



RESEARCH REPORT

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Predictive Validity of the IXL Real-Time Diagnostic Using the South Carolina College- and Career-Ready Assessments as Criterion

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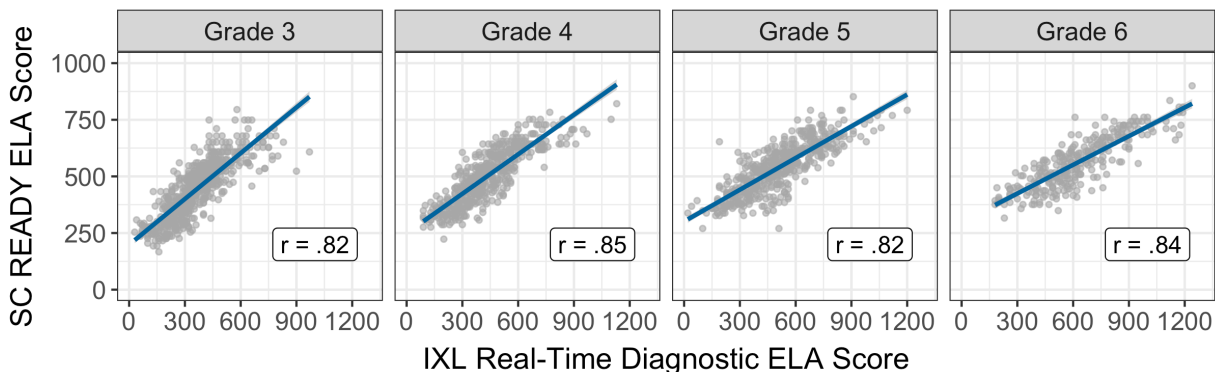
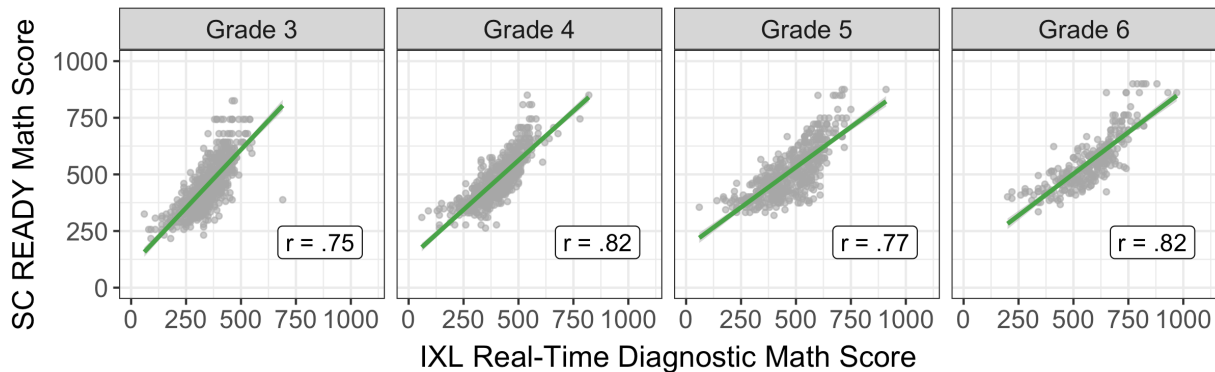
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Executive Summary

IXL is an end-to-end teaching and learning solution that engages learners in grades Pre-K through 12 with a comprehensive curriculum and a first-of-its-kind assessment suite. A core component of IXL is the IXL Real-Time Diagnostic, an interim assessment that delivers up-to-date insights on students' knowledge levels in math and English language arts. Analyzing student response patterns via Item Response Theory (Lord, 1980), the diagnostic creates personalized learning plans, helping every learner achieve more.

