cohorts relative to cohorts not using IXL (Figure 3). The estimated treatment effect for IXL ELA was positive and statistically significant ($b$ = 8.71, $p$ = .006; see Table B2 in Appendix B for full model results). The effect size (Hedges' $g$) was 0.50, which corresponds to a percentile gain of 19 points.

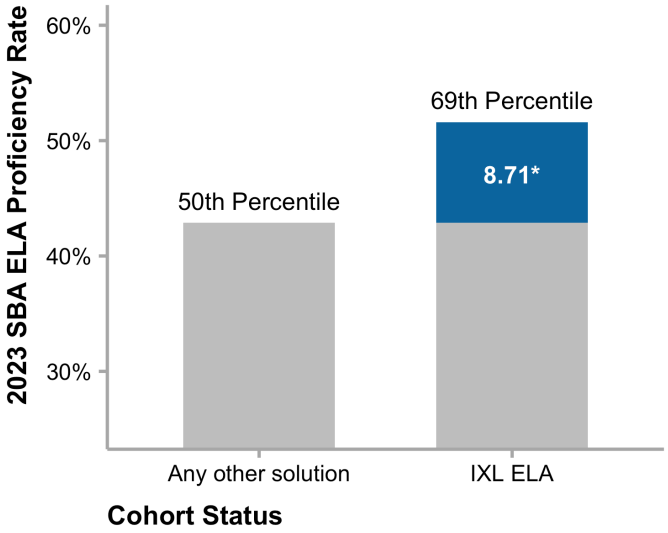



*Figure 3. The efficacy of IXL ELA*

## Discussion and Recommendations

In this study, we investigated the impact of IXL on academic achievement in public schools in Washington state. We found that grade-level cohorts that used IXL outperformed comparable cohorts using any other solution on the 2023 SBA math and ELA assessments, controlling for baseline performance and demographics. These results add to the large body of work showing that IXL is a highly effective way to improve student learning (e.g., An, 2022, 2023; IXL Learning, 2018; Schonberg, 2022a, 2022b; Xiong, 2022).

IXL recommends that students aim to reach proficiency in at least two skills per week in each subject. In this sample, students' usage of IXL was slightly lower than this recommendation. Even so, we found strong effects of IXL usage on performance, demonstrating that IXL is a powerful educational tool even when used in smaller doses. Because interventions are more effective when they are carried out with fidelity (see Finney et al., 2021; Noell et al., 2002), and previous studies illustrate the benefit associated with meeting this guideline (e.g., An et al., 2022; An, 2023), we anticipate that students would achieve even greater gains when IXL is used as recommended.

While the day-to-day educational disruptions caused by the COVID-19 pandemic have largely subsided, the lingering effects on student achievement are just now surfacing (NAEP, 2022), and will continue to challenge administrators, teachers, parents, and students for years to come. With its personalized guidance and first-of-its-kind assessment suite, IXL can play a key role in helping students and teachers close learning gaps. IXL recognizes content areas where students may be struggling and engages them with material at the appropriate level. By meeting students where they are, IXL can help students "catch up" by providing support for relearning missed or forgotten material. This combination of personalized learning and remediation has been suggested as a highly effective approach for both recovering from pandemic-related learning loss as well as boosting subsequent learning gains (Kaffenberger, 2021).

Previous research has proven IXL to be an effective solution in combating pandemic-related learning loss (Schonberg, 2021, 2022a, 2022b). In addition to the current work, studies on thousands of schools across the United States have found that schools using IXL had higher achievement on state assessments than schools using any other solution, and cohorts with higher usage see more benefits (see ixl.com/research). The current study provides even more evidence to support using IXL to accelerate student learning, help students recover from pandemic-related educational challenges, and unlock their full academic potential.

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# Appendix A: Demographics

**Table A. Means (Standard Deviations) for IXL (Treatment) and Non-IXL (Comparison) Cohorts' Achievement and Demographics**

| | Math | | ELA | |
|---|---|---|---|---|
| | IXL Cohorts *n* = 82 | Non-IXL Cohorts *n* = 82 | IXL Cohorts *n* = 26 | Non-IXL Cohorts *n* = 26 |
| **Achievement** | | | | |
| SBA 2022 % proficient | 43.17 (15.68) | 40.20 (17.65) | 51.63 (15.59) | 54.52 (19.39) |
| SBA 2023 % proficient | 46.56 (16.23) | 40.76 (17.65) | 54.28 (15.63) | 52.50 (19.01) |
| **Demographics** | | | | |
| Grade | | | | |
| 3 | 17 | 18 | 3 | 6 |
| 4 | 16 | 20 | 5 | 5 |
| 5 | 15 | 13 | 7 | 5 |
| 6 | 16 | 8 | 5 | 3 |
| 7 | 12 | 11 | 4 | 5 |
| 8 | 6 | 12 | 2 | 2 |
| Title I | 63 | 65 | 19 | 22 |
| Student-teacher ratio | 15.74 (2.87) | 16.04 (2.55) | 16.84 (4.96) | 15.10 (3.70) |
| Total school enrollment | 442.40 (196.35) | 437.65 (188.41) | 434.19 (183.57) | 409.77 (261.86) |
| % Female | 47.98 (3.41) | 48.11 (3.31) | 48.10 (2.67) | 47.58 (2.96) |
| % White | 55.22 (23.98) | 54.18 (24.01) | 58.17 (22.66) | 64.07 (20.40) |
| % Black | 3.65 (8.33) | 3.40 (4.85) | 2.92 (7.79) | 4.71 (7.21) |
| % English language learners | 13.72 (16.00) | 13.70 (12.85) | 11.49 (12.58) | 9.57 (9.60) |
| % Experiencing homelessness | 2.19 (2.26) | 2.39 (2.11) | 2.02 (2.30) | 1.73 (1.73) |
| % Highly capable students | 6.43 (7.31) | 5.09 (4.58) | 6.05 (6.26) | 10.80 (19.48) |

