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The STAR assessments are highly rated for screening and progress monitoring by the U.S. Department of Education's National Center on Response to Intervention!

# THE FOUNDATION OF THE **STAR Assessments**

## QUICK-REFERENCE GUIDE TO THE STAR ASSESSMENTS



**STAR Early Literacy**—used for screening, progress-monitoring, and diagnostic assessment—is a reliable, valid, and efficient computer-adaptive assessment of 41 skills in seven critical early literacy domains. A STAR Early Literacy assessment can be completed without teacher assistance in about 10 minutes by emergent readers grades pre-K–3 and repeated as often as weekly for progress monitoring. STAR Early Literacy also correlates highly with a wide range of more time-intensive assessments and serves as a skills diagnostic for older struggling readers.



**STAR Reading**—used for screening and progress-monitoring assessment—is a reliable, valid, and efficient computer-adaptive assessment of general reading achievement and comprehension for grades 1–12. STAR Reading provides nationally norm-referenced reading scores and criterion-referenced scores. A STAR Reading assessment can be completed without teacher assistance in about 10 minutes and repeated as often as weekly for progress monitoring.



**STAR Math**—used for screening, progress-monitoring, and diagnostic assessment—is a reliable, valid, and efficient computer-adaptive assessment of general math achievement for grades 1–12. STAR Math provides nationally norm-referenced math scores and criterion-referenced evaluations of skill levels. A STAR Math assessment can be completed without teacher assistance in less than 15 minutes and repeated as often as weekly for progress monitoring.



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**STAR Early Literacy**, **STAR Reading**, and **STAR Math** are highly rated for screening and progress monitoring by the National Center on Response to Intervention and meet all criteria for scientifically based progress-monitoring tools set by the National Center on Student Progress Monitoring.

*For more information, see Appendix A: National Center on Response to Intervention Review and Classification Information, p. 18.*

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## INTRODUCTION

In 1984, Judi Paul began creating quizzes for books to motivate her son, a reluctant reader, to read more. Soon, not only were Judi's children more motivated to read but so were the neighborhood children taking Judi's quizzes. The staff at a local school heard about Judi's success, and Accelerated Reader was born.

Eight years later in 1992, Judi's husband Terry joined the company that had grown from Accelerated Reader, and he became the driving force behind the development of STAR Reading in 1996, STAR Math in 1998, and STAR Early Literacy in 2001.

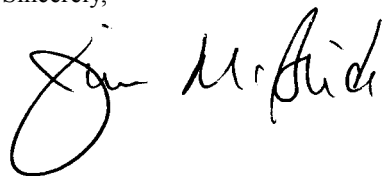
Like Accelerated Reader, the STAR assessments quickly gained favor with teachers because they are easy to use, can be administered quickly, and provide highly valid and reliable data to inform instruction at an affordable price.

Since those early kitchen-table days, Renaissance Learning has grown and evolved into the world's leading provider of computer-based assessment technology, with products in use in more than 75,000 schools, grades pre-K–12. Renaissance Learning tools have a research base unmatched by makers of other educational products and have met the highest review standards set by reputable organizations such as the National Center on Response to Intervention, the What Works Clearinghouse, and the National Center on Student Progress Monitoring.

All Renaissance Learning tools are designed to accomplish our mission—"to accelerate learning for all children and adults of all ability levels and ethnic and social backgrounds, worldwide." A key educational principle supporting this mission is the notion that "the initial step in accelerating learning is to measure its occurrence." The STAR family of assessments—STAR Early Literacy, STAR Reading, and STAR Math—does just that.

I invite you to learn more about the STAR assessments through the information enclosed. I'm confident you'll see rather quickly why teachers using Renaissance Learning tools accelerate learning, get more satisfaction from teaching, and help their students achieve higher scores on state and national tests. For additional information, full technical manuals are available for each STAR assessment by contacting Renaissance Learning at [research@renlearn.com](mailto:research@renlearn.com).

Sincerely,



James R. McBride, Ph.D.  
Vice President & Chief Psychometrician  
Renaissance Learning, Inc.



**James R. McBride, Ph.D.**,  
is vice president and chief  
psychometrician for  
Renaissance Learning.

He was a leader of the pioneering work related to computerized adaptive testing (CAT) conducted by the Department of Defense. McBride has been instrumental in the practical application of item response theory (IRT) and since 1976 has conducted test development and personnel research for a variety of organizations.

At Renaissance Learning, he has contributed to the psychometric research and development of STAR Math, STAR Reading, and STAR Early Literacy. McBride is co-editor of a leading book on the development of CAT and has authored numerous journal articles, professional papers, book chapters, and technical reports.



## THE RENAISSANCE LEARNING INFORMATION PYRAMID

All Renaissance Learning software—including the STAR assessments—runs on the web-based Renaissance Place Real Time platform, which provides a single, unified management system. Using this platform, schools and districts are able to centralize all student data from daily practice monitoring, interim (screening, benchmarking, and progress-monitoring) assessments, and summative annual state tests to create a seamless, integrated three-level assessment system. The integrated three-level assessment system was pioneered by Renaissance Learning (see Figure 1) and reflects the model experts and national educational organizations recommend (e.g., Perie, Marion, & Gong, 2007).

Renaissance Learning's *interim assessments*—the STAR Early Literacy, STAR Reading, and STAR Math assessments—make up the second, or middle, level of the Renaissance Learning Information Pyramid. The purpose of interim assessments is to determine the extent to which instruction and other daily learning tasks are strengthening students' abilities in the core academic areas and preparing them to hit end-of-year proficiency targets. These assessments are administered regularly throughout the year to help determine how all students are doing, both in groups and individually.

Level 2 interim assessments are generally used either for screening/benchmarking or progress monitoring. The STAR assessments, however, were developed for *both* of these purposes:<sup>1</sup>

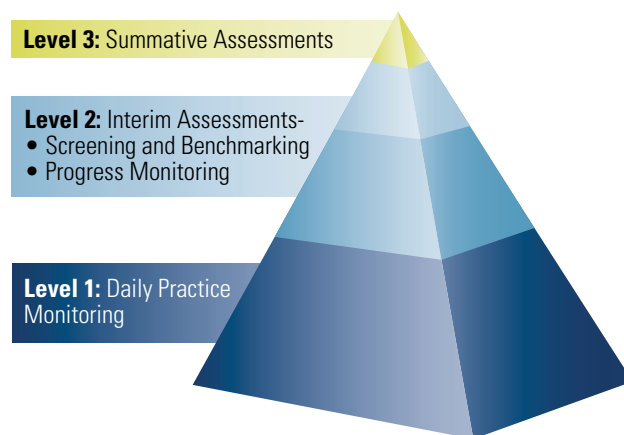
- 1) **Screening and benchmarking** periodic assessments, typically administered two to four times per year to monitor growth of a group toward a proficiency target, which in addition may provide information about the standards students have likely mastered.
- 2) **Progress-monitoring** assessments, defined as measures of academic performance by the National Center on Response to Intervention, administered more frequently than annually but less than daily—usually three to four times a year, but as often as monthly or weekly in intervention situations to measure individual student progress. Progress-monitoring assessments measure growth during the year and longitudinally over two or more years. Also included in this category are diagnostic assessments administered as needed to help identify specific areas of weakness.

The base and topmost layers of the Renaissance Learning Information Pyramid complete an integrated, three-level system:

Level 1, *daily practice monitoring*, includes a wide variety of assessments designed to provide feedback regarding either student completion of important tasks (such as reading or math problem solving) known to improve achievement outcomes or comprehension of direct instruction—both which help to inform instruction and guide practice to improve student performance (e.g., Renaissance Learning's Accelerated Reader, Successful Reader, English in a Flash, Accelerated Math, and MathFacts in a Flash).

Level 3 *summative tests* include once-a-year, high-stakes state tests which assess student proficiency on national core and state-specific standards.

**Figure 1: Renaissance Learning Information Pyramid**



<sup>1</sup> In 2009, all three STAR assessments were highly rated by the authority on screening and progress-monitoring assessments—the National Center on Response to Intervention (NCRTI). Check inside the cover for details and Appendix A, p. 18, for more information about the NCRTI review process.

## THE VALUE AND COST OF INFORMATION

When choosing an appropriate educational assessment, it is important to keep in mind the advice of the National Research Council (2008) about needs:

Have an assessment process that is both child and teacher friendly, minimizes lost instructional time, meets the highest standards of evidence for reliability and validity for the purposes for which assessment is being planned and with the particular kinds of children that comprise the center's population, and that can be purchased and supported within the budgetary limits set out by the director. (p. 222)

Too often, schools underestimate costs by considering only the initial cash outlay for a program or system. Some solutions seem inexpensive initially but generate long-term inefficiencies and often wind up far more expensive in the long run. Two elements must be calculated: 1) the total cost of ownership, and 2) the value generated by that total cost. In the case of assessment systems, these factors constitute a return on information expressed by the formula  $\text{Value} = I/C$  (see Figure 2).

**Figure 2: The Value and Cost of Information**

$$\text{VALUE of an assessment} = \frac{I}{C}$$

**Information**—Amount of reliable & useful information produced by assessment

**Cost**—Total resources required, including price of acquisition; materials per administration; teacher time to administer, score, record, and interpret results; & time diverted from instruction

Suppose an assessment is distributed for free but requires paper administration, necessitating the duplication of test instruments, scoring sheets, record sheets, and so forth. The cost of those paper copies multiplied by the number of times that assessment will be delivered adds to the total cost of ownership. Even more significantly, if the assessment is teacher administered, the cost of that teacher's time must be figured into the calculation. A so-called one-minute probe, in reality, may occupy as many as 10 minutes, on average, of the teacher's time per student per administration (Christensen Associates, 2005).

The total time considered must include preparing materials, calling on the student, explaining the assessment, the administration itself, recording and entering results, and the teacher's reentry into other duties. Using the average 10-minute administration calculation even if only three students in the classroom require testing, that may be *half an hour lost from instruction* every time the test is administered—often weekly—multiplied by the number of measures that need to be taken. As the saying goes, time is money, and teacher time is a very real cost.

This total cost, too, must be compared to the value of the information generated. If 10 minutes of testing produces only one data point on one student, the return on the teacher's time is low. If the same amount of time can generate multiple data points, and/or can be applied to multiple students at the same time, the return on that same amount of time increases exponentially. A broad-based computerized assessment administered simultaneously to a whole classroom, that automatically records results in a database, provides far more information with a much higher rate of return on the teacher's time. The cost per piece of information is therefore much lower—even if the initial cost of the system is higher than the so-called free assessment.

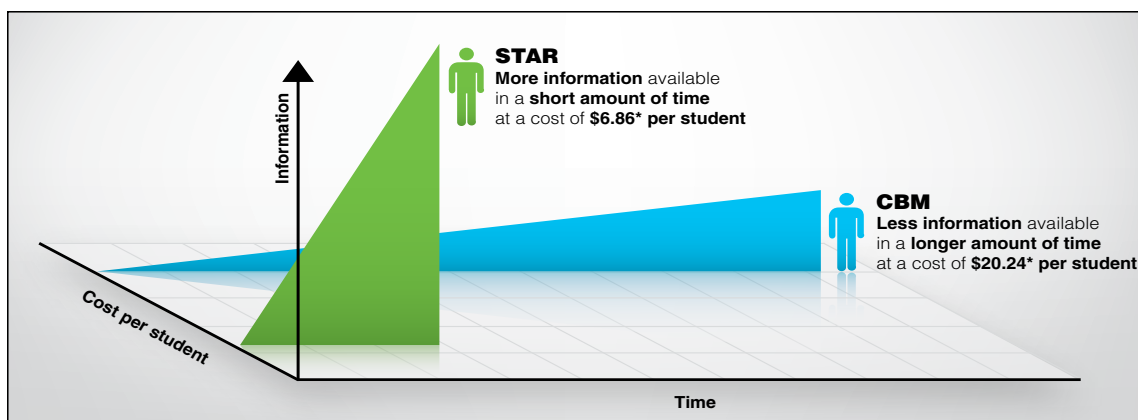
For a practical illustration of how both parts of the  $\text{Value} = I/C$  formula work, compare the paper-based curriculum-based measurement (CBM) Dynamic Indicators of Basic Early Literacy Skills (DIBELS) with Renaissance Learning's STAR Early Literacy computer-based assessment.



An independent economics research firm evaluated the annual cost of the two tests and concluded that STAR Early Literacy costs about one-third as much as DIBELS, including the value of teacher time (Christensen Associates, 2005). DIBELS probes measure only one skill at a time while a single administration of STAR Early Literacy generates data on 41 critical reading skills. So the “I” for STAR Early Literacy is 5 to 10 times the “I” for the conventional CBM. Putting together the information advantage and the cost advantage, the cost-benefit advantage of the computer-based assessment is between 15 and 30 to 1.

Figure 3 illustrates I/C comparing the value of the STAR assessments to CBMs.

**Figure 3: The Value of an Assessment**



\* Christensen Associates, 2005

It is also important to note that if the assessment software can be used for multiple types of assessment (e.g., both screening and diagnostic), the cost-effectiveness goes up still more. This is yet another advantage of computer-based assessments like the STAR assessments.

## COMPUTER-ADAPTIVE TESTING

STAR Early Literacy, STAR Reading, and STAR Math are all computer-adaptive tests (CATs). CATs continually adjust the difficulty of each student's test by choosing each test question based on the student's previous responses. CATs save testing time and spare students the frustration of items that are too difficult and the boredom of items that are too easy.