IXL's Real-Time Diagnostic has been validated with other standardized assessments including the NWEA MAP Growth, Star, ILEARN, FSA, and SOL assessments (An, 2021; An, 2022; IXL Learning, 2020b; Schonberg, 2021a; Schonberg, 2021b; Schonberg, 2022). In this study, we analyzed data from more than 1,900 students in grades 3 to 6 from 13 public schools in a rural school district in South Carolina, and collected additional predictive validity evidence for the IXL Real-Time Diagnostic using the South Carolina College- and Career-Ready Assessments (SC READY) as criterion. Key findings include:

- The IXL Real-Time Diagnostic was a strong predictor of subsequent academic performance as measured by the 2022 SC READY.** For both math and ELA, we found strong positive correlations between IXL Real-Time Diagnostic and SC READY scores, with r s = [.75 - .85] across grades 3 to 6.



- **The IXL Real-Time Diagnostic and the SC READY showed a high degree of alignment in classifying students into proficiency levels.** For both math and ELA, the IXL Real-Time Diagnostic accurately predicted the grade-level proficiency for about 80% of students as determined by subsequent SC READY tests. Students with IXL Diagnostic math scores at or above grade level were 19 times more likely to reach or exceed the SC READY math proficiency standard. Students with IXL Diagnostic ELA scores at or above grade level were 26 times more likely to reach or exceed the SC READY ELA proficiency standard.

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Background

IXL's Real-Time Diagnostic is an interim assessment developed by educators and subject matter experts that covers material aligned with state standards. As a rigorous assessment rooted in learning sciences research (Bashkov et al., 2021), the IXL Real-Time Diagnostic is widely used in schools and classrooms to assess student knowledge and track student growth.

We have conducted many studies examining the psychometric properties of the IXL Real-Time Diagnostic and have garnered desirable reliability and validity evidence, including coherent internal structure (IXL Learning, 2020a), multi-group measurement invariance (An et al., 2022), high reliability (IXL Learning, 2020a; Schonberg, 2021a), and strong predictive validity coefficients using multiple well-established assessments as criterion measures (An, 2021; An, 2022; IXL Learning, 2020b; Schonberg, 2021a; Schonberg, 2021b; Schonberg, 2022).

The primary goal of this study was to further validate IXL's Diagnostic with a dataset from a rural school district in South Carolina using a new criterion measure: the South Carolina College-and Career-Ready Assessments (SC READY). This study also aimed to provide additional predictive validity evidence of IXL's Diagnostic across upper elementary grade levels.

Study Design and Methodology

We studied a total of 2,959 students from grades 3 to 6 who used IXL during the 2021-22 school year. The students were attending 13 public schools in a rural school district in South Carolina serving more than 10,000 Pre-K through 12 students. In our sample, 756 (26%) were 3rd-grade students, 697 (24%) were 4th-grade students, 751 (25%) were 5th-grade students, and 755 (26%) were 6th-grade students. In terms of gender, 1,423 (48%) of the students were female. The majority of the students (84%) were White, 8% were Black, and 5% were Hispanic. There were 195 (7%) English language learners, 2,041 (69%) students from low-income families and 634 (21%) students with disabilities.

Data Sources

Data from two sources were used in this study: students' IXL Real-Time Diagnostic scores during the Spring 2022 semester and students' end-of-year state assessment data from the Spring 2022 SC READY.

Student IXL Diagnostic Data

IXL Real-Time Diagnostic data from spring 2022 were obtained from IXL's internal database. When a student completes a sufficient number of questions in IXL's Diagnostic, they receive a pinpointed

score that indicates their overall grade-level proficiency. For example, a score of 450 indicates that the student has acquired about 50% of 4th-grade material, whereas a score of 500 indicates that the student is ready to learn 5th-grade material. In the analysis, we focused on the available end-of-year diagnostic scores from the date closest to students' state assessment in spring 2022.

