RENAISSANCE®

TECHNICAL PAPER | 2020–2021 School Year

Relating Star Reading® and Star Math® to the Oklahoma School Testing Program (OSTP) Assessments

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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 Oklahoma School Testing Program (OSTP) tests in English Language Arts (ELA) and mathematics in grades 3 through 8.[2]

Assessments that identify early any students at risk of missing academic standards are especially useful.

Main Findings

Results from the linking analysis revealed that Star Reading and Star Math are accurate predictors of the OSTP tests, meaning as an 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 OSTP 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 OSTP tests in ELA 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), staff from 3 districts (50 schools) provided Renaissance with OSTP test scores for students who had taken Star Reading or Star Math during the 2016–2017 school year. Each record included a student's OSTP scores and was matched with all Star scores for that year.

Sample characteristics

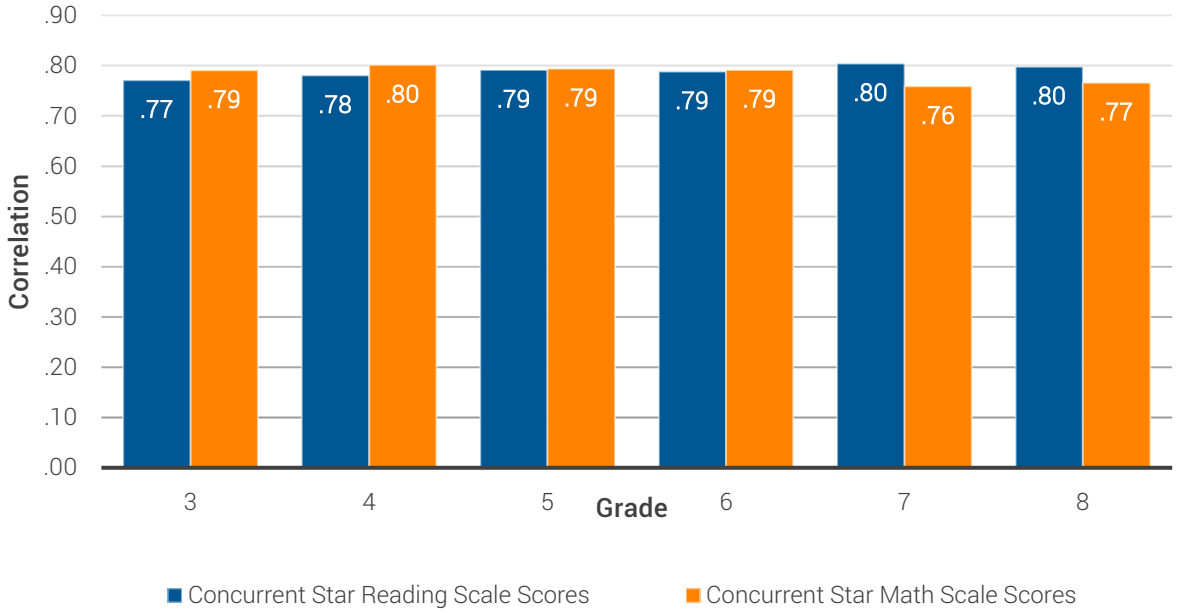
Renaissance divided the data into two samples. The **concurrent** sample included students' scores for all Star tests taken within 30 days before or after the OSTP administration. This sample numbered 21,496 records in grades 3–8 with matched OSTP and Star Reading scores and 18,021 records in those grades with matched OSTP 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 OSTP tests.

Correlations

Before linking Star tests with the OSTP, we ensured there was a strong relationship between the test scales. As seen in figure 1, the correlations were strong, averaging .79 and .78 between OSTP and Star Reading and Star Math, respectively.

Figure 1. Star Reading® and Star Math® scores highly correlate with OSTP tests



Scale linkage

Renaissance then linked the score scales for the Star Reading/Star Math and the OSTP in ELA 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 OSTP administration date), and the result was a table of OSTP scores for each possible Star score.

OSTP cut scores and corresponding Star score equivalents

OSTP results are reported in scaled scores that describe each student's location on an achievement continuum ranging from approximately 200 to 399 and using four achievement levels: *Below Basic, Basic, Proficient,* and *Advanced.* A main purpose in linking Star Reading and Star Math to the OSTP was to identify Star scores at the time of the state test that are approximately equivalent to the cut-off scores that separate the OSTP achievement levels. Table 1 displays these equivalent Star scores at the time of the state test for grades 3–8.[3] The corresponding OSTP cut scores can be found in Appendix B.

Table 1. Star Reading® and Star Math® score equivalents at time of state test for each OSTP achievement level range

Star Reading® cut-score equivalents				
Grade	Below Basic	Basic	Proficient	Advanced
3	< 353	353 – 485	486 – 699	≥ 700
4	< 425	425 – 569	570 – 869	≥ 870
5	< 460	460 – 661	662 – 919	≥ 920
6	< 483	483 – 784	785 – 1163	≥ 1164
7	< 627	627 – 920	921 – 1214	≥ 1215
8	< 628	628 – 983	984 – 1285	≥ 1286
Star Math® cut-score equivalents				
Grade	Below Basic	Basic	Proficient	Advanced
3	< 536	536 – 625	626 – 684	≥ 685
4	< 613	613 – 698	699 – 769	≥ 770
5	< 648	648 – 774	775 – 832	≥ 833
6	< 715	715 – 821	822 – 906	≥ 907
7	< 772	772 – 848	849 – 919	≥ 920
8	< 829	829 – 892	893 – 925	≥ 926

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) OSTP 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.