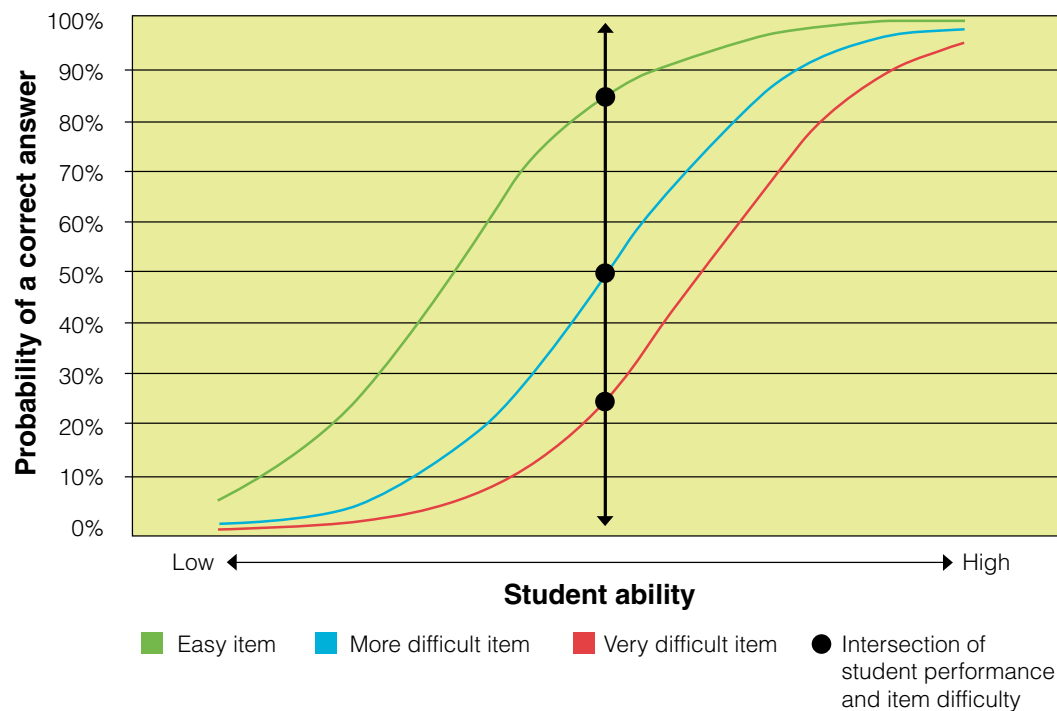
Decades of research have shown that CATs can be considerably more efficient than conventional tests, which present all students with the same test questions (e.g., Lord, 1980; McBride & Martin, 1983). A well-designed CAT is often two or more times as efficient as a conventional test. For example, to equal the reliability of a 50-item conventional test, a good CAT uses only 25 items to yield the same information in half the time. The reliability and validity of the STAR assessments has been confirmed by key federal groups including the National Center on Response to Intervention and the National Center on Student Progress Monitoring, among others (see *Reliability and Validity of the STAR Assessments*, p. 13), and is a result of the care taken by Renaissance Learning in developing each item.

### Item response theory and its role in CAT

Tailoring item difficulty to match a student's knowledge or skill level can be done in a number of different ways; however, most CAT tests use item response theory (IRT) as the basis for both adaptive item selection and test scoring. IRT puts student performance and item difficulty on the same scale and offers a means to estimate the probability that a student will answer a given test item correctly. IRT models provide a way of measuring each item's degree of difficulty and of estimating each student's achievement level from the pattern of correct and incorrect responses to items.

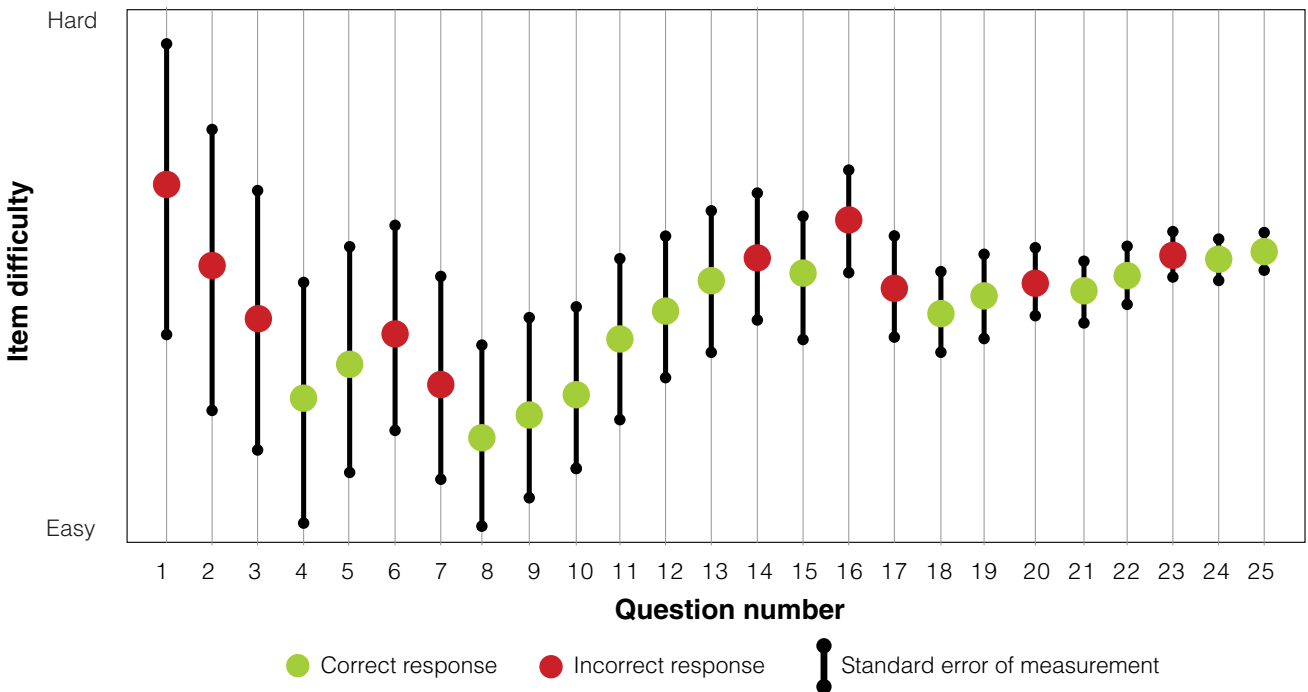
With item response theory, scientists can calculate the probability of a correct response to an item as a function of student ability. As student ability increases, so does the probability. Additionally, because some test items are harder than others, the probability trend differs from one item to another. Figure 4 (next page) shows the probability functions for three test items: an easy one, a moderately difficult one, and a still harder one.

**Figure 4: Illustration of Student's Reactions to Three Test Items of Varying Difficulty**



In the STAR assessments, the software automatically moves up or down the scale to select questions based on the student's answers. If the student answers a question correctly, the next question will usually be more difficult. If the student answers incorrectly, the next question will be less difficult. Unlike manual paper-and-pencil assessments, STAR assessments dynamically adjust to each student's unique responses. As a result, STAR assessments pinpoint student achievement levels quickly and efficiently. Figure 5 shows, for a single student's test, the progression of easy and more difficult items selected in a computer-adaptive assessment based on the student's previous item responses. It also shows how a computer-adaptive test's ability to select items tailored to a student helps to reduce measurement error as the test progresses.

**Figure 5: How Computer-Adaptive Technology Works**



## ITEM DEVELOPMENT

### Multiple-choice format

When the STAR assessments were developed, high priority was placed on selecting a test format that was well suited to computerized testing, precise, and efficient in terms of student and teacher time. Renaissance Learning explored, researched, discussed, and prototyped several item-response formats and ultimately chose to use multiple-choice test items. Much research supports the use of the multiple-choice, also referred to as selected-response, format. As noted by Stiggins (2005):

[Selected-response] tests are efficient in that we can administer large numbers of multiple-choice or true/false test items per unit of testing time. Thus, they permit us to sample widely and draw relatively confident generalizations from the content sampled. For this reason, when the target is knowledge mastery, selected response formats fit nicely into the resource realities of most classrooms. (p. 70)

Renaissance Learning constructs multiple-choice items to represent a balanced range of cognitive complexity. Item specifications require verifying the accuracy of all content; using grade-level-appropriate cognitive load, vocabulary, syntax, and readability; including only essential text and graphics to avoid wordiness and visual clutter; and employing bias, fairness, and sensitivity standards.

The multiple-choice format lends itself well to computerized scoring, which automates the testing process and saves teachers' time in collecting and scoring results (Nicol, 2007). A large number of multiple-choice test items can be administered in a short amount of time, and a key factor in the measurement precision of any test is the number of items each student must answer. According to Haladyna and Downing (1989), "the use of multiple-choice formats generally leads to more content-valid test score interpretations."

Research has shown that well-designed multiple-choice questions can assess an array of skills (Popham, 2008; Cassels & Johnstone, 1984; Russel et al., 2003) at higher levels of student learning (Cox, 1976; Johnstone & Arnbusaidi, 2000; Mattimore, 2009; Osterlind, 1998; Popham, 2003).

### Item development process

Item development is of critical concern to Renaissance Learning. Professional designers, writers, and editors, with education backgrounds and content-area expertise, develop the content for all Renaissance Learning products, including the STAR assessments. These experts follow research-based assessment item-development practices, receive ongoing item-writing and bias-and-fairness training, and adhere to the following process to ensure quality item development:

- Analyze standards to be assessed in the categories of skill, action, vocabulary, and context; and refer to national or state resources for appropriate standard and grade-level expectation interpretation.
- Write item specifications and provide specifications training to item writers and editors.
- Establish item metadata to guide development, including standards-related and item-related data.
- Use a multistep recursive writing and editing process that ensures adherence to specifications and alignment to standards and item metadata.
- Post items for calibration and acquire student-response data through the STAR Early Literacy, STAR Reading, and STAR Math dynamic calibration process (see *Dynamic Calibration*, p. 7).
- Examine psychometricians' analyses of item testing results.
- Add successful items to the operational assessment item bank.

Renaissance Learning follows strict item-writing specifications including bias and fairness criteria that address stereotypes and characterizations of people or events that could be construed as demeaning, patronizing, or otherwise insensitive. Content-development tools track and report attributes such as gender, age, ethnicity, subject matter, and regional references. Individual attributes, as well as the intersection of multiple attributes, are tracked throughout the development process to ensure that final content is demographically balanced and free of bias.

Assessment items must also pass strict quality reviews which check for discipline-specific criteria, accuracy, language appropriateness and readability level, bias and fairness, and technical quality control.

**Rules for item retention.** Following these analyses, all information pertaining to each test item—including traditional and IRT analysis data, test level, form, and item identifier—is stored in an item-statistics database.

Then a panel of content reviewers examines each item within content strands to determine whether the item meets all criteria for use in an operational assessment. After all content reviewers have designated certain items for elimination, the recommendations are combined and a second review is conducted to resolve any issues.

**Large item banks.** Each of the STAR assessments contains a large item bank to allow multiple administrations without risk of item overexposure (see Table 1). And Renaissance Learning continually develops high-quality assessment items that are added to the item banks to support frequent testing and achieve an even distribution of assessment items across the difficulty levels of each STAR assessment.

**Table 1: Size of STAR Assessment Item Banks**

	STAR Early Literacy	STAR Reading	STAR Math
Number of Items	2,300	2,400	1,900

**Items aligned to state standards**

Renaissance Learning’s standards team is dedicated to best practices in standards research and alignment. The team follows an alignment strategy based on ongoing research and consultation with leading educational organizations including Mid-continent Research for Education and Learning (McREL), which provides research-based guidance to educators and policymakers and advocates standards-based school improvement programs; and the Northwest Regional Educational Laboratory (NWREL), which provides evaluation and research services. In addition to these ongoing efforts, the standards team has more than 25 years of combined experience aligning assessment and practice items to state standards. Renaissance Learning standards experts analyze each assessment objective with respect to the overarching content standard and in the categories of skill, action, vocabulary, and context; and they refer to national or state resources for appropriate standards and assessment objective interpretation.

A STAR Early Literacy, STAR Reading, or STAR Math objective is aligned or developed based on whether its characteristics are the same as or a subset of the characteristics of the national or state assessment objective. This process ensures that an assessment item does not extend beyond the domain and intent of the state assessment objective.

**ADMINISTRATION TIME**

The STAR assessments were developed not only to provide *precise* measurement of student achievement in reading and math, but to do so *efficiently*. As mentioned earlier, computer-adaptive testing saves teachers time by automating scoring and administration. And even more importantly, it allows students to be assessed on a larger and more varied range of skills with fewer items, which results in students spending less time completing the assessment—i.e., less administration time. Table 2 shows an overview of the average amount of time it takes students to take each STAR assessment.

**Table 2: Average Administration Time for Each STAR Assessment**

	STAR Early Literacy	STAR Reading	STAR Math
Average Administration Time / Standard Deviation	8.5 minutes / 2 minutes	7.5 minutes / 3 minutes	11.5 minutes / 4 minutes

### Number of questions

The STAR assessments are fixed-length assessments, which means the item count is the sole criterion for ending a test. STAR Early Literacy and STAR Reading administer 25 items while STAR Math administers 24 items. Table 3 explains the number and types of items administered for each assessment.

**Table 3: STAR Assessment Item Administration Breakdown, by Number and Type**

	STAR Early Literacy	STAR Reading	STAR Math
<b>Item Breakdown / Number of Items Administered</b>	25 items chosen from 41 skills within 7 domains: <ul style="list-style-type: none"><li>✓ General readiness</li><li>✓ Graphophonemic knowledge</li><li>✓ Phonemic awareness</li><li>✓ Phonics</li><li>✓ Comprehension</li><li>✓ Structural analysis</li><li>✓ Vocabulary</li></ul>	20 short comprehension items (grades 3–12)  5 extended comprehension items (grades 3–12)  OR  25 short comprehension items (grades 1–2)	Items 1–8: numeration concepts  Items 9–16: computation processes  Items 17–24: word problems, estimation, data analysis and statistics, geometry, measurement, algebra  Items cover 8 strands / 214 objectives

### DYNAMIC CALIBRATION

Each new STAR assessment test item goes through a calibration process to determine its difficulty scale value, which ranges from easy to hard. This is done by administering test items to large samples of students, collecting student-response and other data, and performing a statistical analysis on the response data to determine the scale values. Norming, reliability, and validity studies take place after items successfully pass through calibration.

To maintain and update the large item banks for each STAR assessment, Renaissance Learning continually develops and calibrates new test items using a special feature called dynamic calibration. In dynamic calibration, one or more new items are embedded at random points in a STAR test. These items do not count toward the student’s score on the STAR assessment, but student-response data are stored for later psychometric analysis with the responses of thousands of other students. Students may take as many as five additional items per test; in some cases, students will be administered no additional items. On average, the new items increase testing time by one to two minutes.

### GROWTH MODELING

Progress monitoring is essential within a Response to Intervention framework, and the key is setting appropriate goals for each student. If a progress-monitoring goal is set too high, and as a result a student does not meet that goal, the student will incorrectly appear as unable to “respond to intervention.”

With STAR Early Literacy, STAR Reading, and STAR Math, educators have access to a scientific method for setting appropriate, achievable, and challenging progress-monitoring goals for students. Since thousands of schools use the STAR assessments through the web-hosted version, Renaissance Learning is able to observe how students grow. Using this longitudinal data<sup>2</sup> on the *learning patterns* of more than 1 million students for reading and more than 300,000 students for math, the STAR assessments provide educators with critical information about how students grow over time. Specifically, the Goal-Setting Wizard in each STAR assessment uses this information to help educators set progress-monitoring goals tailored to each student—goals that result in setting challenging but reasonable expectations for that particular student.

The breadth and depth of our database allows us to identify the growth norms of nearly any student. Educators who use the STAR assessments have this valuable information at their fingertips, enabling them to gain a more precise understanding of how their students grow and set appropriate goals to help students reach their full potential.

<sup>2</sup> All data collected by Renaissance Learning is used in complete compliance with Family Educational Rights and Privacy Act (FERPA) privacy requirements.