Student Assessment Data

The district provided the 2021 and 2022 state assessment data in math and ELA for students. Every spring, the South Carolina College- and Career-Ready Assessments (SC READY) in math and ELA are administered to students in grades 3 to 8 (see [PSSA Technical Report](#) for more details). Student performance on the SC READY falls into four performance levels: *Does Not Meet Expectations*, *Approaches Expectations*, *Meets Expectations*, and *Exceeds Expectations*. In this study, *Meets Expectations* and *Exceeds Expectations* were combined and used to represent student grade-level proficiency. Students' performance on the 2022 SC READY math and ELA tests served as the criterion in evaluating the predictive validity of IXL's Diagnostic. The analysis requires complete data, so students with missing IXL Diagnostic or assessment data were excluded from the analysis, leaving a sample of 1,956 for math and a sample of 1,902 for ELA.

Research Questions

This study aimed to answer two research questions, for math and ELA separately:

Research Question 1. Grade-level predictive validity: Was there a strong and positive correlation (i.e., $r \geq .70$) between students' IXL Real-Time Diagnostic scores and SC READY scores among all students as well as among students in each grade?

Research Question 2. Classification alignment: What was the degree of alignment or agreement in classifying students into proficiency levels based on the IXL Real-Time Diagnostic and the SC READY across grades?

Analytic Approach

To assess the IXL Diagnostic's predictive validity, we examined the correlation coefficients between IXL Real-Time Diagnostic scores and SC READY scores using the Pearson product moment correlation r . This correlation coefficient measures the linear relationship between two variables with values ranging from -1.00 to 1.00. An r value of 0 indicates no correlation, whereas an r value greater than .70 indicates a strong positive relationship (Ratner, 2009). High positive correlations between the IXL Real-Time Diagnostic and a subsequent SC READY test would support the validity of the IXL Real-Time Diagnostic in predicting future academic achievement. In this study, we calculated the correlations between IXL Real-Time Diagnostic scores and SC READY scores for all the students across grades 3 through 6, as well as for each grade level separately.

To examine classification alignment, we checked the extent to which students were classified as proficient (at or above grade level) versus not proficient (below grade level) by both the IXL Real-Time Diagnostic and the SC READY. For example, were students classified as performing at or above grade level by IXL's Diagnostic also classified as such by the SC READY? Furthermore, we conducted chi-square tests and logistic regressions to evaluate whether students with diagnostic scores at or above grade level were more likely to reach proficiency on the SC READY. We conducted these

analyses separately for math and ELA across grades.

Each analysis is accompanied by a test of statistical significance and a probability (p) value. The p -value is the probability of observing the current or more extreme data, assuming the effect is zero (Cohen, 1994). As such, the smaller the p -value, the less likely that the result occurred at random, with .05, .01, and .001 commonly used as thresholds in research practice. Effects associated with p -values smaller than these thresholds are considered statistically significant at each of these significance levels.

Results

Descriptive Statistics

Among the analyzed students for math ($n = 1,956$), the average IXL Diagnostic math score was 430.62 ($SD = 130.09$), with 793 (41%) students performing at or above grade level. For ELA ($n = 1,902$), the average IXL Diagnostic score was 461.05 ($SD = 199.23$), with 799 (42%) students performing at or above grade level.

In terms of SC READY performance, the average 2022 SC READY math scale score was 491.85 ($SD = 115.82$), with 900 (46%) students reaching proficiency. For ELA, the average 2022 SC READY ELA scale score was 502.28 ($SD = 124.16$), with 880 (46%) students reaching proficiency.

Correlations

IXL Math

We found that the IXL Real-Time Diagnostic math assessment and the SC READY math test had a strong positive correlation, supporting the predictive validity of IXL’s Diagnostic math assessment. Specifically, the overall correlation among all students was .78 ($p < .001$). The correlations by grade level ranged from .75 to .82 with $ps < .001$ and are displayed via scatter plots in Figure 1.

