

## Pathway to Proficiency: Linking Star Reading® and Star Math® to the Rhode Island Comprehensive Assessment System (RICAS) Tests



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Initial publication July 29, 2019

# 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,<sup>1</sup> 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 RICAS tests in English Language Arts (ELA) and Mathematics in grades 3 through 8.<sup>2</sup>

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## Main Findings

Results from the linking analysis revealed that Star Reading and Star Math are accurate predictors of the RICAS, 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 RICAS 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 RICAS tests in ELA and mathematics, we began by linking the score scales for each assessment.

### School-Level Data collection

To find a sample of students who were assessed by both the RICAS and Star Assessments, we began by gathering all Star Reading and Star Math test records from 2017–2018 for Rhode Island. Then, each

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<sup>1</sup> **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.

<sup>2</sup> Technical manuals are available for Star Reading and Star Math by request to [research@renaissance.com](mailto:research@renaissance.com).

school's Star Reading and Star Math data were aggregated by grade and subject area. The next step was to match Star data with the RICAS data from the same school year by district and school name. To do this, performance level distribution data from the RICAS was obtained from the public data provided by the Rhode Island Department of Education. The file included the number of students tested in each grade and the percentage of students who were *Not Meeting Expectations*, *Partially Meeting Expectations*, *Meeting Expectations*, or *Exceeding Expectations*.

## Sample characteristics

Once we determined how many students in each grade at a school were tested on the RICAS ELA and took a Star Reading assessment, we calculated the percentage of students assessed on both tests. Then we repeated this exercise for the math assessments. In each grade at each school, if between 95% and 105% of the students who tested on the RICAS had taken a Star assessment, that grade was included in the sample. This method of sample selection ensured that our sample consisted of cases in which all or nearly all the enrolled students who took the RICAS also took a Star test within the specified window of time. If a total of approximately 1,000 or more students per grade met the sample criteria, that grade's sample was considered sufficiently large for analysis.

The reading sample included 21,468 Star Reading students from 123 schools. The math sample included 24,640 Star Math students from 129 schools. Table 1 displays by-grade test summaries for the reading and math samples. It also includes percentages of students in the *Not Meeting Expectations*, *Partially Meeting Expectations*, *Meeting Expectations*, and *Exceeding Expectations* performance levels, both for the sample and statewide.

**Table 1. Performance characteristics of reading and math samples**

| Star Reading® sample performance |                        |                     |                          |       |                                |       |                      |       |                        |       |
|----------------------------------|------------------------|---------------------|--------------------------|-------|--------------------------------|-------|----------------------|-------|------------------------|-------|
| Grade                            | Star Reading® students | RICAS ELA students  | Not Meeting Expectations |       | Partially Meeting Expectations |       | Meeting Expectations |       | Exceeding Expectations |       |
|                                  |                        |                     | Sample                   | State | Sample                         | State | Sample               | State | Sample                 | State |
| 3                                | 3,144                  | 3,071               | 9%                       | 11%   | 47%                            | 49%   | 39%                  | 35%   | 5%                     | 5%    |
| 4                                | 3,786                  | 3,696               | 11%                      | 15%   | 42%                            | 47%   | 41%                  | 34%   | 6%                     | 4%    |
| 5                                | 3,933                  | 3,843               | 8%                       | 14%   | 44%                            | 49%   | 45%                  | 35%   | 3%                     | 2%    |
| 6                                | 3,474                  | 3,375               | 12%                      | 20%   | 45%                            | 46%   | 38%                  | 31%   | 5%                     | 4%    |
| 7                                | 3,565                  | 3,453               | 20%                      | 29%   | 50%                            | 47%   | 27%                  | 22%   | 3%                     | 2%    |
| 8                                | 3,566                  | 3,454               | 20%                      | 30%   | 44%                            | 42%   | 33%                  | 25%   | 3%                     | 3%    |
| Star Math® sample performance    |                        |                     |                          |       |                                |       |                      |       |                        |       |
| Grade                            | Star Math® students    | RICAS Math students | Not Meeting Expectations |       | Partially Meeting Expectations |       | Meeting Expectations |       | Exceeding Expectations |       |
|                                  |                        |                     | Sample                   | State | Sample                         | State | Sample               | State | Sample                 | State |
| 3                                | 3,251                  | 3,169               | 16%                      | 20%   | 46%                            | 45%   | 34%                  | 31%   | 4%                     | 4%    |
| 4                                | 4,097                  | 3,999               | 19%                      | 23%   | 51%                            | 50%   | 28%                  | 25%   | 2%                     | 2%    |
| 5                                | 4,035                  | 3,939               | 13%                      | 21%   | 53%                            | 52%   | 32%                  | 25%   | 2%                     | 1%    |
| 6                                | 3,958                  | 3,854               | 13%                      | 21%   | 56%                            | 54%   | 30%                  | 24%   | 1%                     | 1%    |
| 7                                | 4,654                  | 4,519               | 20%                      | 26%   | 48%                            | 47%   | 30%                  | 25%   | 2%                     | 2%    |
| 8                                | 4,645                  | 4,497               | 15%                      | 24%   | 58%                            | 53%   | 25%                  | 21%   | 2%                     | 1%    |