## A CLOSER LOOK AT THE STAR ASSESSMENTS

The STAR assessments are tools for teachers and administrators to precisely and efficiently assess student achievement in pre-reading skills (STAR Early Literacy), reading (STAR Reading), and math (STAR Math). Teachers use information provided by the assessments to target instruction, provide students with the most appropriate instructional materials, and intervene with struggling students. What follows are brief descriptions of each assessment. For additional information, full technical manuals are available for each STAR assessment by contacting Renaissance Learning at [research@renlearn.com](mailto:research@renlearn.com).

### STAR Early Literacy

#### About the assessment

STAR Early Literacy is a reliable, valid, and time-efficient assessment of early literacy skills appropriate for use within various early learning environments. Quick and accurate results produced by STAR Early Literacy provide teachers with specific benchmarking, screening, progress-monitoring, and diagnostic information to help inform instruction that meets the needs of all students.

The development of STAR Early Literacy was based on an analysis of early learning research, with an emphasis on identifying the pre-reading and reading skills necessary for later reading success. This analysis revealed seven major content areas (Adams, 1990; Snow, Burns, & Griffin, 1998; Trelease, 1995; Anderson, Hiebert, Scott, & Wilkinson, 1985; National Reading Panel, 2000; Anderson, Wilson, & Fielding, 1988) that became the basis for the seven skill domains assessed in STAR Early Literacy: general readiness, graphophonemic knowledge, phonemic awareness, phonics, comprehension, structural analysis, and vocabulary.

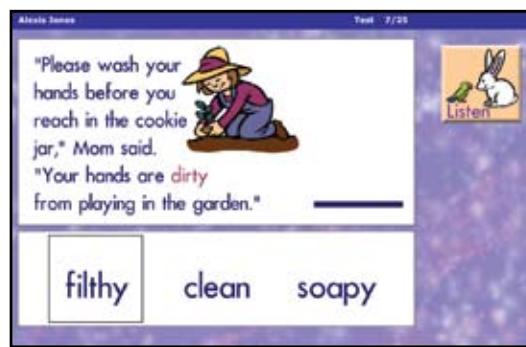
The STAR Early Literacy domains include four of the five critical areas of reading instruction identified by the National Reading Panel. While the fifth area identified by the National Reading Panel—fluency—is not directly assessed in STAR Early Literacy, it is highly correlated with other reading skills such as comprehension. Because fluency is an important component of general reading achievement, STAR Early Literacy provides an Estimated Oral Reading Fluency score<sup>3</sup> for beginning readers (grades 1–3).

Renaissance Learning also examined the early learning research while determining both the skills to assess within the seven selected domains and the design of the emergent reader test items. In total, 41 skills sets (containing a total of 147 skills) were identified. The test items were designed to incorporate text, graphics, and audio, as appropriate, to assess the skills in the most straightforward manner possible. And STAR Early Literacy test item instructions were written to be explicit, clear, and consistent from item to item so that students are able to test independently. Figure 6 shows sample assessment items.

**Figure 6: STAR Early Literacy Sample Assessment Items**



*"Listen carefully. The pictures are king, fish, foot. Click on the picture that has a different beginning sound than the others."*  
Students may repeat audio instructions by clicking on the Listen button.



*"Read the story. Then pick the word that means about the same as dirty."* Students may repeat audio instructions by clicking on the Listen button.

<sup>3</sup> Estimated oral reading fluency is an estimation of the number of words a student should be able to read correctly on a grade-level appropriate passage within a one-minute time span. The score is based on research correlating STAR Early Literacy and STAR Reading scores to student performance on oral reading fluency measures. Students with high oral reading fluency demonstrate accurate decoding, automatic word recognition, and appropriate use of the rhythmic aspects of language (e.g., intonation, phrasing, pitch, emphasis).



# Using STAR Early Literacy data

STAR Early Literacy is used for screening/benchmarking and progress monitoring of emergent readers in grades pre-K–3. The assessment also provides diagnostic data to make instructional decisions and help identify likely gaps in knowledge for students experiencing reading difficulties. Three key reports for STAR Early Literacy are the Screening Report, Student Progress Monitoring Report, and Class Diagnostic Report (see Figure 7):

The **Screening Report**—complete with built-in benchmarks and cut scores—was designed to provide information about which students are responding well to core instruction and which need to be considered for intervention.

The **Student Progress Monitoring Report** graphs students’ progress toward goals, including those set using the STAR Early Literacy Goal-Setting Wizard. The new Goal-Setting Wizard was created with significant input from leading Response to Intervention (RTI) experts and allows the teacher to select an appropriate goal for each student.

The **Class Diagnostic Report** lists the specific skills each student is struggling with, data that can be used for instructional planning and intervention decisions for struggling readers.

Figure 7: STAR Early Literacy Sample Reports<sup>4</sup>

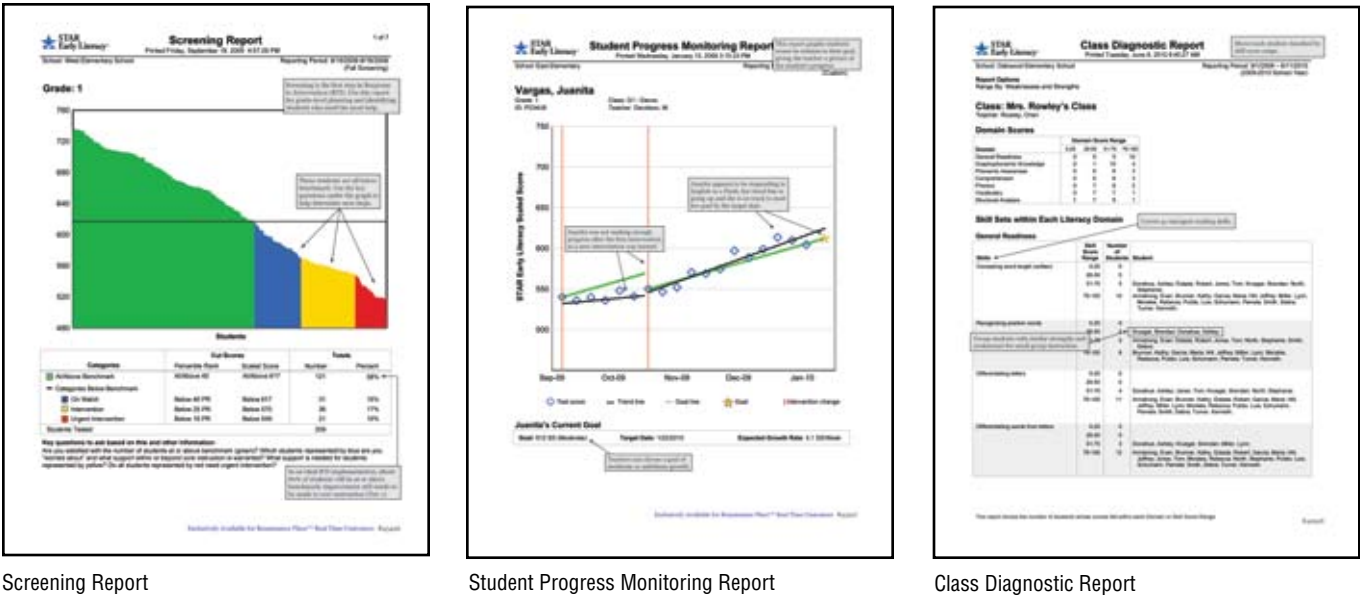
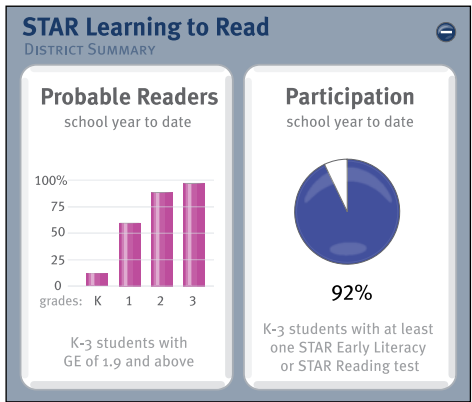


Figure 8: STAR Learning to Read Dashboard



So that teachers and administrators can zero in on their emergent readers’ progress, Renaissance Learning has developed a STAR Learning to Read Dashboard (see Figure 8) where teachers can view the percentage of students with 1) STAR Early Literacy grade equivalent (GE) scores of 1.9 or above (Probable Readers), and 2) at least one STAR Early Literacy or STAR Reading test taken school year to date (Participation).

<sup>4</sup> For full-size samples of these reports, see Appendix D, p. 25. The complete menu of reports available for each STAR assessment is found in a separate publication from Renaissance Learning, *Key Report Samples*, available online from <http://doc.renlearn.com/KMNet/R003563228GE7E80.pdf>

## STAR Reading

### About the assessment

STAR Reading is a reliable, valid, and time-efficient assessment of general reading comprehension appropriate for use within varied instructional and curriculum frameworks. Quick and accurate results produced by STAR Reading provide teachers with specific benchmarking, screening, and progress-monitoring information to help tailor instruction, monitor reading growth, and improve reading achievement for all students.

STAR Reading assesses one skill, reading comprehension, through the use of two item types: short comprehension items and extended comprehension items. The use of the former is based on abundant and long-standing research verifying that vocabulary is closely tied to comprehension (Davis, 1942; Just & Carpenter, 1987; see Figure 9). STAR Reading's short comprehension items contain one complete contextual sentence with a tightly controlled vocabulary level and a single-word deletion. The longer extended comprehension items contain multiple sentences and a single-word deletion. Figure 10 shows examples of both items.

For both formats, the information needed to determine the correct answer is given within the assessment-item passage provided, with the semantics and syntax of each context sentence arranged to provide clues as to the correct answer choice. The only prior knowledge a student needs is an understanding of the words that constitute the text passages and answer choices. STAR Reading assessment items require reading comprehension because the student must actually interpret the meaning of the sentence or passage in order to choose the correct answer; all of the answer choices “fit” the context sentence either semantically or syntactically but only one is correct. The reading levels of the items range from kindergarten through post high school.

Figure 9: How Comprehension Occurs

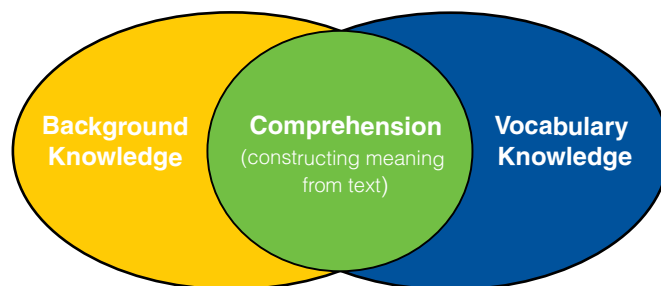


Figure 10: STAR Reading Sample Assessment Items

Shannon Fritts	6/25
I saw the bird <u>fly</u> out of the nest.	
<ol style="list-style-type: none"><li>ride</li><li>tree</li><li><b>fly</b></li></ol>	

Shannon Fritts	23/25
We were startled, soon after, by a loud whistling noise above our heads; and on looking up, saw a flock of wild ducks making for the coast. We watched these, and, observing where they alighted, followed them up until we came upon a most lovely blue lake. Now, as we neared the shore, Jack and I said we would go a little out of our way to see if we could <u>procure</u> one of those ducks; so directing Peterkin to go straight to the shore and kindle a fire, we separated. But we did not find the ducks, although we made a diligent search.	
<ol style="list-style-type: none"><li>replenish</li><li>relinquish</li><li><b>procure</b></li><li>disperse</li></ol>	

STAR Reading results for students taking the assessment in grades 1–4 include an Estimated Oral Reading Fluency score.<sup>5</sup> Although fluency is not directly assessed in STAR Reading, it is highly correlated with reading comprehension and an important component of general reading achievement.

### Using STAR Reading data

STAR Reading is used for screening/benchmarking and progress monitoring of students in grades 1–12.<sup>6</sup> The assessment automates benchmarks, cut scores, progress-monitoring goals, and instructional recommendations, and it helps the teacher determine if student achievement is heading in the right direction. Three key reports for STAR Reading are the Screening Report, Growth Report, and Student Progress Monitoring Report (see Figure 11):

<sup>5</sup> Estimated oral reading fluency is an estimation of the number of words a student should be able to read correctly on a grade-level appropriate passage within a one-minute time span. The score is based on research correlating STAR Early Literacy and STAR Reading scores to student performance on oral reading fluency measures. Students with high oral reading fluency demonstrate accurate decoding, automatic word recognition, and appropriate use of the rhythmic aspects of language (e.g., intonation, phrasing, pitch, emphasis).

<sup>6</sup> STAR Reading may also be used with kindergarten students, though the assessment has not been normed for this age group.

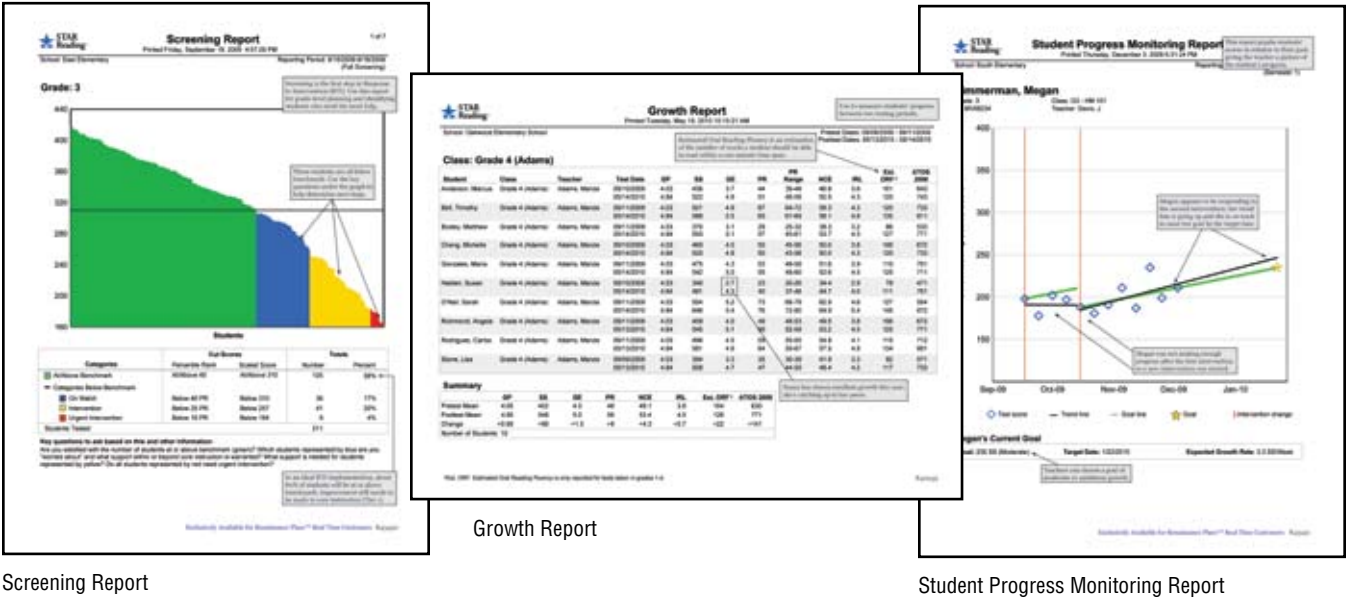


The **Screening Report**—complete with built-in benchmarks and cut scores—was designed to provide information about which students are responding well to core instruction and which need to be considered for intervention.