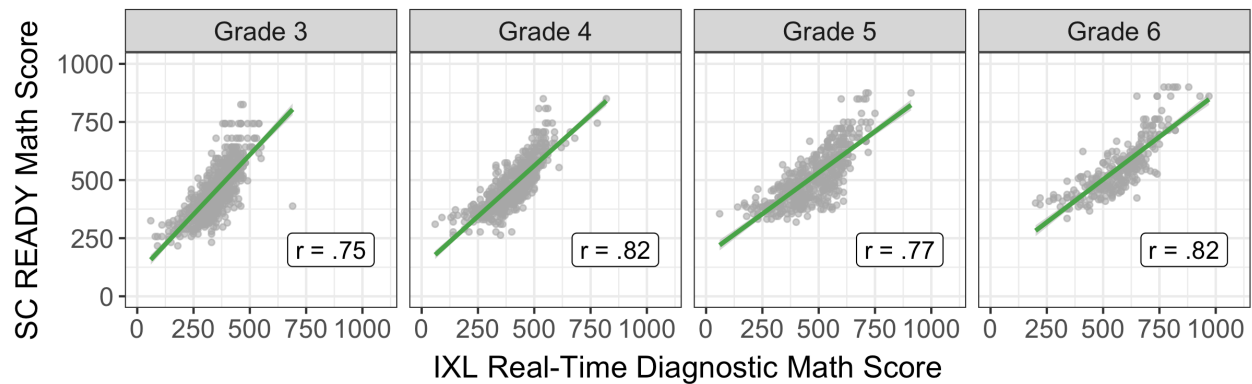


Figure 1. Correlations between IXL Real-Time Diagnostic math scores and SC READY math scores

IXL ELA

Similarly, we found that the IXL Real-Time Diagnostic ELA assessment and the SC READY ELA test had a strong positive correlation, supporting the predictive validity of IXL’s ELA diagnostic assessment. The overall correlation among all students was .84 ($p < .001$). The correlations by grade level ranged from .82 to .85 with $ps < .001$ and are displayed via scatter plots in Figure 2.

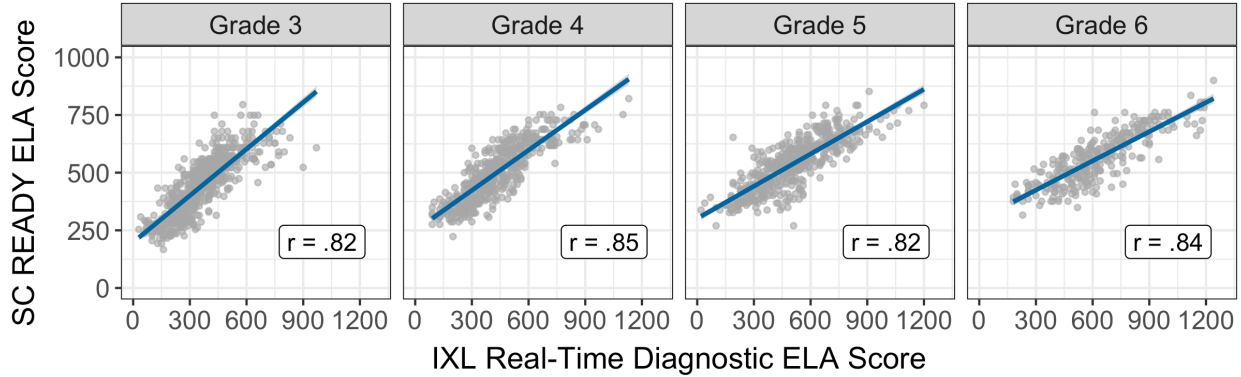


Figure 2. Correlations between IXL Real-Time Diagnostic ELA scores and SC READY ELA scores

Classification Alignment

IXL Math

We found a significant association between the classifications of students into proficiency levels based on the IXL Real-Time Diagnostic math assessment and the SC READY math test ($\chi^2 = 654.52$, $p < .001$; see Table A1 in Appendix A for details). Overall, the IXL Real-Time Diagnostic math assessment accurately predicted the proficiency status for 1,517 out of 1,956 (78%) students. Specifically, 70% of the students classified as proficient (i.e., performing at or above grade level) by the IXL Real-Time Diagnostic math assessment were also identified as proficient by the SC READY math assessment. Meanwhile, 89% of students classified as below grade level by the IXL Real-Time Diagnostic math assessment also did not reach proficiency on the SC READY math assessment.

