

Pathway to Proficiency: Linking Star Reading® and Star Math® to the South Carolina College-and Career-Ready Assessments (SC READY)



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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 South Carolina College- and Career-Ready Assessments (SC READY) tests in 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 SC READY 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 SC READY 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 SC READY tests in ELA and mathematics, we began by linking the score scales for each assessment.

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.

School-Level Data collection

To find a sample of students who were assessed by both the SC READY and Star Assessments, we began by gathering all Star Reading and Star Math test records from 2015–2016 for South Carolina. Then, each 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 SC READY data from the same school year by district and school name. To do this, performance level distribution data from the SC READY was obtained from the South Carolina Department of Education website. The file included the number of students tested in each grade and the percentage of students who were *Does Not Meet*, *Approaches*, *Meets*, and *Exceeds*. Students scoring in the *Meets* and *Exceeds* categories would be counted as meeting proficiency standards for state and federal performance-level reporting.

Sample characteristics

Once we determined how many students in each grade at a school were tested on the SC READY 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 SC READY had taken a Star assessment, that grade was included in the sample³. This method of sample selection ensured that our sample consisted of cases in which all or nearly all the enrolled students who took the SC READY 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 20,002 Star Reading students from 110 schools. The math sample included 8,472 Star Math students from 54 schools. Table 1 displays by-grade test summaries for the reading and math samples. It also includes percentages of students in the *Does Not Meet*, *Approaches*, *Meets*, and *Exceeds* performance levels, both for the sample and statewide.

³ The grade 7 mathematics sample was initially lower than other grades. Inspection of the matched schools indicated that several schools had percentages of students assessed on both tests that were high, but failed to meet the 95% - 105% cutoff. These additional schools were included in the grade 7 math sample to make this sample size comparable to other grades.

Table 1. Performance characteristics of reading and math samples

| Star Reading® sample performance | | | | | | | | | | |
|----------------------------------|------------------------|------------------------|---------------|-------|------------|-------|--------|-------|---------|-------|
| Grade | Star Reading® students | SC READY ELA students | Does Not Meet | | Approaches | | Meets | | Exceeds | |
| | | | Sample | State | Sample | State | Sample | State | Sample | State |
| 3 | 4,686 | 4,605 | 22% | 22% | 33% | 34% | 30% | 29% | 15% | 15% |
| 4 | 3,644 | 3,579 | 26% | 24% | 31% | 32% | 28% | 29% | 15% | 15% |
| 5 | 4,529 | 4,481 | 25% | 24% | 37% | 35% | 26% | 28% | 12% | 13% |
| 6 | 1,947 | 1,916 | 24% | 20% | 38% | 39% | 24% | 27% | 14% | 14% |
| 7 | 2,419 | 2,434 | 25% | 23% | 37% | 36% | 26% | 27% | 12% | 14% |
| 8 | 2,777 | 2,733 | 25% | 22% | 36% | 33% | 28% | 30% | 11% | 15% |
| Star Math® sample performance | | | | | | | | | | |
| Grade | Star Math® students | SC READY Math students | Does Not Meet | | Approaches | | Meets | | Exceeds | |
| | | | Sample | State | Sample | State | Sample | State | Sample | State |
| 3 | 2,190 | 2,152 | 26% | 21% | 27% | 25% | 32% | 34% | 15% | 20% |
| 4 | 1,760 | 1,730 | 34% | 23% | 35% | 30% | 17% | 25% | 14% | 22% |
| 5 | 1,778 | 1,758 | 25% | 23% | 36% | 33% | 23% | 25% | 16% | 19% |
| 6 | 876 | 873 | 31% | 26% | 39% | 35% | 20% | 22% | 10% | 17% |
| 7 | 928 | 908 | 32% | 27% | 43% | 39% | 16% | 19% | 9% | 15% |
| 8 | 940 | 927 | 27% | 29% | 35% | 38% | 19% | 19% | 19% | 14% |

Results

Scale linkage

Renaissance linked the Star test scale to the SC READY by applying equipercentile linking analysis (Kolen & Brennan, 2004). First, we aggregated the sample of schools for each subject to grade level. Next, we calculated the percentage of students scoring in each SC READY performance level for each grade. Finally, we ordered Star scores and analyzed the distribution to determine the scaled score at the same percentile as the SC READY Proficient level. For example, in our third grade reading sample, 22% of students were classified as *Does Not Meet*, 33% *Approaches*, 30% *Meets*, and 15% *Exceeds*. Therefore, the cutscores for proficiency levels in the third grade are at the 22nd percentile for *Approaches*, the 55th percentile for *Meets*, and the 85th percentile for *Exceeds*.