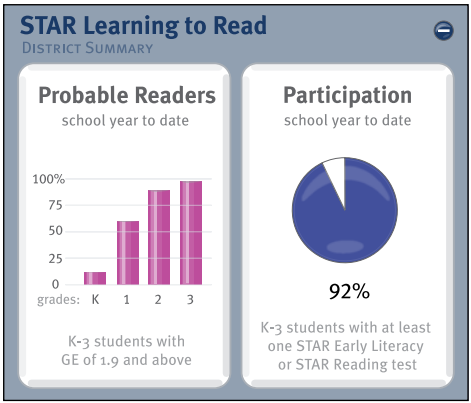
The **Growth Report** is used to measure progress between assessment periods.

The **Student Progress Monitoring Report** graphs students’ progress toward goals, including those set using the STAR Reading Goal-Setting Wizard. The new Goal-Setting Wizard was created with significant input from leading Response to Intervention (RTI) experts and allows the teacher to select an appropriate goal for each student.

**Figure 11: STAR Reading Sample Reports<sup>7</sup>**



**Figure 12: STAR Learning to Read Dashboard**



As mentioned previously in the STAR Early Literacy section (p. 9), so that teachers and administrators can zero in on their emergent readers’ progress, Renaissance Learning has developed a STAR Learning to Read Dashboard (see Figure 12) where teachers can view the percentage of students with 1) STAR Early Literacy grade equivalent (GE) scores of 1.9 or above (Probable Readers), and 2) at least one STAR Early Literacy or STAR Reading test taken school year to date (Participation).

<sup>7</sup> For full-size samples of these reports, see Appendix D, p. 25. The complete menu of reports available for each STAR assessment is found in a separate publication from Renaissance Learning, *Key Report Samples*, available online from <http://doc.renlearn.com/KMNet/R003563228GE7E80.pdf>

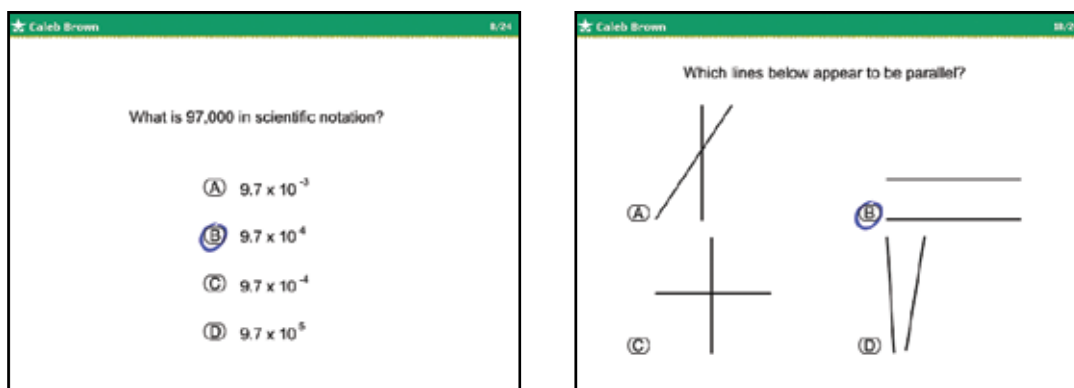
## STAR Math

### About the assessment

STAR Math is a reliable, valid, and time-efficient assessment of mathematics skills appropriate for use within various instructional and curriculum frameworks. Quick and accurate results produced by STAR Math provide teachers with specific benchmarking, screening, progress-monitoring, and diagnostic information to help tailor instruction, monitor math growth, and improve math achievement for all students.

The content for STAR Math is based on analysis of professional standards, curriculum materials, test frameworks, and content-area research, including best practices for mathematics instruction. Research indicates that numeration concepts are key for deep conceptual development and that computational processes emphasizing fluency complement conceptual development. STAR Math provides a unique system of joint analysis of numeration and computational processes in addition to content for geometry, measurement, algebra, data analysis and statistics, estimation, and word problems. The STAR Math item bank includes 214 core math objectives, with multiple items available to measure each objective. Figure 13 shows sample assessment items.

Figure 13: STAR Math Sample Assessment Items



### Using STAR Math data

STAR Math is used for screening/benchmarking, progress monitoring, and diagnosis of students' skills in grades 1–12.<sup>8</sup> The assessment also provides a recommended math instructional level for each student, which is critical for students assigned to receive interventions. Four key reports for STAR Math are the Screening Report, Student Progress Monitoring Report, Diagnostic Report, and Parent Report (see Figure 14):

The **Screening Report**—complete with built-in benchmarks and cut scores—was designed to provide information about which students are responding well to core instruction and which need to be considered for intervention. This report also recommends a starting point in Accelerated Math for each student.

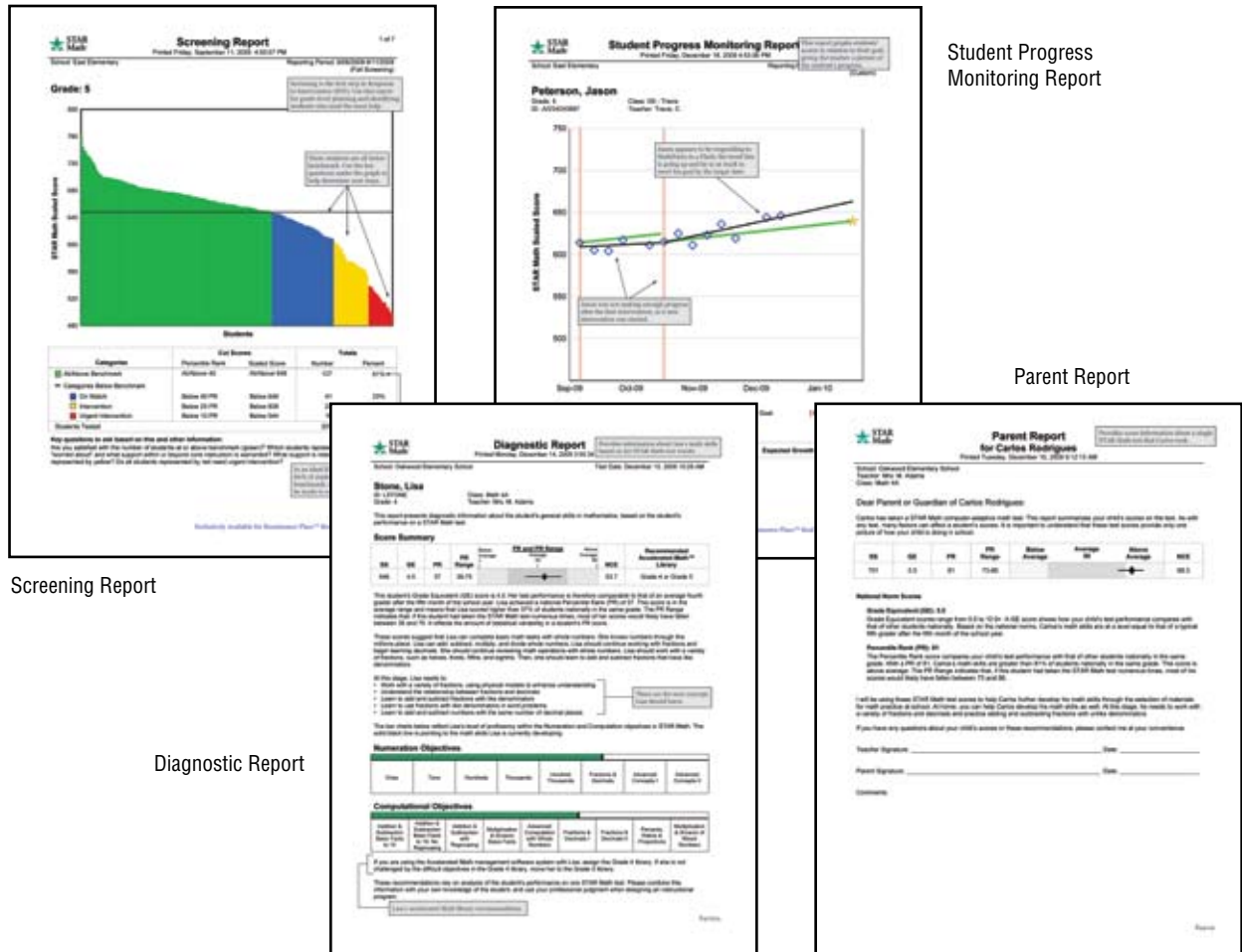
The **Student Progress Monitoring Report** graphs students' progress toward goals, including those set using the STAR Math Goal-Setting Wizard. The new Goal-Setting Wizard was created with significant input from leading Response to Intervention (RTI) experts and allows the teacher to select an appropriate goal for each student.

The **Diagnostic Report** shows a student's level of proficiency within numeration and computation objectives as well as a recommended starting point in Accelerated Math, information that can be used for instructional planning and intervention decisions.

The **Parent Report**—available in English or Spanish—keeps the lines of communication open between school and home about a student's progress.

<sup>8</sup> STAR Math may also be used with kindergarten students, though the assessment has not been normed for this age group.

**Figure 14: STAR Math Sample Reports<sup>9</sup>**



For additional information, full technical manuals are available for each STAR assessment by contacting Renaissance Learning at [research@renlearn.com](mailto:research@renlearn.com).

## RELIABILITY AND VALIDITY OF THE STAR ASSESSMENTS

Reliability is the extent to which a test yields consistent results from one administration of the test to another. To be useful, tests must yield consistent results. The validity of an assessment is the degree to which it measures what it is intended to measure and often is used to judge a test's usefulness. STAR Early Literacy, STAR Reading, and STAR Math have all been found to be highly reliable and valid assessments (Salvia, Ysseldyke, & Bolt, 2010).

The standard error of measurement (SEM) of a test score measures how precise that score is. It provides a means to gauge the extent to which scores would be expected to fluctuate because of imperfect reliability, which is a characteristic of all educational tests.

The following provides a brief explanation of the reliability and validity of each STAR assessment. Please see *Appendix B: Correlations of the STAR Assessments to State and Other Tests*, p. 19, for tables summarizing the reliability and validity studies conducted for each assessment.

<sup>9</sup> For full-size samples of these reports, see Appendix D, p. 25. The complete menu of reports available for each STAR assessment is found in a separate publication from Renaissance Learning, *Key Report Samples*, available online from <http://doc.renlearn.com/KMNet/R003563228GE7E80.pdf>

## **STAR Early Literacy reliability and validity**

STAR Early Literacy's reliability was estimated using three different methods to determine the overall precision of its test scores. More than 9,000 students participated in the analysis. The reliability estimates were very high for a test composed of only 25 items and compare favorably with the reliability estimates provided for other published early literacy tests.

For STAR Early Literacy to measure literacy skills, Renaissance Learning knew it was necessary that its scores correlate highly with other measures of reading, literacy, and readiness. To evaluate this, Renaissance Learning performed a validity research study of STAR Early Literacy in spring 2001 to assess reliability, validity, and score distributions by age and grade. Although the validity research study sample was targeted to include schools using certain standardized early literacy and reading assessments, the participating school districts, specific schools, and individual students were approximately representative of the U.S. school population in terms of the following three key variables: geographic region, school system and per-grade district enrollment, and socioeconomic status. The final study sample included approximately 11,000 students from 84 schools in the U.S. and Canada.

Renaissance Learning asked teachers participating in the study to submit student scores from other assessments of reading, early literacy, readiness, and social skills. Usable scores were received for more than 2,400 students. The resulting correlation estimates were substantial and reflect well on the validity of STAR Early Literacy as a tool for assessing early literacy skills. For more information, see *Appendix B: Correlations of the STAR Assessments to State and Other Tests*, p. 19.

## **STAR Reading reliability and validity**

STAR Reading's reliability was estimated using three different methods when the test was first normed in spring 1999 with a sample of 30,000 students from 269 schools in 47 U.S. states. Schools and districts were selected based on their geographic location, per-grade district enrollment, and socioeconomic status. The reliability estimates were very high for a test composed of only 25 items and compare favorably with the reliability estimates provided for other published reading tests.

For STAR Reading to measure reading achievement, Renaissance Learning knew it was necessary that its scores correlate highly with other measures of reading achievement. To that end, during the STAR Reading norming study, schools submitted their students' STAR Reading results along with data on how their students performed on a wide variety of other popular standardized tests. Usable scores were received for more than 10,000 students. The resulting correlation estimates were substantial and reflect well on the validity of STAR Reading as a tool for assessing reading achievement. (For more information, see *Appendix B: Correlations of the STAR Assessments to State and Other Tests*, p. 19.) Additional data supporting the validity of STAR Reading are collected and reported on a continuing basis, resulting in a large and growing body of validity evidence.

In spring 2008, STAR Reading was renormed, using national samples of students drawn from routine administrations of STAR Reading. In other words, the students in the 2008 norming sample took STAR Reading tests as they are administered in everyday use. This was a change from the previous special-purpose norming study, in which national samples of schools were cast, and those schools were administered a special norming version of the assessment. In total, 69,738 students in grades 1–12 were part of the 2008 norming study, representing 2,709 schools across 48 U.S. states and the District of Columbia.

## **STAR Math reliability and validity**

STAR Math reliability was estimated using three different methods when the test was normed in the spring of 2002. Renaissance Learning obtained a nationally representative sample by selecting school districts and schools based on their geographic location, per-grade district enrollment, and socioeconomic status. The final norming sample for STAR Math included approximately 29,200 students from 312 schools in 48 U.S. states. The reliability estimates were very high for a test composed of only 24 items and compare favorably with the reliability estimates provided for other published math achievement tests.

For STAR Math to measure math achievement, Renaissance Learning knew it was necessary that its scores correlate highly with other measures of math achievement. During the STAR Math norming study, schools submitted their students' STAR Math results along with data on how their students performed on other popular standardized tests. Usable scores were received for more than 10,000 students. The resulting correlation estimates were substantial and reflect well on the validity of STAR Math as a tool for assessing math achievement. (For more information, see *Appendix B: Correlations of the STAR Assessments to State and Other Tests*, p. 19.) As with STAR Reading, additional data supporting the validity of STAR Math are collected and reported on a continuing basis, resulting in a large and growing body of validity evidence.

