RENAISSANCE®

TECHNICAL PAPER | 2020–2021 School Year

Relating Star Reading® and Star Math® to the Ohio State Tests

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Introduction

At Renaissance we know that as an educator, chief among your responsibilities is making decisions about how to allocate limited resources to best serve diverse student needs. A good assessment system supports your efforts, by providing timely, relevant information to help address key questions about which students are on track to meet important standards and who may need additional assistance.

Assessments that identify early any students at risk of missing academic standards are especially useful, as they inform instructional decisions to improve student performance and reduce gaps in achievement. Assessments that do this while taking little time away from instruction are particularly valuable. *Interim assessments*, one of three broad categories of educational assessment,[1] indicate which students are on track to meet later expectations (Perie, Marion, Gong, & Wurtzel, 2007).

This linking study applied results from two interim assessments, Renaissance Star Reading® and Renaissance Star Math® to help you predict whether individual students are on track or need more assistance to succeed on the year-end summative Ohio State Tests (OST) in English language arts and mathematics in grades 3 through 8.[2]

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Main Findings

Results from the linking analysis revealed that Star Reading and Star Math are accurate predictors of the Ohio State Tests, meaning as an Ohio educator you can use Star scores to:

1. Identify early in the year students likely to miss reading and math yearly progress goals in time to make meaningful adjustments to instruction well before the year-end test.

2. Forecast the percent of students at each OST performance level to serve as an early warning system for building and district administrators and allow redirection of resources as needed.

Study

To determine if Star Reading and Star Math can predict student achievement on the end-of-year Ohio State Tests in English language arts and mathematics, we began by linking the score scales for each assessment.

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1 **Formative assessments** are short and frequent processes, embedded in instruction, that support learning and provide specific feedback on what students know and can do versus where gaps in knowledge exist. **Summative assessments** evaluate whether students have met a set of standards, and serve most commonly as year-end state-mandated tests. **Interim assessments** represent the middle ground, in terms of duration and frequency and can serve purposes including informing instruction, evaluating curriculum and student responsiveness to intervention, and forecasting performance on high-stakes summative year-end tests.

2 Technical manuals are available for Star Reading and Star Math by request to research@renaissance.com.

Data collection

Using a secure data-matching procedure compliant with the federal Family Educational Rights and Privacy Act (FERPA) and Ohio Department of Education policies, staff from six large Ohio districts provided Renaissance with state summative test scores for students who had taken Star Reading or Star Math during the 2015–2016 school year. Each record included a student's OST scores and was matched with all Star scores for that year.

Sample characteristics

Renaissance divided the Ohio data into two samples. The **concurrent** sample included students' scores for all Star tests taken within 30 days before or after the mid-date of the OST administration window. This sample numbered 31,791 students in grades 3–8 with matched OST and Star Reading scores and 21,828 students in those grades with matched OST and Star Math scores. In each grade, we then set aside scores from a subset of these students—10%— as a **holdout sample** to use only to evaluate the scale linkage.