SC READY cut scores and corresponding Star score equivalents

SC READY results are reported in scaled scores that are split into four achievement levels: *Well Below State Expectations*, *Below State Expectations*, *At State Expectations*, and *Above State Expectations*. The public data available on the South Carolina Department of Education website includes performance information for two levels only: the combined *Well Below or Below State Expectations* levels and the combined *At or Above State Expectations* Levels. The main purpose in linking Star Reading and Star Math to the SC READY was to identify Star scores approximately equivalent to the cut-off scores that separate the SC READY levels.

Table 2 displays these equivalent Star scores. The corresponding SC READY cut scores can be found in Appendix B.

Table 2. Star Reading® and Star Math® score equivalents for each SC READY achievement level

| Star Reading® cut-score equivalents | | | | |
|-------------------------------------|---------------|------------|-------|---------|
| Grade | Does Not Meet | Approaches | Meets | Exceeds |
| 3 | < 306 | 306 | 445 | 579 |
| 4 | < 398 | 398 | 531 | 704 |
| 5 | < 463 | 463 | 647 | 880 |
| 6 | < 481 | 481 | 725 | 952 |
| 7 | < 537 | 537 | 815 | 1089 |
| 8 | < 599 | 599 | 876 | 1206 |
| Star Math® cut-score equivalents | | | | |
| Grade | Does Not Meet | Approaches | Meets | Exceeds |
| 3 | < 551 | 551 | 609 | 672 |
| 4 | < 616 | 616 | 693 | 737 |
| 5 | < 662 | 662 | 748 | 809 |
| 6 | < 695 | 695 | 790 | 845 |
| 7 | < 726 | 726 | 835 | 880 |
| 8 | < 765 | 765 | 852 | 897 |

Accuracy of scale linkage confirmed

Two South Carolina schools shared student level SC READY scores to explore the accuracy of using Star Reading and Star Math for forecasting SC READY performance. The Star Reading sample consisted of 10,011 students and the Star Math sample consisted of 8,909 students. We took students' Star scores from tests taken prior to the mid-date of the SC READY administration and used national growth norms (Renaissance Learning, 2016a, 2016b) to project what their Star scores would be at the date of the SC READY administration. We used the projected Star scores (or the average of the projected scores for students with multiple Star scores prior to the mid-date of the SC READY administration) to examine the accuracy of the linkage to the SC READY scale.

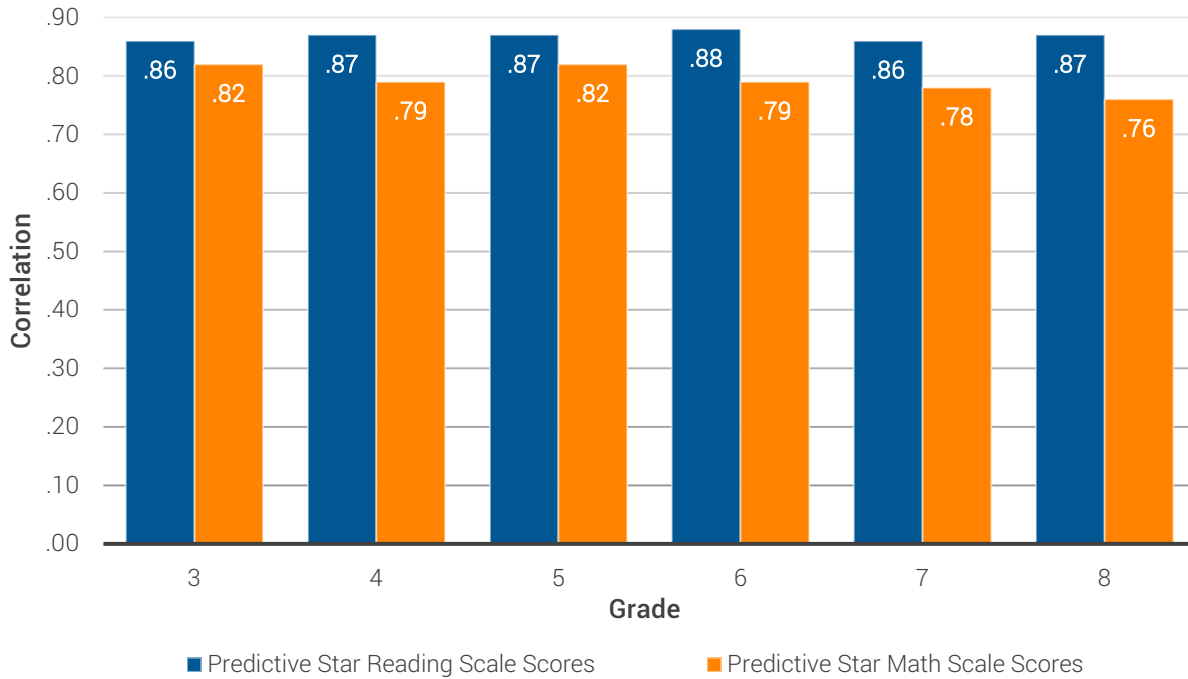
Classification diagnostics were derived from counts of correct and incorrect classifications when using Star scores to predict whether a student would achieve proficiency on the SC READY. The results indicate that Star Assessments provide an effective means of estimating end-of-year achievement on the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