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## APPENDIX A: NATIONAL CENTER ON RESPONSE TO INTERVENTION REVIEW AND CLASSIFICATION INFORMATION

Prior to 2009, the U.S. Department of Education’s National Center on Student Progress Monitoring (NCSPM)<sup>10</sup> reviewed each of the STAR assessments and determined they fit all criteria for scientifically based progress-monitoring tools. In 2009, the U.S. Department of Education began funding the National Center on Response to Intervention (NCRTI), whose mission is “to provide technical assistance to states and districts and building the capacity of states to assist districts in implementing proven models for RTI/EIS” ([www.rti4success.org](http://www.rti4success.org)).

RTI stands for Response to Intervention, a framework for making instructional decisions based on data in order to accelerate learning for all students. Interim assessments, like STAR Early Literacy, STAR Reading, and STAR Math, play a key role in RTI, helping to provide data to inform and improve instruction. The STAR assessments fulfill both of the key elements of a school’s RTI framework—screening and progress monitoring.

The NCRTI agrees—Renaissance Learning has submitted STAR Early Literacy, STAR Reading, and STAR Math to the NCRTI for technical review as tools appropriate for RTI, and all three of the STAR assessments have been highly rated for both screening and progress monitoring.

### Screening defined

As defined by the RTI network (<http://www.rtinetwork.org/Essential/Assessment/Universal/ar/ReadingProblems>), universal screening or benchmark assessment is typically done with all students and is a quick, low-cost, repeatable test. The goal of the screening tool is to predict who is and who is not at risk for later academic failure. It is likely that students classified by the screening tool as at risk for later academic failure could have difficulty in the regular classroom.

A useful screening tool will be both practical and accurate. *Practical* for a screening tool means that it can be administered in a time-efficient manner at a low cost. The *accuracy* of a screening tool is measured by a classification analysis, which compares how students perform on the screening tool with a later outcome (at least 3 months after the screening), such as a state achievement test or a nationally normed assessment.

Sensitivity and specificity are two statistics that can be calculated to test how accurately a screening tool classifies students. *Sensitivity* is the accuracy of the screening tool in identifying the students who go on to fail the outcome measure (it is calculated by dividing the number of true positives by the total number of students who go on to fail the outcome). *Specificity* is the ability of the screening tool to identify the students who go on to pass the outcome measure. A screening tool’s sensitivity increases as it accurately identifies more students who have later academic difficulties. Likewise, the screening tool’s specificity increases as it accurately identifies more students whose later academic performance is adequate.

### Progress monitoring defined

On the National Center on Response to Intervention website, [www.rti4success.org](http://www.rti4success.org), progress monitoring is defined as:

Repeated measurement of academic performance to inform instruction of individual students in general and special education in grades K–8. It is conducted at least monthly to (a) estimate rates of improvement, (b) identify students who are not demonstrating adequate progress and/or (c) compare the efficacy of different forms of instruction to design more effective, individualized instruction.

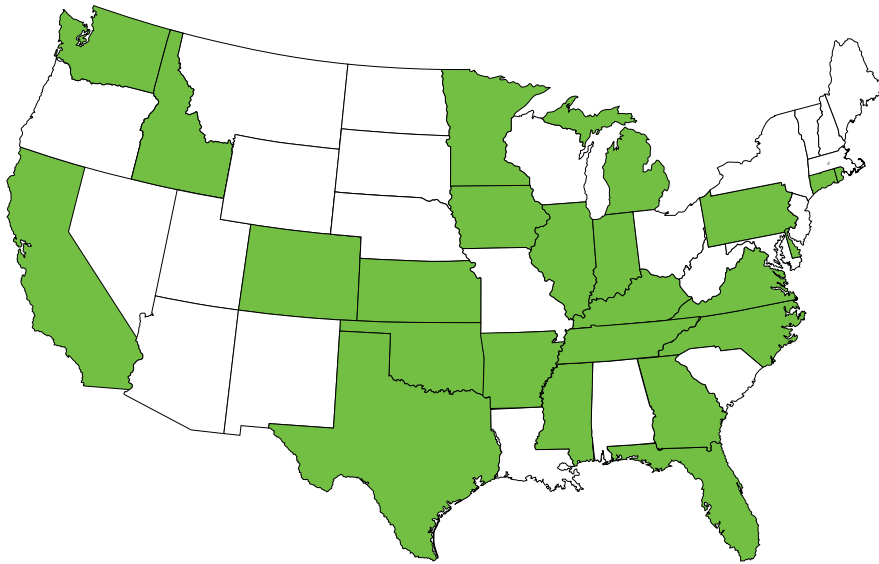
A progress-monitoring assessment needs to be valid and reliable, and it should be brief and place minimal burden on the teacher. Progress-monitoring tools measure general outcomes to provide broad perspective on student proficiency on general curriculum (like the STAR assessments) and look at more specific, shorter term mastery measurement outcomes by tracking a student’s mastery through a hierarchy of objectives.

<sup>10</sup> As explained at [www.studentprogress.org](http://www.studentprogress.org), the NCSPM’s mission was “to provide technical assistance to states and districts and disseminate information about progress monitoring practices proven to work in different academic content areas.” The NCSPM’s Progress Monitoring Tools Chart is available here: [http://www.studentprogress.org/chart/docs/print\\_chart122007.pdf](http://www.studentprogress.org/chart/docs/print_chart122007.pdf)



## APPENDIX B: CORRELATIONS OF THE STAR ASSESSMENTS TO STATE AND OTHER TESTS

### STAR assessment correlations to state assessments<sup>11</sup>



#### STAR Early Literacy

Scores from STAR Early Literacy correlate well with the following state assessments:

- ✓ Florida Comprehensive Assessment Test (FCAT)
- ✓ Indiana Statewide Testing for Educational Progress (ISTEP)
- ✓ Iowa Test of Basic Skills (ITBS)

[STAR Early Literacy scores also correlate with several assessments of early literacy skills: AIMSweb, Child Observation Record (COR), Developing Skills Checklist (DSC), Developmental Indicators for the Assessment of Learning (DIAL-3 ), Dynamic Indicators of Basic Early Literacy Skills (DIBELS), Gates-MacGinitie Reading Test (GMRT), Group Reading Assessment and Diagnostic Evaluation (GRADE), Metropolitan Readiness Test (MRT), Michigan Literacy Progress Profile (MLPP), NWEA Levels Test, Running Records, Stanford Achievement Test (SAT-9), and Texas Primary Reading Inventory (TPRI)]

#### STAR Reading

Scores from STAR Reading correlate well with the following state assessments:

- ✓ Arkansas Augmented Benchmark Examinations
- ✓ California Achievement Test (CAT)
- ✓ Colorado Student Assessment Program (CSAP)
- ✓ Delaware Student Testing Program (DSTP)—Reading
- ✓ Florida Comprehensive Assessment Test (FCAT)
- ✓ Idaho Standards Achievement Test (ISAT)
- ✓ Illinois Standards Achievement Test (ISAT)—Reading
- ✓ Indiana Statewide Testing for Educational Progress (ISTEP)
- ✓ Iowa Test of Basic Skills (ITBS)
- ✓ Kansas Reading Assessment
- ✓ Michigan Educational Assessment Program (MEAP)—English Language Arts
- ✓ Michigan Educational Assessment Program (MEAP)—Reading

<sup>11</sup> Predictive reports for new states are released on a regular basis. Please email [research@renlearn.com](mailto:research@renlearn.com) for the most up-to-date lists.

- ✓ Mississippi Curriculum Test (MCT)
- ✓ North Carolina End of Grade Tests
- ✓ Oklahoma Core Curriculum Tests (OCCT)
- ✓ Tennessee Comprehensive Assessment Program (TCAP) Achievement Test

## STAR Math

Scores from STAR Math correlate well with the following state assessments:

- ✓ Arkansas Augmented Benchmark Examinations
- ✓ California Achievement Test (CAT)
- ✓ Connecticut Mastery Test (CMT)
- ✓ Delaware Student Testing Program—Mathematics
- ✓ Florida Comprehensive Assessment Test (FCAT)
- ✓ Georgia High School Graduation Tests (GHSGT)
- ✓ Idaho Standards Achievement Test (ISAT)
- ✓ Indiana Statewide Testing for Educational Progress (ISTEP)
- ✓ Iowa Test of Basic Skills (ITBS)
- ✓ Kansas Mathematics Assessment
- ✓ Kentucky Core Content Test (KCCT)
- ✓ Michigan Educational Assessment Program (MEAP)—Mathematics
- ✓ Minnesota Comprehensive Assessments
- ✓ Mississippi Curriculum Test (MCT)
- ✓ North Carolina End of Grade Tests
- ✓ Oklahoma Core Curriculum Tests (OCCT)
- ✓ Pennsylvania System of School Assessment (PSSA)
- ✓ Rhode Island New Standards Reference Exams (NSRES)—Mathematics
- ✓ Tennessee Comprehensive Assessment Program (TCAP) Achievement Test
- ✓ Texas Assessment of Knowledge and Skills (TAKS)
- ✓ Virginia Standards of Learning (SOL) Tests
- ✓ Washington Assessment of Student Learning (WASL)

## Correlation summary

Tables B1, B2, and B3 summarize the reliability and validity studies conducted for each STAR assessment. For additional information, full technical manuals are available for each STAR assessment by contacting Renaissance Learning at [research@renlearn.com](mailto:research@renlearn.com).

**Table B1: Summary of STAR Early Literacy Validity Studies (Meta-analysis)**

Grade	Predictive			Concurrent		
	Studies	Students	Average Correlation	Studies	Students	Average Correlation
<b>K</b>	15	30,423	0.52	6	198	0.64
<b>1</b>	15	24,525	0.62	7	281	0.68
<b>2</b>	15	5,370	0.67	12	513	0.52
<b>3</b>	2	558	0.67	9	384	0.57

**Table B2: Summary of STAR Reading Validity Studies (Meta-analysis)**

	Predictive			Concurrent		
Grade	Studies	Students	Average Correlation	Studies	Students	Average Correlation
<b>1</b>	6	74,877	.68	15	1,135	.77
<b>2</b>	10	184,434	.78	32	4,142	.72
<b>3</b>	30	200,929	.80	44	4,051	.75
<b>4</b>	25	185,528	.82	41	5,409	.75
<b>5</b>	29	126,029	.82	40	3,588	.75
<b>6</b>	23	82,189	.82	37	2,728	.71
<b>7</b>	23	64,978	.81	33	3,294	.70
<b>8</b>	25	34,764	.81	29	2,148	.72
<b>9</b>	8	9,567	.83	15	949	.72
<b>10</b>	9	7,021	.85	11	566	.61
<b>11</b>	6	6,653	.86	6	324	.70
<b>12</b>	2	3,107	.86	4	165	.74

**Table B3: Summary of STAR Math Validity Studies (Meta-analysis)**

	Predictive			Concurrent		
Grade	Studies	Students	Average Correlation	Studies	Students	Average Correlation
<b>1</b>	6	11,880	.55	6	179	.58
<b>2</b>	10	33,076	.63	17	987	.61
<b>3</b>	30	52,604	.66	49	6,400	.61
<b>4</b>	23	55,285	.69	49	5,823	.59
<b>5</b>	29	39,869	.70	58	6,873	.64
<b>6</b>	13	27,663	.73	37	4,202	.66
<b>7</b>	15	18,919	.75	29	3,361	.64
<b>8</b>	11	12,780	.76	29	3,713	.65
<b>9</b>	6	2,545	.78	13	665	.57
<b>10</b>	6	2,236	.79	10	334	.60
<b>11</b>	6	1,921	.80	10	495	.68
<b>12</b>	2	885	.77	9	233	.68

## APPENDIX C: STAR ASSESSMENT SCORE DEFINITIONS

### STAR Early Literacy

**Estimated oral reading fluency (Est. ORF)**, reported in correct words per minute, is an estimate of a student's ability to read words quickly and accurately in order to comprehend text efficiently. Students with oral reading fluency demonstrate accurate decoding, automatic word recognition, and appropriate use of the rhythmic aspects of language (e.g., intonation, phrasing, pitch, emphasis). Est. ORF is based on a known relationship between STAR Early Literacy performance and oral reading fluency.

**Literacy classifications** are the stages of literacy development measured in STAR Early Literacy and associated with scaled scores. They are an easy way to monitor student progress:

#### **Emergent Reader (300–674):**

An *Early Emergent Reader (300–487)* is beginning to understand that printed text has meaning. The student is learning that reading involves printed words and sentences and that print flows from left to right and from top to bottom of a page. Student is also beginning to identify colors, shapes, numbers, and letters.

A *Late Emergent Reader (488–674)* can identify most of the letters of the alphabet and match most of the letters to sounds. The student is beginning to “read” picture books and familiar words around home. Through repeated reading of favorite books with an adult, a student at this stage is building vocabulary, listening skills, and understanding of print.

A **Transitional Reader (675–774)** has mastered alphabet skills and letter-sound relationships. The student can identify many beginning and ending consonant sounds as well as long and short vowel sounds. The student is probably able to blend sounds and word parts to read simple words and is likely using a variety of strategies to figure out words, such as pictures, story patterns, and phonics.

A **Probable Reader (775–900)** is becoming proficient at recognizing many words, both in and out of context, and spends less time identifying and sounding out words and more time understanding what was read. A probable reader can blend sounds and word parts to read words and sentences more quickly, smoothly, and independently than students in other stages of development.

**Literacy domain score**, ranging from 0 to 100, is criterion-referenced and represents the percentage of items a student would be expected to answer correctly within the following seven domains, covering 41 literacy skills:

**General readiness (GR):** Ability to identify shapes, numbers, colors, and patterns; explore word length and word pairs; and examine oral and print numbers.

**Graphophonemic knowledge (GK):** Ability to relate letters to corresponding sounds; addresses skills like matching upper- and lowercase letters, recognizing the alphabet, naming letters, recognizing letter sounds, and knowing alphabetical order.

**Phonemic awareness (PA):** Ability to detect and identify individual sounds within spoken words. Assesses skills like rhyming words; blending word parts and phonemes; discriminating between beginning, medial, and ending sounds; understanding word length; and identifying missing sounds.

**Phonics (PH):** Ability to read words by using the sounds of letters, letter groups, and syllables. Addresses skills like identifying short and long vowels, beginning and ending consonants, and consonant blends and digraphs; recognizing word families; and using strategies such as consonant and vowel replacement.

**Comprehension (CO):** Ability to understand what has been read aloud, understand word meaning, and read text correctly. Addresses skills like identifying and understanding words, selecting the word that best completes a sentence, and answering items about stories.

**Structural analysis (SA):** Ability to understand the structure of words and word parts. Addresses skills like finding words, adding beginning or ending letters or syllables to a word, building words, and identifying compound words.

**Vocabulary (VO):** Ability to identify high-frequency words, match pictures with synonyms, match words with phrases, match stories with words, identify opposites, match pictures with opposite word meanings, and identify opposite word meanings.

**Scaled score (SS)** is useful in comparing student performance over time and is calculated based on the difficulty of items and the number of correct responses. Because the same range is used for all students, scaled scores are also useful for comparing student performance across grade levels. STAR Early Literacy scaled scores range from 300 to 900 and relate directly to the literacy classifications above.