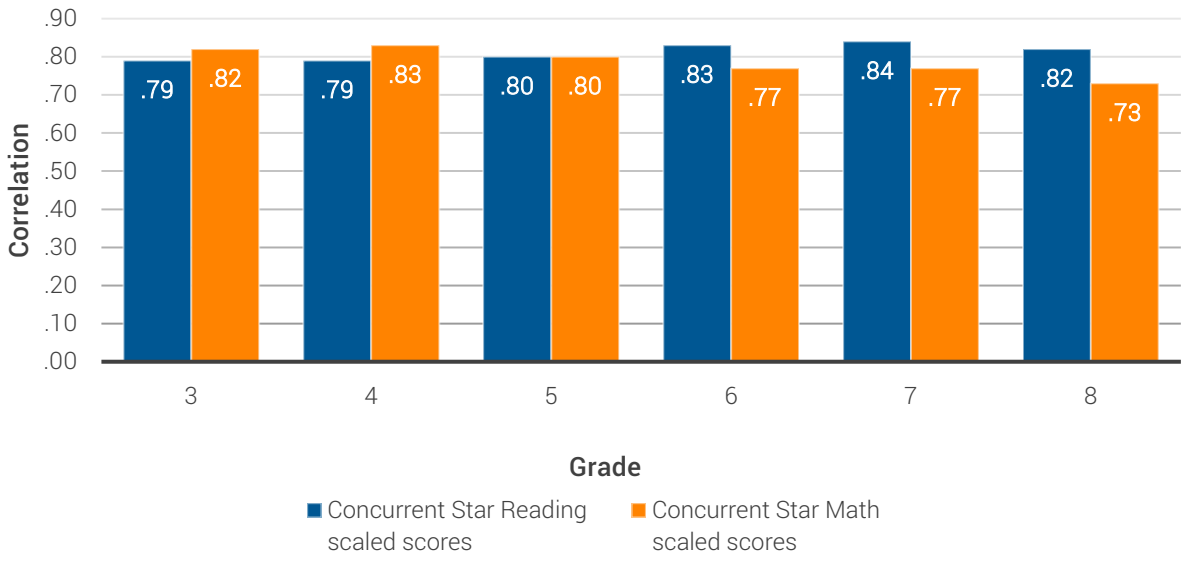
> The linking analysis revealed that Star Reading and Star Math are accurate predictors of the Ohio State Tests.

The **predictive** sample, which included 27,487 students for reading and 19,682 students for math, included Star scores for tests taken more than 30 days before the mid-date in the OST testing window.

Correlations

Before linking Star tests with the OST, we ensured there was a strong relationship between the test scales. As seen in figure 1, the correlations were positive, averaging .81 and .79 between OST and Star Reading and Star Math, respectively.

Figure 1. Star Reading® and Star Math® scores highly correlate with Ohio State Tests



Scale linkage

Renaissance then linked the score scales for the Star Reading/Star Math and the OST in English language arts and mathematics by applying equipercentile linking analysis (Kolen & Brennan, 2004) in grades 3–8. The concurrent sample (sans the holdout sample) was used in the linking (scores from all Star tests taken within 30 days before or after the OST testing mid-date), and the result was a table of OST scores for each possible Star score.

The predictive sample was then used to evaluate if the linking results could accurately predict student performance on the OST with Star data from earlier in the school year. To do so, we took students' Star scores from tests taken more than 30 days prior to the OST testing mid-date and used national growth norms (Renaissance, 2016a, 2016b) to project what their Star scores would be at the mid-date. Then the scale linkage table was used to look up the projected Star scores (or the average of the projected scores for students with multiple Star scores in the predictive sample) to see how they translated to the OST scale.

Ohio cut scores and corresponding Star score equivalents

OST results are reported in scaled scores that describe each student's location on an achievement continuum ranging from approximately 545 to 865 and using five achievement levels: *Limited*, *Basic*, *Proficient*, *Accelerated*, and *Advanced*.

A main purpose in linking Star Reading and Star Math to the OST was to identify Star scores approximately equivalent to the cut-off scores that separate the Ohio achievement levels. Table 1 displays these equivalent Star scores for grades 3–8. The corresponding OST cut scores can be found in the Appendix B.[3]

Table 1. Star Reading® and Star Math® score equivalents for each OST achievement level range

Star Reading® cut-score equivalents					
Grade	Limited	Basic	Proficient	Accelerated	Advanced
3	< 380	380–448	449–520	521–586	≥587
4	< 436	436–521	522–607	608–719	≥720
5	< 478	478–590	591–709	710–878	≥879
6	< 582	582–724	725–857	858–995	≥996
7	< 601	601–802	803–976	977–1212	≥1213
8	< 779	779–947	948–1216	1217–1319	≥1320
Star Math® cut-score equivalents					
Grade	Limited	Basic	Proficient	Accelerated	Advanced
3	< 572	572–607	608–647	648–687	≥688
4	< 636	636–666	667–706	707–771	≥772
5	< 695	695–746	747–807	808–848	≥849
6	< 737	737–790	791–838	839–872	≥873
7	< 762	762–802	803–853	854–894	≥895
8	< 773	773–812	813–880	881–914	≥915

3 The linking sample came from six school districts, so cut scores should be considered approximations to be updated with greater precision as more data become available.