Predictive Star scores correlate highly with actual SC READY scores

To summarize the predictive power of Star Reading and Star Math, we calculated correlations between observed SC READY scores and projected Star scores. As seen in figure 1, the correlations were strong, averaging .87 and .79 between SC READY and Star Reading and Star Math, respectively.

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

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



Star scores discriminate well between students who score proficient or not

We compared actual SC READY performance to students' estimated SC READY performance based on projected 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 SC READY using projected Star scores. On average, students were correctly classified (i.e., overall classification accuracy) 86% of the time by Star Reading and 87% of the time by Star Math.

For Area Under the ROC Curve (AUC), a summary measure of diagnostic accuracy, Star Reading averaged .94 and Star Math averaged .94 (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

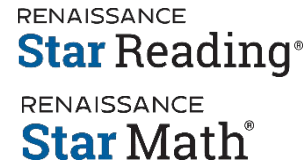
| Star Reading® | | | | | | |
|--|-------|------|------|------|------|------|
| Measure | Grade | | | | | |
| | 3 | 4 | 5 | 6 | 7 | 8 |
| Overall classification accuracy (percentage of correct classifications) | 85% | 85% | 85% | 86% | 85% | 87% |
| Area Under the ROC Curve | 0.94 | 0.93 | 0.93 | 0.95 | 0.93 | 0.94 |
| Star Math® | | | | | | |
| Measure | Grade | | | | | |
| | 3 | 4 | 5 | 6 | 7 | 8 |
| Overall classification accuracy (percentage of correct classifications) | 85% | 87% | 86% | 88% | 89% | 88% |
| Area Under the ROC Curve | 0.93 | 0.94 | 0.94 | 0.95 | 0.95 | 0.94 |

Other diagnostic accuracy measures studied:

- ✓ **Sensitivity** represents the percentage of proficient students that were correctly forecasted, which for Star Reading averaged 85% and for Star Math averaged 83%.
- ✓ **Specificity** represents the percentage of not-proficient students that were correctly forecasted, which for Star Reading averaged 86% and for Star Math averaged 89%.
- ✓ **Positive predictive values**, which indicate that when Star scores forecasted students to be proficient, they actually were proficient, were 76% for Star Reading and 79% for Star Math.
- ✓ **Negative predictive values**, which indicate that when Star scores forecasted students to miss proficiency, they actually weren't proficient, were 91% for reading and 91% 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 4% and Star Math averaged 1% (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.



at American Institutes for Research ■

Appendix B: SC READY achievement levels

Table B1. SC READY achievement level score ranges

| SC READY achievement level score ranges: ELA | | | | |
|--|---------------|------------|-----------|-----------|
| Grade | Does Not Meet | Approaches | Meets | Exceeds |
| 3 | 100 – 358 | 359 – 451 | 452 – 539 | 540 – 825 |
| 4 | 100 – 418 | 419 – 508 | 509 – 592 | 593 – 850 |
| 5 | 100 – 449 | 450 – 557 | 558 – 652 | 653 – 875 |
| 6 | 100 – 454 | 455 – 575 | 576 – 667 | 668 – 900 |
| 7 | 100 – 511 | 512 – 614 | 615 – 704 | 705 – 925 |
| 8 | 100 – 537 | 538 – 642 | 643 – 737 | 738 – 950 |
| SC READY achievement level score ranges: Mathematics | | | | |
| Grade | Does Not Meet | Approaches | Meets | Exceeds |
| 3 | 100 – 359 | 360 – 437 | 438 – 543 | 544 – 825 |
| 4 | 100 – 401 | 402 – 481 | 482 – 562 | 563 – 850 |
| 5 | 100 – 447 | 448 – 535 | 536 – 621 | 622 – 875 |
| 6 | 100 – 453 | 454 – 542 | 543 – 627 | 628 – 900 |
| 7 | 100 – 487 | 488 – 577 | 578 – 649 | 650 – 925 |
| 8 | 100 – 526 | 527 – 614 | 615 – 683 | 684 – 950 |

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