**Skill score**, ranging from 0 to 100, is criterion-referenced and estimates a student's percent of mastery of specific skills within the seven domains listed above. Renaissance Learning considers students to be proficient in a skill when they obtain a score of greater than 75.

## **STAR Reading**

**Grade equivalent (GE)** score, ranging 0.0 to 12.9+, is norm-referenced and represents how a student's test performance compares with other students nationally. For example, a fifth-grade student with a GE of 7.6 performed as well as a typical seventh-grader in the sixth month of the school year. This does not mean the student is necessarily capable of reading seventh-grade material—rather, it indicates that the student's reading skills are well above average for fifth grade.

**Estimated oral reading fluency (Est. ORF)**, reported in correct words per minute, is an estimate of a student's ability to read words quickly and accurately in order to comprehend text efficiently. Students with oral reading fluency demonstrate accurate decoding, automatic word recognition, and appropriate use of the rhythmic aspects of language (e.g., intonation, phrasing, pitch, emphasis). Est. ORF is based on a known relationship between STAR Reading performance and oral reading fluency.

**Grade placement (GP)** is a numeric representation of a student's grade level, based on the month in which a student takes a STAR Reading assessment. The STAR Reading software considers the standard school year from September through June and assigns increment values of 0.0 through 0.9 to these months. The software automatically assigns a student's grade placement using grade level and the month in which that student takes a STAR Reading assessment. GP is important because percentile rank and normal curve equivalent values are based on a student's scaled score *and* the student's grade placement at the time of the test.

**Instructional reading level (IRL)** is a criterion-referenced score that indicates the highest reading level at which a student is at least 80 percent proficient at recognizing words and understanding material with instructional assistance. For example, a seventh-grade student with an IRL score of 8.0 reads eighth-grade words with 80 percent accuracy or better. IRL scores are Pre-Primer (PP), Primer (P), grades 1.0 through 12.9, and Post-High School (PHS).

**Normal curve equivalent (NCE)** score, ranging from 1 to 99, is norm-referenced and similar to the percentile rank score but based on an equal interval scale. This means the difference between any two successive scores on the NCE scale has the same meaning throughout the scale. NCEs are mostly used for research and are useful in making comparisons between different achievement tests and for statistical computations—for example, determining an average score for a group of students.

**Percentile rank (PR)** score, ranging from 1 to 99, is norm-referenced and provides the best measure of a student's level of reading achievement compared to other students in the same grade nationally. The score indicates the percentage of a student's peers whose scores were equal to or lower than the score of that student—for example, a student with a PR score of 85 performed as well as or better than 85 percent of students in the same grade.

**Percentile rank range (PR Range)** is norm-referenced and reflects the amount of statistical variability in a student's percentile rank score. For example, a student with a percentile rank range of 32–59 is likely to score within that range if the STAR Reading assessment is taken again within a short time frame—for example, four to six weeks.

**Scaled score (SS)** is useful in comparing student performance over time and is calculated based on the difficulty of items and the number of correct responses. Because the same range is used for all students, scaled scores are also useful for comparing student performance across grade levels. STAR Reading scaled scores range from 0 to 1400. All norm-referenced scores are derived from the scaled score.

**Zone of proximal development (ZPD)** is an individualized range of readability levels based on a student's results from a STAR Reading assessment. Books students choose to read within their ZPD range should neither be too difficult nor too easy and should allow students to experience optimal growth.

## **STAR Math**

**Accelerated Math Library Recommendation** is determined based on the results of a student's STAR Math assessment and helps educators place a student in the Accelerated Math library that will be of the most benefit, based on that student's individual achievement level.

**Grade equivalent (GE)** score, ranging 0.0 to 12.9+, is norm-referenced and represents how a student's test performance compares with other students nationally. For example, a fifth-grade student with a GE of 7.6 performed as well as a typical seventh-grader in the sixth month of the school year. This does not mean the student is necessarily capable of doing seventh-grade math—rather, it indicates that the student's math skills are well above average for fifth grade.

**Grade placement (GP)** is a numeric representation of a student's grade level, based on the month in which a student takes a STAR Math assessment. The STAR Math software considers the standard school year from September through June and assigns increment values of 0.0 through 0.9 to these months. The software automatically assigns a student's grade placement using grade level and the month in which that student takes a STAR Math assessment. GP is important because percentile rank and normal curve equivalent values are based on a student's scaled score *and* the student's grade placement at the time of the test.

**Math instructional level (MIL)** is a student's current level of math instruction. Teachers can adjust this value to enable the software to raise or lower the beginning difficulty level of the first STAR Math assessment a student takes.

**Normal curve equivalent (NCE)** score, ranging from 1 to 99, is norm-referenced and similar to the percentile rank score but based on an equal interval scale. This means the difference between any two successive scores on the NCE scale has the same meaning throughout the scale. NCEs are mostly used for research and are useful in making comparisons between different achievement tests and for statistical computations—for example, determining an average score for a group of students.

**Percentile rank (PR)** score, ranging from 1 to 99, is norm-referenced and provides the best measure of a student's level of math achievement compared to other students in the same grade nationally. The score indicates the percentage of a student's peers whose scores were equal to or lower than the score of that student—for example, a student with a PR score of 85 performed as well as or better than 85 percent of students in the same grade.

**Percentile rank range (PR Range)** is norm-referenced and reflects the amount of statistical variability in a student's percentile rank score. For example, a student with a percentile rank range of 32–59 is likely to score within that range if the STAR Math assessment is taken again within a short time frame—for example, four to six weeks.

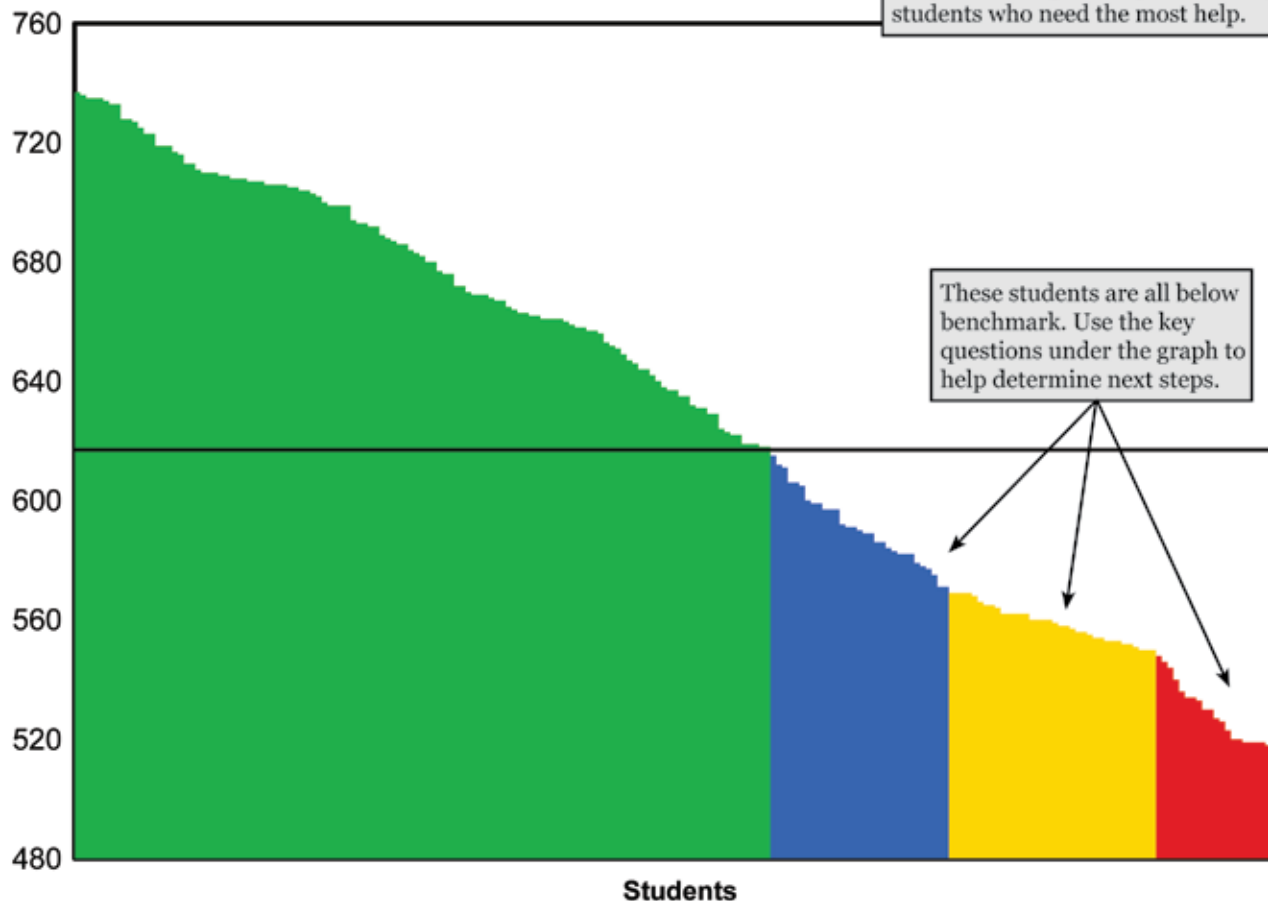
**Scaled score (SS)** is useful in comparing student performance over time and is calculated based on the difficulty of items and the number of correct responses. Because the same range is used for all students, scaled scores are also useful for comparing student performance across grade levels. STAR Math scaled scores range from 0 to 1400. All norm-referenced scores are derived from the scaled score.

## APPENDIX D: SAMPLE KEY REPORTS

On the following pages are full-size samples of the reports shown on pp. 9, 11 and 13. The complete menu of reports available for each STAR assessment is found in a separate publication from Renaissance Learning, *Key Report Samples*, available online from <http://doc.renlearn.com/KMNet/R003563228GE7E80.pdf> or by request to (800) 338-4204.

## Grade: 1

Screening is the first step in Response to Intervention (RTI). Use this report for grade-level planning and identifying students who need the most help.



Categories	Cut Scores		Totals	
	Percentile Rank	Scaled Score	Number	Percent
At/Above Benchmark	At/Above 40	At/Above 617	121	58%
<b>Categories Below Benchmark</b>				
On Watch	Below 40 PR	Below 617	31	15%
Intervention	Below 25 PR	Below 570	36	17%
Urgent Intervention	Below 10 PR	Below 549	21	10%
Students Tested			209	

### Key questions to ask based on this and other information:

Are you satisfied with the number of students at or above benchmark (green)? Which students represented by blue are you "worried about" and what support within or beyond core instruction is warranted? What support is needed for students represented by yellow? Do all students represented by red need urgent intervention?

In an ideal RTI implementation, about 80% of students will be at or above benchmark; improvement still needs to be made to core instruction (Tier 1).



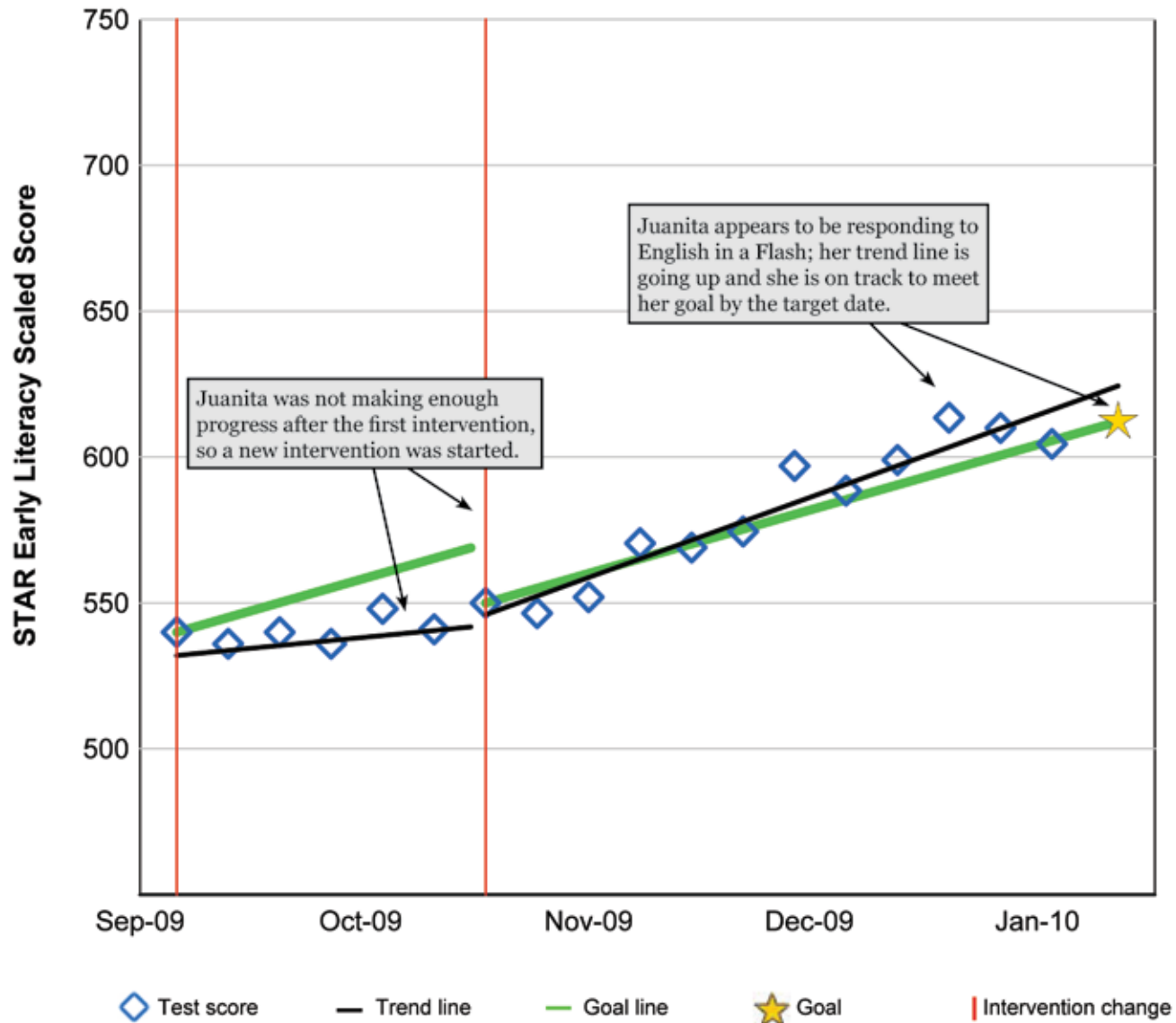
## Vargas, Juanita

Grade: 1

Class: G1 - Davos

ID: P234U8

Teacher: Davidson, M.



### Juanita's Current Goal

Goal: 612 SS (Moderate)

Target Date: 1/22/2010

Expected Growth Rate: 5.1 SS/Week

Teachers can choose a goal of moderate or ambitious growth.