Results

Accuracy of scale linkage confirmed

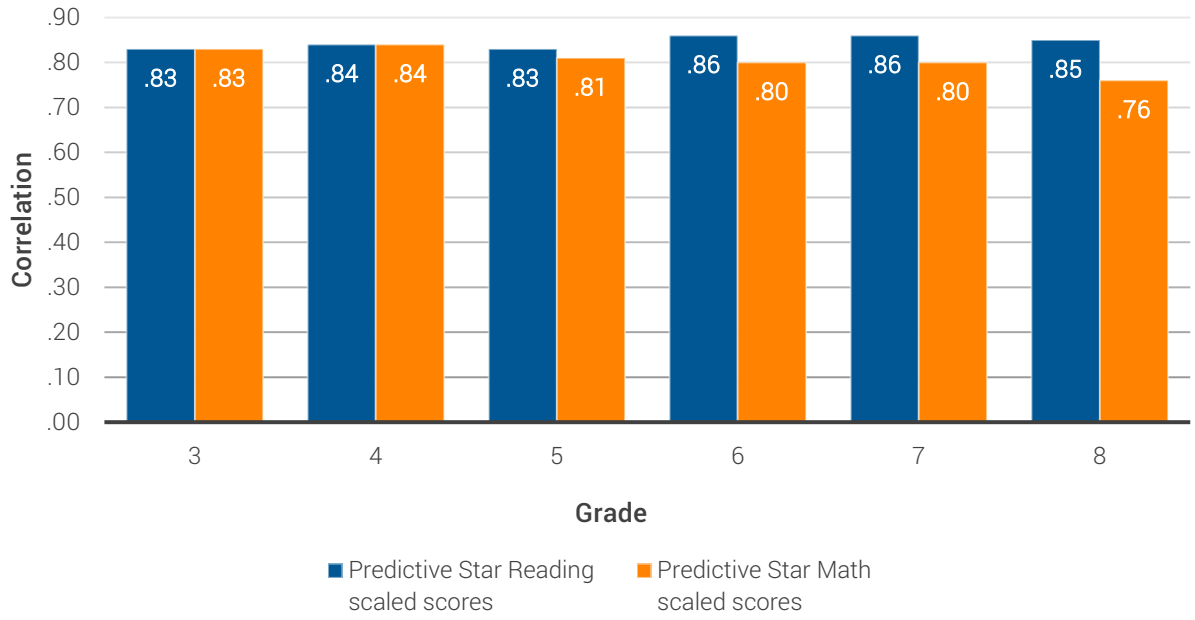
In evaluating the accuracy of the scale linkage, we used two methods to examine the differences between students' observed (actual) OST scores and our Star equivalents: (1) computing the RMSEL (the root mean squared errors of linking) using the scores from the linking study, and (2) applying the holdout sample, consisting of the subset of concurrent scores not used in the linking, to the linking results. Results showed that our linking computation performed as intended.

Predictive Star scores correlate highly with actual OST scores

Star scores have a strong relationship with end-of-year OST scores.

To summarize the predictive power of Star Reading and Star Math, we calculated raw correlations between observed (actual) OST scores and projected Star scores. As figure 2 shows, the predictive correlation showed a strong relationship between the assessments (similar to the correlations from the concurrent sample, see figure 1, p. 4), indicating that earlier Star scores have a strong relationship with end-of-year OST scores. For reading, the correlations averaged .84 and for math, the associations were also high, averaging .81.