*Note.* Numbers in parentheses show standard deviations.

# Appendix B: Efficacy Analysis Results

**Table B1. Full IXL Math Efficacy Model Predicting 2023 SBA Math Proficiency**

| Predictor | *b* | *SE* | 95% CI | β | *t* | *p* |
|---|---|---|---|---|---|---|
| (Intercept) | 45.20 | 2.16 | 41.10 – 49.21 | 0.10 | 20.90 | <.001 |
| 2022 SBA math % proficient[1] | 0.59 | 0.07 | 0.45 – 0.75 | 0.57 | 7.95 | <.001 |
| Grade[1] | -1.66 | 0.61 | -2.79 – -0.44 | -0.16 | -2.73 | .007 |
| Title I school[2] | -4.32 | 2.29 | -8.54 – 0.05 | -0.25 | -1.88 | .006 |
| Student-teacher ratio[1] | -0.50 | 0.40 | -1.24 – 0.24 | -0.08 | -1.27 | .206 |
| Total school enrollment[1] | 0.00 | 0.01 | -0.01 – 0.01 | 0.03 | 0.41 | .684 |
| % Female[1] | 0.25 | 0.26 | -0.24 – 0.74 | 0.05 | 0.97 | .334 |
| % White[1] | 0.00 | 0.07 | -0.14 – 0.13 | 0.00 | -0.03 | .980 |
| % Black[1] | 0.16 | 0.14 | -0.11 – 0.42 | 0.06 | 1.15 | .254 |
| % English language learners[1] | -0.21 | 0.11 | -0.42 – 0.01 | -0.18 | -1.83 | .071 |
| % Experiencing homelessness[1] | -0.13 | 0.43 | -0.93 – 0.71 | -0.02 | -0.31 | .758 |
| % Highly capable students[1] | 0.25 | 0.16 | -0.06 – 0.55 | 0.09 | 1.55 | .124 |
| **Used IXL Math** | **3.34** | **1.64** | **0.28 – 6.42** | **0.19** | **2.04** | **.044** |

*Note.* Dependent variable: percentage of students reaching proficiency on the 2023 SBA math assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient.

[1] Grand-mean centered. [2] Dummy coded; non-Title I schools as reference group.

**Table B2. Full IXL ELA Efficacy Model Predicting 2023 SBA ELA Proficiency**

| Predictor | *b* | *SE* | 95% CI | β | *t* | *p* |
|---|---|---|---|---|---|---|
| (Intercept) | 42.88 | 4.47 | 34.48 – 51.14 | -0.40 | 9.60 | <.001 |
| 2022 SBA ELA % proficient[1] | 0.67 | 0.10 | 0.49 – 0.87 | 0.68 | 6.94 | <.001 |
| Grade[1] | -2.19 | 0.92 | -4.09 – -0.25 | -0.20 | -2.38 | .023 |
| Title I school[2] | 3.00 | 4.00 | -3.58 – 10.08 | 0.17 | 0.75 | .464 |
| Student-teacher ratio[1] | -0.11 | 0.37 | -0.77 – 0.54 | -0.03 | -0.30 | .771 |
| Total school enrollment[1] | 0.00 | 0.01 | -0.01 – 0.02 | 0.04 | 0.46 | .650 |
| % Female[1] | 0.98 | 0.52 | -0.29 – 2.06 | 0.16 | 1.89 | .068 |
| % White[1] | 0.24 | 0.13 | 0.02 – 0.49 | 0.30 | 1.82 | .079 |
| % Black[1] | 0.12 | 0.27 | -0.39 – 0.58 | 0.05 | 0.43 | .673 |
| % English language learners[1] | 0.09 | 0.24 | -0.33 – 0.57 | 0.06 | 0.40 | .695 |
| % Experiencing homelessness[1] | -0.67 | 0.82 | -2.20 – 0.79 | -0.08 | -0.81 | .421 |
| % Highly capable students[1] | 0.21 | 0.13 | -0.01 – 0.45 | 0.18 | 1.63 | .113 |
| **Used IXL ELA** | **8.71** | **2.99** | **2.78 – 14.69** | **0.50** | **2.92** | **.006** |

*Note.* Dependent variable: percentage of students reaching proficiency on the 2023 SBA ELA assessment. *b* = unstandardized regression coefficient, *SE* = standard error, CI = confidence interval, β = standardized regression coefficient.

[1] Grand-mean centered. [2] Dummy coded; non-Title I schools as reference group.