School: Oakwood Elementary School

Reporting Period: 9/1/2009 – 6/11/2010  
(2009-2010 School Year)

## Report Options

Range By: Weaknesses and Strengths

## Class: Mrs. Rowley's Class

Teacher: Rowley, Cheri

## Domain Scores

Domain	Domain Score Range			
	0-25	26-50	51-75	76-100
General Readiness	0	0	5	10
Graphophonemic Knowledge	0	1	10	4
Phonemic Awareness	0	6	6	3
Comprehension	0	6	6	3
Phonics	0	7	6	2
Vocabulary	0	7	7	1
Structural Analysis	1	7	6	1

## Skill Sets within Each Literacy Domain

Covers 41 emergent reading skills.

### General Readiness

Skills	Skill Score Range	Number of Students	Student
Comparing word length (written)	0-25	0	
	26-50	0	
	51-75	5	Donahue, Ashley; Estada, Robert; Jones, Tom; Kruegar, Brendan; North, Stephanie;
	76-100	10	Armstrong, Evan; Brunner, Kathy; Garcia, Maria; Hill, Jeffrey; Miller, Lynn; Morales, Rebecca; Pulido, Luis; Schumann, Pamela; Smith, Debra; Turner, Kenneth;
Recognizing position words	0-25	0	
	26-50	2	Kruegar, Brendan; Donahue, Ashley;
	51-75	5	Armstrong, Evan; Estada, Robert; Jones, Tom; North, Stephanie, Smith, Debra;
	76-100	8	Brunner, Kathy; Garcia, Maria; Hill, Jeffrey; Miller, Lynn; Morales, Rebecca; Pulido, Luis; Schumann, Pamela; Turner, Kenneth;
Differentiating letters	0-25	0	
	26-50	0	
	51-75	4	Donahue, Ashley; Jones, Tom; Kruegar, Brendan; North, Stephanie;
	76-100	11	Armstrong, Evan; Brunner, Kathy; Estada, Robert; Garcia, Maria; Hill, Jeffrey; Miller, Lynn; Morales, Rebecca; Pulido, Luis; Schumann, Pamela; Smith, Debra; Turner, Kenneth;
Differentiating words from letters	0-25	0	
	26-50	0	
	51-75	3	Donahue, Ashley; Kruegar, Brendan; Miller, Lynn;
	76-100	12	Armstrong, Evan; Brunner, Kathy; Estada, Robert; Garcia, Maria; Hill, Jeffrey; Jones, Tom; Morales, Rebecca; North, Stephanie; Pulido, Luis; Schumann, Pamela; Smith, Debra; Turner, Kenneth;

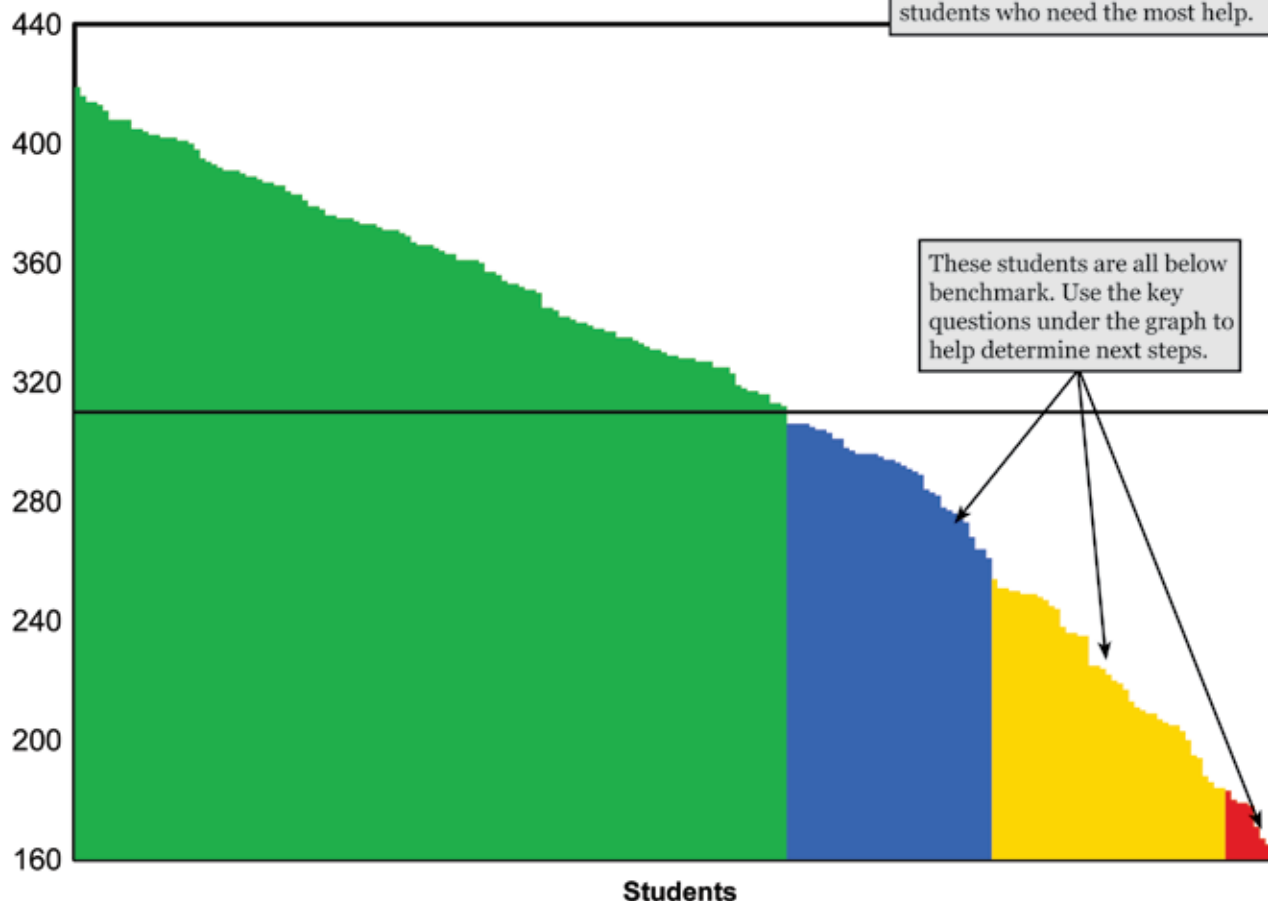
Group students with similar strengths and weaknesses for small group instruction.

School: East Elementary

Reporting Period: 9/15/2009-9/18/2009  
(Fall Screening)

## Grade: 3

Screening is the first step in Response to Intervention (RTI). Use this report for grade-level planning and identifying students who need the most help.



Categories	Cut Scores		Totals	
	Percentile Rank	Scaled Score	Number	Percent
At/Above Benchmark	At/Above 40	At/Above 310	125	59%
Categories Below Benchmark				
On Watch	Below 40 PR	Below 310	36	17%
Intervention	Below 25 PR	Below 257	41	20%
Urgent Intervention	Below 10 PR	Below 184	9	4%
Students Tested			211	

### Key questions to ask based on this and other information:

Are you satisfied with the number of students at or above benchmark (green)? Which students represented by blue are you "worried about" and what support within or beyond core instruction is warranted? What support is needed for students represented by yellow? Do all students represented by red need urgent intervention?

In an ideal RTI implementation, about 80% of students will be at or above benchmark; improvement still needs to be made to core instruction (Tier 1).



# Growth Report

Printed Tuesday, May 18, 2010 10:15:21 AM

Use to measure students' progress between two testing periods.

School: Oakwood Elementary School

Pretest Dates: 09/09/2009 - 09/11/2009  
Posttest Dates: 05/13/2010 - 05/14/2010

Estimated Oral Reading Fluency is an estimation of the number of words a student should be able to read within a one-minute time span.

## Class: Grade 4 (Adams)

Student	Class	Teacher	Test Date	GP	SS	GE	PR	PR Range	NCE	IRL	Est. ORF <sup>b</sup>	ATOS 2000
Anderson, Marcus	Grade 4 (Adams)	Adams, Marcie	09/10/2009 05/14/2010	4.03 4.84	436 522	3.7 4.8	44 51	39-48 46-58	46.8 50.5	3.6 4.3	101 120	643 743
Bell, Timothy	Grade 4 (Adams)	Adams, Marcie	09/11/2009 05/14/2010	4.03 4.84	521 586	4.8 5.5	67 65	64-72 61-69	59.3 58.1	4.3 4.8	120 135	733 811
Bosley, Matthew	Grade 4 (Adams)	Adams, Marcie	09/11/2009 05/14/2010	4.03 4.84	370 550	3.1 5.1	29 57	25-32 45-61	38.3 53.7	3.2 4.5	86 127	533 771
Chang, Michelle	Grade 4 (Adams)	Adams, Marcie	09/10/2009 05/14/2010	4.03 4.84	460 520	4.0 4.8	50 50	45-56 43-56	50.0 50.0	3.8 4.3	106 120	672 733
Gonzales, Maria	Grade 4 (Adams)	Adams, Marcie	09/11/2009 05/14/2010	4.03 4.84	475 542	4.3 5.0	53 55	49-58 49-60	51.6 52.6	3.9 4.5	110 125	701 711
Halden, Susan	Grade 4 (Adams)	Adams, Marcie	09/10/2009 05/14/2010	4.03 4.84	340 481	2.7 4.3	23 40	20-26 37-46	34.4 44.7	2.9 4.0	78 111	471 701
O'Neil, Sarah	Grade 4 (Adams)	Adams, Marcie	09/11/2009 05/14/2010	4.03 4.84	554 646	5.2 5.4	73 76	68-79 72-80	62.9 64.9	4.6 5.4	127 145	554 872
Richmond, Angela	Grade 4 (Adams)	Adams, Marcie	09/11/2009 05/13/2010	4.03 4.84	458 545	4.0 5.1	49 56	48-53 52-59	49.5 53.2	3.8 4.5	106 125	672 771
Rodriguez, Carlos	Grade 4 (Adams)	Adams, Marcie	09/11/2009 05/13/2010	4.03 4.84	496 581	4.5 4.8	59 64	55-65 59-67	54.8 57.5	4.1 4.8	115 134	712 801
Stone, Lisa	Grade 4 (Adams)	Adams, Marcie	09/09/2009 05/13/2010	4.03 4.84	394 508	3.3 4.7	35 47	30-39 44-50	41.9 48.4	3.3 4.2	92 117	571 733

## Summary

	GP	SS	GE	PR	NCE	IRL	Est. ORF <sup>b</sup>	ATOS 2000
Pretest Mean	4.05	452	4.0	48	49.1	3.8	104	630
Posttest Mean	4.85	548	5.0	56	53.4	4.5	126	771
Change	+0.80	+96	+1.0	+8	+4.3	+0.7	+22	+141
Number of Students:	10							

Susan has shown excellent growth this year; she's catching up to her peers.

<sup>b</sup>Est. ORF: Estimated Oral Reading Fluency is only reported for tests taken in grades 1-4.

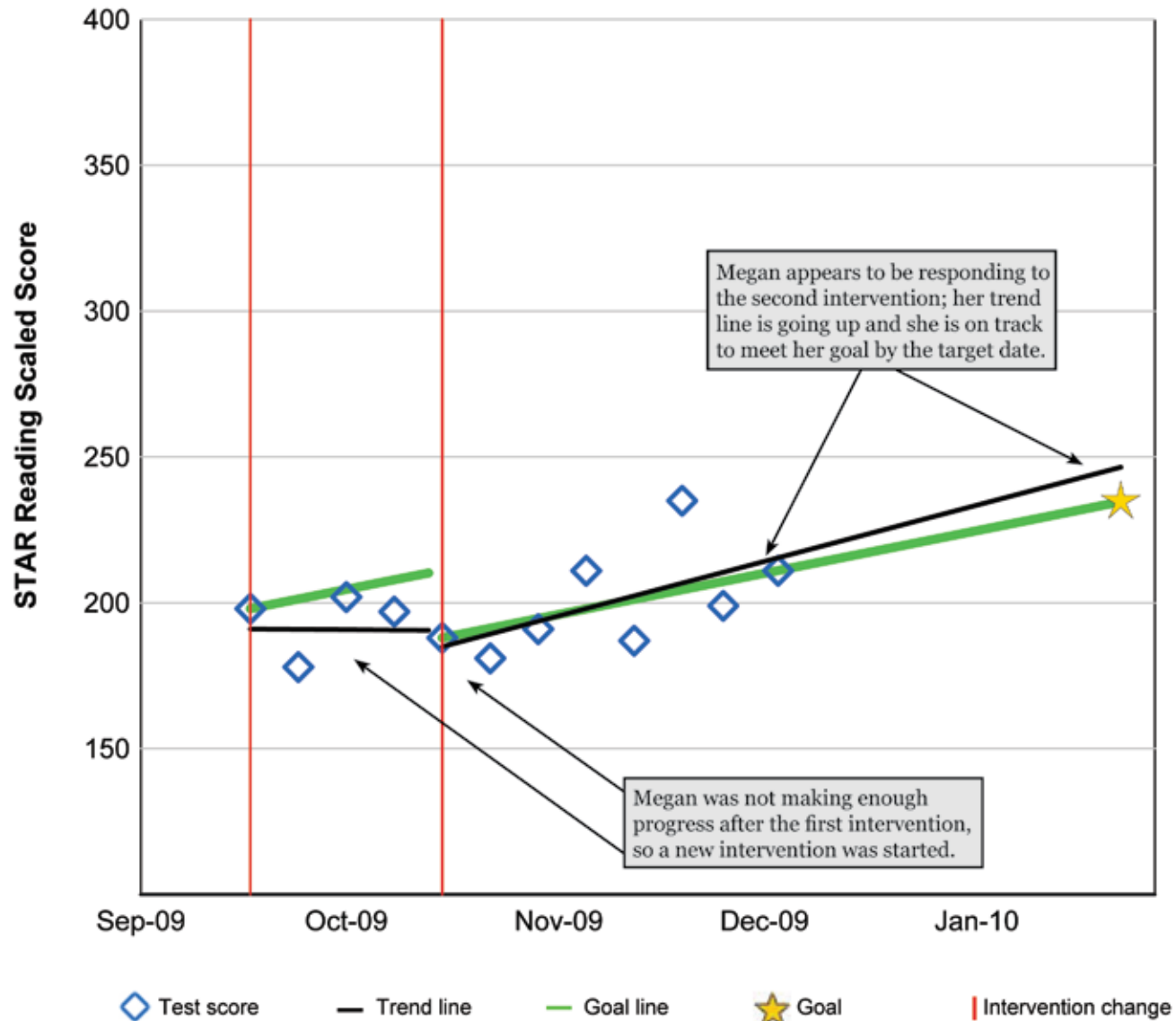
## Timmerman, Megan

Grade: 3

Class: G3 - HM 101

ID: MV98234

Teacher: Davis, J.