Figure *2.* Projected scores from Star Reading® and Star Math® highly correlate with Ohio State Test scores



Star scores discriminate well between students who score proficient or not

Using the sample of actual OST scores, we were able to compare how our projected Star scores aligned with the observed Ohio scores. Table 2 displays classification diagnostics about whether students were correctly or incorrectly classified as proficient or not on the OST using projected Star scores. On average,

For Area Under the ROC Curve (AUC), a summary measure of diagnostic accuracy, Star Reading and Star Math averaged .93 and .92, respectively (also displayed in table 2). The AUCs far exceed the .85 standard set by the National Center on Response to Intervention to indicate convincing evidence that an assessment can accurately predict another assessment result or outcome.

Table 2. Proficiency forecasting using Star Reading® and Star Math® scores yields accurate results

Star Reading®						
Measure	Grade					
	3	4	5	6	7	8
Overall classification accuracy (percentage of correct classifications)	85%	84%	85%	87%	85%	86%
Area Under the ROC Curve	0.93	0.92	0.92	0.94	0.93	0.94
Star Math®						
Measure	Grade					
	3	4	5	6	7	8
Overall classification accuracy (percentage of correct classifications)	84%	82%	83%	85%	85%	81%
Area Under the ROC Curve	0.92	0.91	0.92	0.92	0.93	0.89

Other diagnostic accuracy measures studied:

- ✓ **Sensitivity** represents the percentage of proficient students that were correctly forecasted, which for Star Reading averaged 83% and for Star Math averaged 79%.
- ✓ **Specificity** represents the percentage of not-proficient students that were correctly forecasted, which for Star Reading averaged 87% and for Star Math averaged 86%.
- ✓ **Positive predictive values** indicate that when Star scores forecasted students to be proficient, they actually were proficient 87% of the time for Star Reading and 84% of the time for Star Math.
- ✓ **Negative predictive values** indicate that when Star scores forecasted students to miss proficiency, they actually weren't proficient 84% of the time for reading and 83% of the time for math.
- ✓ **Proficiency status projection error**, the difference between actual and projected proficiency rates, indicates how well scores accurately predict proficiency within each grade. Star Reading and Star Math both averaged -2% (negative scores indicate under-prediction while positive scores show over-prediction).

Appendix A: About Star Reading® and Star Math®

The computer-adaptive Star Reading and Star Math assessments serve multiple purposes including screening, progress monitoring, instructional planning, forecasting proficiency, standards mastery, and measuring growth. These highly reliable, valid, and efficient standards-based measures of student performance in reading and math provide valuable information regarding the acquisition of skills along a continuum of learning expectations. The assessments can be completed in about 20 minutes, and we recommend administering them two to five times a year for most purposes and more frequently when used for progress monitoring.

RENAISSANCE Star Reading®

RENAISSANCE Star Math®

Star Reading and Star Math are highly rated for academic screening and academic progress monitoring by the National Center on Intensive Intervention.

National Center on INTENSIVE INTERVENTION at American Institutes for Research

Appendix B: Ohio State Test achievement levels

Table B1. OST achievement level score ranges

OST achievement level score ranges: English language arts					
Grade	Limited	Basic	Proficient	Accelerated	Advanced
3	545–671	672–699	700–724	725–751	752–863
4	549–673	674–699	700–724	725–752	753–846
5	552–668	669–699	700–724	725–754	755–848
6	555–667	668–699	700–724	725–750	751–851
7	568–669	670–699	700–724	725–748	749–833
8	586–681	682–699	700–724	725–743	744–805
OST achievement level score ranges: Mathematics					
Grade	Limited	Basic	Proficient	Accelerated	Advanced
3	587–682	683–699	700–724	725–752	753–818
4	605–685	686–699	700–724	725–758	759–835
5	624–686	687–699	700–724	725–748	749–804
6	616–681	682–699	700–724	725–743	744–790
7	605–683	684–699	700–724	725–754	755–806
8	633–689	690–699	700–724	725–743	744–774

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