# Results

## Scale linkage

Renaissance linked the Star test scale to the RICAS by applying equipercntile linking analysis (Kolen & Brennan, 2004). First, we aggregated the sample of schools to calculate the percentage of students categorized as *Not Meeting Expectations*, *Partially Meeting Expectations*, *Meeting Expectations*, and *Exceeding Expectations* for each subject and grade. Then we analyzed the distribution of Star scores to determine the scaled score corresponding to the same percentile as specific RICAS level. For example, as shown in Table 1, 9% of students in the third-grade reading sample were classified as *Not Meeting Expectations*, 47% were classified as *Partially Meeting Expectations*, 39% were classified as *Meeting Expectations*, and 5% were classified as *Exceeding Expectations*. Therefore, the cut score was at the 9<sup>th</sup> percentile for *Partially Meeting Expectations*, the 56<sup>th</sup> percentile for *Meeting Expectations*, and the 95<sup>th</sup> percentile for *Exceeding Expectations*.

## RICAS cut scores and corresponding Star score equivalents

RICAS results are reported in scaled scores that are split into four achievement levels: *Not Meeting Expectations*, *Partially Meeting Expectations*, *Meeting Expectations*, and *Exceeding Expectations*. The main purpose in linking Star Reading and Star Math to the RICAS was to identify Star scores at the time of the state test that are approximately equivalent to the cut-off scores that separate the RICAS levels. Table 2 displays these equivalent Star scores at the time of the state test for grades 3-8.<sup>3</sup> The corresponding RICAS cut scores can be found in Appendix B.

**Table 2. Star Reading<sup>®</sup> and Star Math<sup>®</sup> score equivalents for each RICAS achievement level range**

| Star Reading <sup>®</sup> cut-score equivalents |                          |                                |                      |                        |
|---|--------------------------|--------------------------------|----------------------|------------------------|
| Grade   | Not Meeting Expectations | Partially Meeting Expectations | Meeting Expectations | Exceeding Expectations |
| 3   | < 254                    | 254 – 481                      | 482 – 730            | ≥ 731                  |
| 4   | < 368                    | 368 – 587                      | 588 – 914            | ≥ 915                  |
| 5   | < 408                    | 408 – 684                      | 685 – 1144           | ≥ 1145                 |
| 6   | < 503                    | 503 – 815                      | 816 – 1221           | ≥ 1222                 |
| 7   | < 650                    | 650 – 1019                     | 1020 – 1315          | ≥ 1316                 |
| 8   | < 703                    | 703 – 1072                     | 1073 – 1335          | ≥ 1336                 |
| Star Math <sup>®</sup> cut-score equivalents    |                          |                                |                      |                        |
| Grade   | Not Meeting Expectations | Partially Meeting Expectations | Meeting Expectations | Exceeding Expectations |
| 3   | < 550                    | 550 – 642                      | 643 – 721            | ≥ 722                  |
| 4   | < 628                    | 628 – 730                      | 731 – 823            | ≥ 824                  |
| 5   | < 658                    | 658 – 790                      | 791 – 881            | ≥ 882                  |
| 6   | < 680                    | 680 – 823                      | 824 – 924            | ≥ 925                  |
| 7   | < 731                    | 731 – 848                      | 849 – 945            | ≥ 946                  |
| 8   | < 733                    | 733 – 878                      | 879 – 958            | ≥ 959                  |