To further examine the likelihood of reaching proficiency on the 2022 SC READY math assessment for students whose IXL Real-Time Diagnostic math scores were at or above grade level, we calculated odds ratios using logistic regression. Results showed that students with IXL Diagnostic math scores at or above their grade level were 19 times more likely to reach SC READY proficiency in math than students with IXL Real-Time Diagnostic math scores below grade level (see Table A1 in Appendix A for more details).

IXL ELA

Similarly, we also found a significant association between the classifications of students into proficiency levels based on the IXL Real-Time Diagnostic ELA assessment and the SC READY ELA test ($\chi^2 = 748.70$, $p < .001$; see Table A2 in Appendix A for details). Overall, the IXL Real-Time Diagnostic ELA assessment accurately predicted the proficiency status for 1,527 out of 1,902 (80%) students. Specifically, 73% of the students classified as proficient (i.e., performing at or above grade level) by the IXL Real-Time Diagnostic ELA assessment were also identified as proficient by the SC READY

ELA assessment. Meanwhile, 90% of students classified as below grade level by the IXL Real-Time Diagnostic ELA assessment also did not reach proficiency on the SC READY ELA assessment.

To further examine the likelihood of reaching proficiency on the 2022 SC READY ELA assessment for students whose IXL Real-Time Diagnostic ELA scores were at or above grade level, we calculated odds ratios using logistic regression. Results showed that students with IXL Diagnostic ELA scores at or above their grade level were 26 times more likely to reach SC READY proficiency in ELA than students with IXL Real-Time Diagnostic ELA scores below grade level (see Table A2 in Appendix A for more details).

Conclusion

In this study, we investigated the predictive validity of the IXL Real-Time Diagnostic with a novel set of state assessments, the South Carolina state assessment—SC READY. We examined test-criterion relationships between the two assessments by grade, providing empirical evidence in each grade level from grades 3 to 6. The IXL Real-Time Diagnostic demonstrated desirable predictive validity properties: we found strong correlations between the IXL Real-Time Diagnostic and the SC READY overall as well as in each grade and also observed a high degree of alignment in the two measures' classifications of student proficiency.

Coupled with prior studies of construct validity, internal consistency, and predictive validity, our findings corroborate a strong program of reliability and validity for the IXL Real-Time Diagnostic. It is worth noting that IXL Real-Time Diagnostic successfully classified 90% of students who did not reach proficiency in SC READY for both math and ELA. Thus, educators should consider using IXL's diagnostic to identify students who might be at risk at an early stage and to keep students on track in the classroom and ready for interim and state assessments.

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Appendix A: Classification Alignment

Table A1. 2x2 Table, Chi-square Test, and Logistic Regression for Math

		SC READY math (n = 1,956)		χ^2	Odds ratio
		Below proficient	At or above proficient		
IXL Real-Time Diagnostic math	Below grade level	705 (88.90%)	88 (11.10%)	654.52 ***	18.53 ***
	At or above grade level	351 (30.18%)	812 (69.82%)		

Note. ***: significance at the .001 level.

Table A2. 2x2 Table, Chi-square Test, and Logistic Regression for ELA

		SC READY ELA (n = 1,902)		χ^2	Odds ratio
		Below proficient	At or above proficient		
IXL Real-Time Diagnostic ELA	Below grade level	723 (90.49%)	76 (9.51%)	748.70 ***	25.58 ***
	At or above grade level	299 (27.11%)	804 (72.89%)		

Note. ***: significance at the .001 level.