3 The Star Reading and Star Math cut-score equivalents presented in Table 1 apply only to the time of the state test. Some Renaissance reports adjust the Star Reading and Star Math cut-score equivalents based on date.

Star scores discriminate well between students who score proficient or not

Using the holdout sample, we were able to compare how concurrent Star scores aligned with the observed OSTP scores. Table 2 displays classification diagnostics about whether students were correctly or incorrectly classified as proficient or not on the OSTP using concurrent Star scores. On average, students were correctly classified (i.e., overall classification accuracy) 83% of the time for reading and 84% of the time for math.

For Area Under the ROC Curve (AUC), a summary measure of diagnostic accuracy, Star Reading averaged .90 and Star Math averaged .91 (also displayed in table 2). The AUCs 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)	82%	80%	85%	81%	85%	84%
Area Under the ROC Curve	0.89	0.87	0.91	0.92	0.92	0.90
Star Math®						
Measure	Grade					
	3	4	5	6	7	8
Overall classification accuracy (percentage of correct classifications)	81%	82%	85%	83%	86%	86%
Area Under the ROC Curve	0.90	0.90	0.91	0.90	0.91	0.91

Other diagnostic accuracy measures studied:

- ✓ **Sensitivity** represents the percentage of proficient students that were correctly forecasted, which for Star Reading averaged 77% and for Star Math averaged 78%.
- ✓ **Specificity** represents the percentage of not-proficient students that were correctly forecasted, which averaged 87% for Star Reading and Star Math.
- ✓ **Positive predictive values** indicate that when Star scores forecasted students to be proficient, they actually were proficient 79% of the time for Star Reading and 76% of the time for Star Math.
- ✓ **Negative predictive values** indicate that when Star scores forecasted students to miss proficiency, they actually weren't proficient 85% of the time for reading and 87% 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 averaged -1% and Star Math averaged 0% (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.

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

Appendix B: Oklahoma School Testing Program (OSTP) Test achievement levels

Table B1. OSTP achievement level score ranges

OSTP achievement level score ranges: English language arts				
Grade	Below Basic	Basic	Proficient	Advanced
3	200 – 276	277 – 299	300 – 328	329 – 399
4	200 – 274	275 – 299	300 – 330	331 – 399
5	200 – 270	271 – 299	300 – 322	323 – 399
6	200 – 268	269 – 299	300 – 329	330 – 399
7	200 – 272	273 – 299	300 – 322	323 – 399
8	200 – 268	269 – 299	300 – 321	322 – 399
OSTP achievement level score ranges: Mathematics				
Grade	Below Basic	Basic	Proficient	Advanced
3	200 – 273	274 – 299	300 – 320	321 – 399
4	200 – 272	273 – 299	300 – 321	322 – 399
5	200 – 265	266 – 299	300 – 320	321 – 399
6	200 – 266	267 – 299	300 – 329	330 – 399
7	200 – 278	279 – 299	300 – 328	329 – 399
8	200 – 276	277 – 299	300 – 315	316 – 399

References

Kolen, M. J., & Brennan, R. R. (2004). *Test equating scaling and linking: Methods and practices*. New York, NY: Springer Science+Business Media.

Perie, M., Marion, S., Gong, B., & Wurtzel, J. (2007). *The role of interim assessments in a comprehensive assessment system*. Aspen, CO: Aspen Institute.

Renaissance Learning. (2018a). *Star Math technical manual*. Wisconsin Rapids, WI: Author. Available by request to research@renaissance.com

Renaissance Learning. (2018b). *Star Reading technical manual*. Wisconsin Rapids, WI: Author. Available by request to research@renaissance.com

Independent technical reviews of Star Reading® and Star Math®

U.S. Department of Education: National Center on Intensive Intervention. (2018a). *Review of academic progress monitoring tools* [Review of Star Math]. Washington, DC: Author. Retrieved from https://charts.intensiveintervention.org/chart/progress-monitoring

U.S. Department of Education: National Center on Intensive Intervention. (2018b). *Review of academic progress monitoring tools* [Review of Star Reading]. Washington, DC: Author. Retrieved from https://charts.intensiveintervention.org/chart/progress-monitoring

U.S. Department of Education: National Center on Intensive Intervention. (2018c). *Review of academic screening tools* [Review of Star Math]. Washington, DC: Author. Retrieved from https://charts.intensiveintervention.org/chart/academic-screening

U.S. Department of Education: National Center on Intensive Intervention. (2018d). *Review of academic screening tools* [Review of Star Reading]. Washington, DC: Author. Retrieved from https://charts.intensiveintervention.org/chart/academic-screening

U.S. Department of Education: National Center on Response to Intervention. (2010a). *Review of progress monitoring tools* [Review of STAR Math]. Washington, DC: Author. Retrieved from https://web.archive.org/web/20120813035500/http://www.rti4success.org/pdf/progressMonitoringGOM.pdf

U.S. Department of Education: National Center on Response to Intervention. (2010b). *Review of progress monitoring tools* [Review of STAR Reading]. Washington, DC: Author. Retrieved from https://web.archive.org/web/20120813035500/http://www.rti4success.org/pdf/progressMonitoringGOM.pdf

U.S. Department of Education: National Center on Response to Intervention. (2011a). *Review of screening tools* [Review of STAR Math]. Washington, DC: Author. Retrieved from https://web.archive.org/web/20171027185735/http://www.rti4success.org:80/resources/tools-charts/screening-tools-chart

U.S. Department of Education: National Center on Response to Intervention. (2011b). *Review of screening tools* [Review of STAR Reading]. Washington, DC: Author. Retrieved from https://web.archive.org/web/20171027185735/http://www.rti4success.org:80/resources/tools-charts/screening-tools-chart