<sup>3</sup> The Star Reading and Star Math cut-score equivalents presented in Table 2 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.

## Accuracy of scale linkage confirmed

Six districts in Rhode Island shared student level RICAS scores to explore the accuracy of using Star Reading and Star Math for forecasting RICAS performance. The Star Reading sample consisted of 20,972 students and the Star Math sample consisted of 22,041 students. We took students' Star scores from tests taken within 30 days of the mid-date of the RICAS administration to examine the accuracy of the linkage to the RICAS scale.

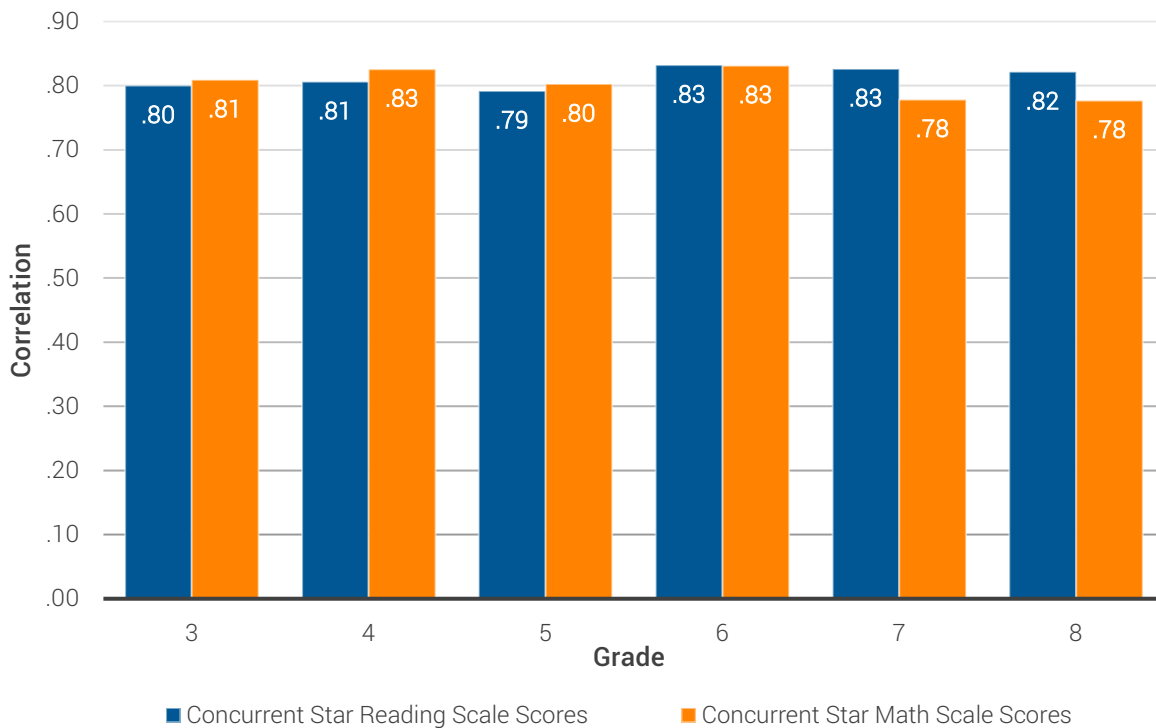
Classification diagnostics were derived from counts of correct and incorrect classifications when using Star scores to predict whether a student would achieve proficiency on the RICAS. The results indicate that Star Assessments provide an effective means of estimating end-of-year achievement on the RICAS.

## Star scores correlate highly with actual RICAS scores

To summarize the predictive power of Star Reading and Star Math, we calculated correlations between concurrent RICAS scores and Star scores. As seen in figure 1, the correlations were strong, averaging .81 and .80 between RICAS and Star Reading and Star Math, respectively.

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

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



## Star scores discriminate well between students who score proficient or not

We compared actual RICAS performance to students' estimated RICAS performance based on concurrent Star scores and the estimated Star cut score equivalents. Table 3 displays classification diagnostics about whether students were correctly or incorrectly classified as proficient or not on the RICAS using Star scores. On average, students were correctly classified (i.e., overall classification accuracy) 88% of the time by Star Reading and 90% of the time by Star Math.

For Area Under the ROC Curve (AUC), a summary measure of diagnostic accuracy, Star Reading averaged .93 and Star Math averaged .95 (also displayed in table 3). The AUCs met or exceeded 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 3. Proficiency forecasting using Star Reading® and Star Math® scores yields accurate results**

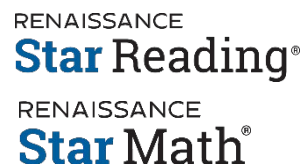
| Star Reading®   |       |      |      |      |      |      |
|---|-------|------|------|------|------|------|
| Measure   | Grade |      |      |      |      |      |
|   | 3     | 4    | 5    | 6    | 7    | 8    |
| Overall classification accuracy (percentage of correct classifications) | 86%   | 86%  | 86%  | 89%  | 92%  | 89%  |
| Area Under the ROC Curve  | 0.91  | 0.91 | 0.91 | 0.94 | 0.94 | 0.93 |
| Star Math®  |       |      |      |      |      |      |
| Measure   | Grade |      |      |      |      |      |
|   | 3     | 4    | 5    | 6    | 7    | 8    |
| Overall classification accuracy (percentage of correct classifications) | 86%   | 89%  | 90%  | 91%  | 93%  | 91%  |
| Area Under the ROC Curve  | 0.93  | 0.94 | 0.95 | 0.96 | 0.97 | 0.95 |

Other diagnostic accuracy measures studied:

- ✓ **Sensitivity** represents the percentage of proficient students that were correctly forecasted, which for Star Reading averaged 73% and for Star Math averaged 82%.
- ✓ **Specificity** represents the percentage of not-proficient students that were correctly forecasted, which for Star Reading averaged 91% and Star Math averaged 92%.
- ✓ **Positive predictive values**, which indicate that when Star scores forecasted students to be proficient, they actually were proficient, were 62% for Star Reading and 63% for Star Math.
- ✓ **Negative predictive values**, which indicate that when Star scores forecasted students to miss proficiency, they actually weren't proficient, were 94% for reading and 97% 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 3% and Star Math averaged 4% (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.

National Center on  
**INTENSIVE INTERVENTION**

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## Appendix B: RICAS achievement levels

**Table B1. RICAS achievement level score ranges**

| RICAS achievement level score ranges: ELA         |                          |                                |                      |                        |
|---|--------------------------|--------------------------------|----------------------|------------------------|
| Grade   | Not Meeting Expectations | Partially Meeting Expectations | Meeting Expectations | Exceeding Expectations |
| 3   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 4   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 5   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 6   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 7   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 8   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| RICAS achievement level score ranges: Mathematics |                          |                                |                      |                        |
| Grade   | Not Meeting Expectations | Partially Meeting Expectations | Meeting Expectations | Exceeding Expectations |
| 3   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 4   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 5   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 6   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 7   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |
| 8   | 440 – 469                | 470 – 499                      | 500 – 529            | 530 – 560              |



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