### Megan's Current Goal

Goal: 235 SS (Moderate)

Target Date: 1/22/2010

Expected Growth Rate: 3.3 SS/Week

Teachers can choose a goal of moderate or ambitious growth.

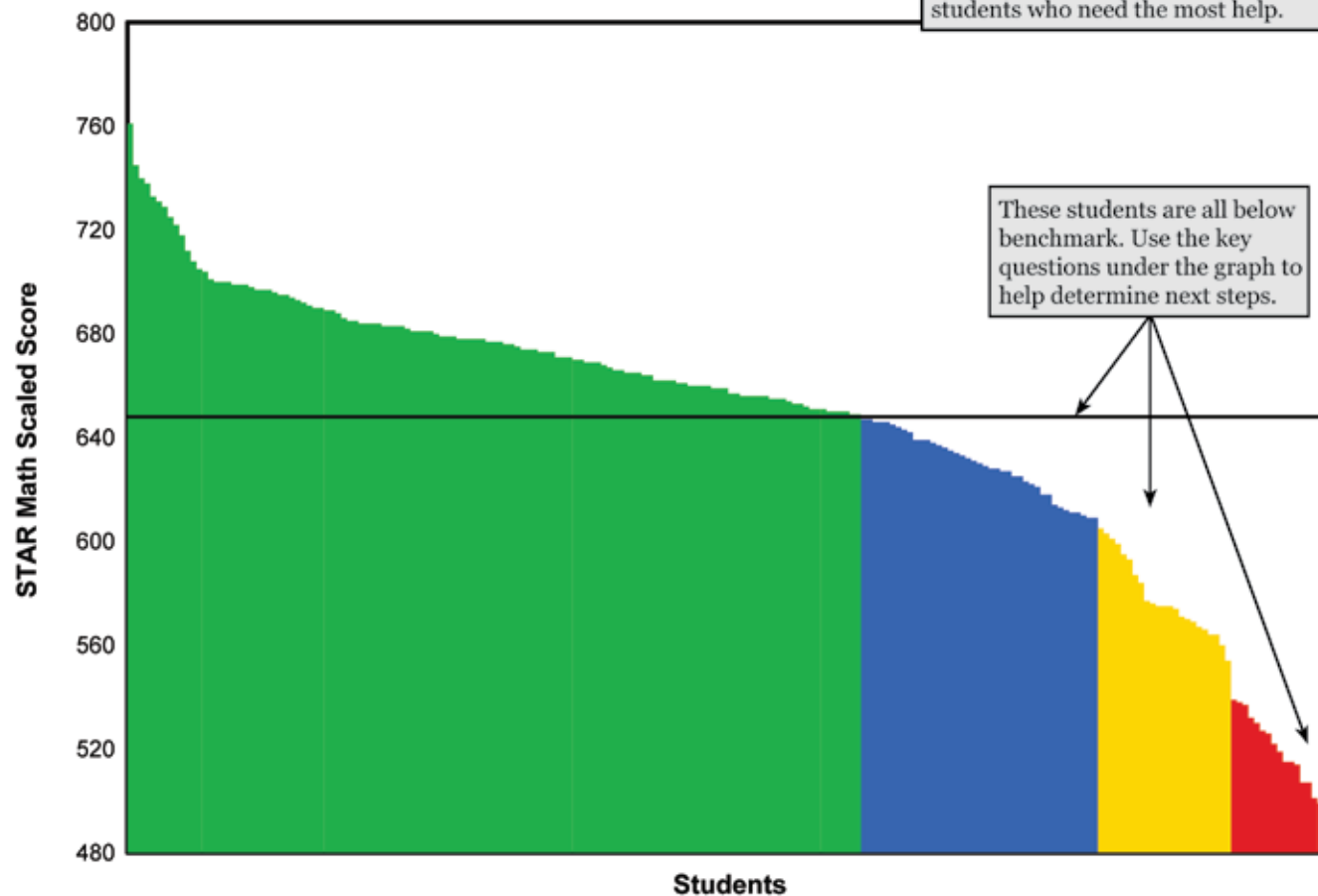


School: East Elementary

Reporting Period: 9/08/2009-9/11/2009  
(Fall Screening)

## Grade: 5

Screening is the first step in Response to Intervention (RTI). Use this report for grade-level planning and identifying students who need the most help.



Categories	Cut Scores		Totals	
	Percentile Rank	Scaled Score	Number	Percent
<span style="color: green;">■</span> At/Above Benchmark	At/Above 40	At/Above 648	127	61%
— Categories Below Benchmark				
<span style="color: blue;">■</span> On Watch	Below 40 PR	Below 648	41	20%
<span style="color: yellow;">■</span> Intervention	Below 25 PR	Below 608	23	11%
<span style="color: red;">■</span> Urgent Intervention	Below 10 PR	Below 544	16	8%
Students Tested			207	

### Key questions to ask based on this and other information:

Are you satisfied with the number of students at or above benchmark (green)? Which students represented by blue are you "worried about" and what support within or beyond core instruction is warranted? What support is needed for students represented by yellow? Do all students represented by red need urgent intervention?

In an ideal RTI implementation, about 80% of students will be at or above benchmark; improvement still needs to be made to core instruction (Tier 1).

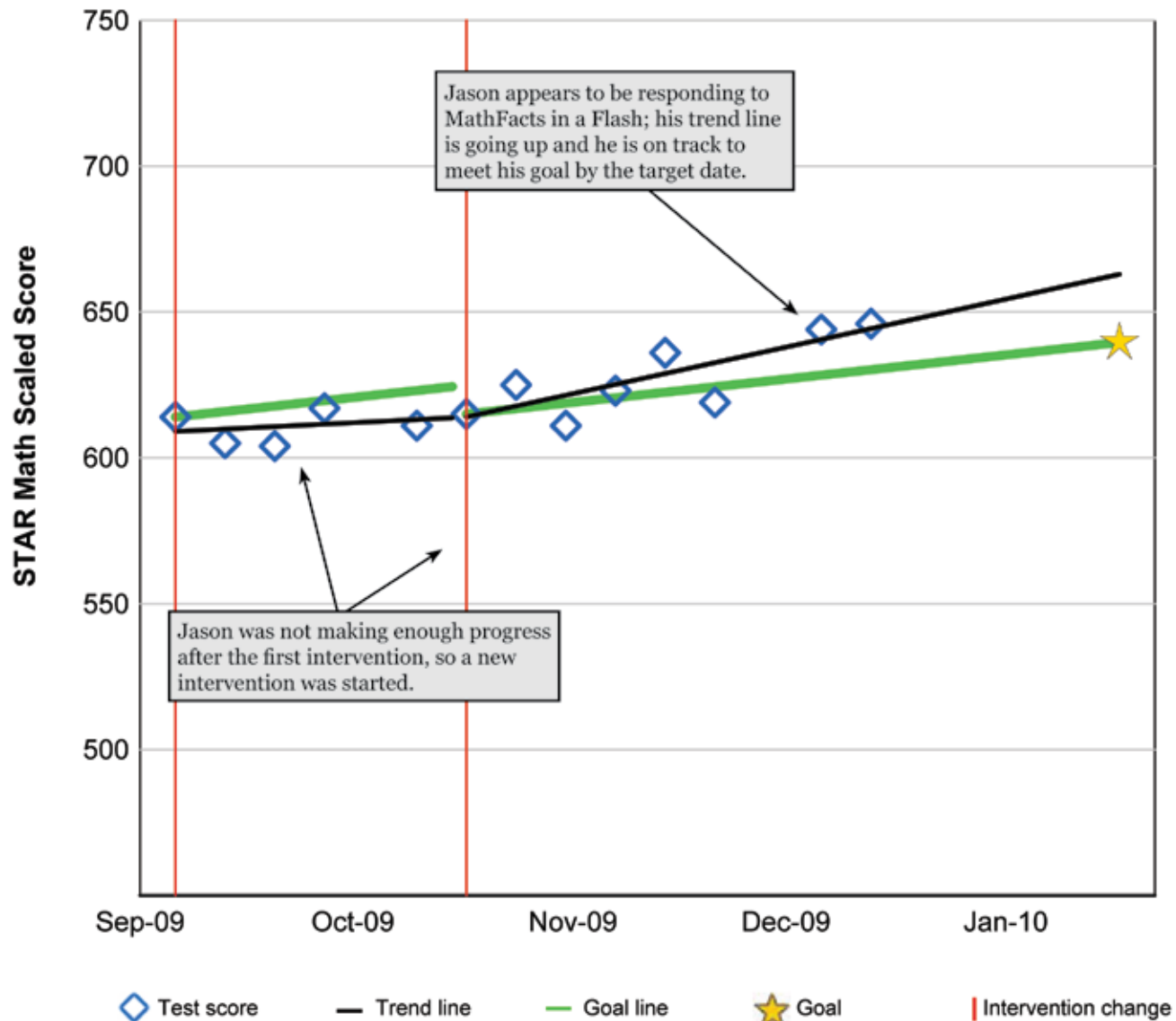
## Peterson, Jason

Grade: 5

Class: G5 - Travis

ID: JV234243897

Teacher: Travis, C.



### Jason's Current Goal

Goal: 640 SS (Moderate)

Target Date: 1/22/2010

Expected Growth Rate: 1.9 SS/Week

Teachers can choose a goal of moderate or ambitious growth.

School: Oakwood Elementary School

Test Date: December 10, 2009 10:28 AM

## Stone, Lisa

ID: LSTONE  
Grade: 4

Class: Math 4A  
Teacher: Mrs. M. Adams

This report presents diagnostic information about the student's general skills in mathematics, based on the student's performance on a STAR Math test.

## Score Summary

SS	GE	PR	PR Range	Below Average 1	PR and PR Range Average 50	Above Average 99	NCE	Recommended Accelerated Math™ Library
646	4.5	57	38-75				53.7	Grade 4 or Grade 5

This student's Grade Equivalent (GE) score is 4.5. Her test performance is therefore comparable to that of an average fourth grader after the fifth month of the school year. Lisa achieved a national Percentile Rank (PR) of 57. This score is in the average range and means that Lisa scored higher than 57% of students nationally in the same grade. The PR Range indicates that, if this student had taken the STAR Math test numerous times, most of her scores would likely have fallen between 38 and 75. It reflects the amount of statistical variability in a student's PR score.

These scores suggest that Lisa can complete basic math tasks with whole numbers. She knows numbers through the millions place. Lisa can add, subtract, multiply, and divide whole numbers. Lisa should continue working with fractions and begin learning decimals. She should continue reviewing math operations with whole numbers. Lisa should work with a variety of fractions, such as halves, thirds, fifths, and eighths. Then, she should learn to add and subtract fractions that have like denominators.

At this stage, Lisa needs to:

- Work with a variety of fractions, using physical models to enhance understanding
- Understand the relationship between fractions and decimals
- Learn to add and subtract fractions with like denominators
- Learn to use fractions with like denominators in word problems
- Learn to add and subtract numbers with the same number of decimal places

These are the next concepts Lisa should learn.

The bar charts below reflect Lisa's level of proficiency within the Numeration and Computation objectives in STAR Math. The solid black line is pointing to the math skills Lisa is currently developing.

## Numeration Objectives

Ones	Tens	Hundreds	Thousands	Hundred Thousands	Fractions & Decimals	Advanced Concepts I	Advanced Concepts II
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## Computational Objectives

Addition & Subtraction Basic Facts to 10	Addition & Subtraction Basic Facts to 18, No Regrouping	Addition & Subtraction with Regrouping	Multiplication & Division Basic Facts	Advanced Computation with Whole Numbers	Fractions & Decimals I	Fractions & Decimals II	Percents, Ratios & Proportions	Multiplication & Division of Mixed Numbers
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If you are using the Accelerated Math management software system with Lisa, assign the Grade 4 library. If she is not challenged by the difficult objectives in the Grade 4 library, move her to the Grade 5 library.

These recommendations rely on analysis of the student's performance on one STAR Math test. Please combine this information with your own knowledge of the student, and use your professional judgment when designing an instructional program.

Lisa's Accelerated Math library recommendation.



# Parent Report for Carlos Rodrigues

Provides score information about a single STAR Math test that Carlos took.


Printed Tuesday, December 15, 2009 9:12:15 AM

School: Oakwood Elementary School  
Teacher: Mrs. M. Adams  
Class: Math 4A

Available  
in both  
English and  
Spanish

Dear Parent or Guardian of Carlos Rodrigues:

Carlos has taken a STAR Math computer-adaptive math test. This report summarizes your child's scores on the test. As with any test, many factors can affect a student's scores. It is important to understand that these test scores provide only one picture of how your child is doing in school.

SS	GE	PR	PR Range	Below Average	Average 50	Above Average	NCE
701	5.5	81	73-86				68.5

## National Norm Scores

### Grade Equivalent (GE): 5.5

Grade Equivalent scores range from 0.0 to 12.9+. A GE score shows how your child's test performance compares with that of other students nationally. Based on the national norms, Carlos's math skills are at a level equal to that of a typical fifth grader after the fifth month of the school year.

### Percentile Rank (PR): 81

The Percentile Rank score compares your child's test performance with that of other students nationally in the same grade. With a PR of 81, Carlos's math skills are greater than 81% of students nationally in the same grade. This score is above average. The PR Range indicates that, if this student had taken the STAR Math test numerous times, most of his scores would likely have fallen between 73 and 86.

I will be using these STAR Math test scores to help Carlos further develop his math skills through the selection of materials for math practice at school. At home, you can help Carlos develop his math skills as well. At this stage, he needs to work with a variety of fractions and decimals and practice adding and subtracting fractions with unlike denominators.

If you have any questions about your child's scores or these recommendations, please contact me at your convenience.

Teacher Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Parent Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Comments:





## ACKNOWLEDGEMENTS

The following experts have advised Renaissance Learning in the development of the STAR assessments.



**Joseph Betts, MMIS, Ph.D., NCSP**, is the senior measurement statistician at Renaissance Learning. His research has focused on the development of growth norms for evaluating student growth relative to similar performing peers and the use of technology-enhanced progress-monitoring tools. In addition, he has done research on the moderating role of language proximity between the development of oral fluency and reading comprehension, and he has investigated the structure of student engagement subtypes across the middle and high school grades. Betts has also participated in the development of measures of early literacy and numeracy for use in kindergarten as well as a preschool screening measure to help with the early identification of students in need of special services. Betts has specialized in the statistical analysis of longitudinal and time series data, latent variable modeling, item response theory, and computerized-adaptive testing. At Renaissance Learning, he contributes to the ongoing development of the STAR assessments for mathematics, reading, and early literacy along with research lines associated with the developmental trajectories of early math and literacy skills. He has contributed to numerous professional papers in peer-reviewed journals, technical reports, and professional presentations.



**Thomas P. Hogan, Ph.D.**, is a professor of psychology and a Distinguished University Fellow at the University of Scranton. He has more than 40 years of experience conducting reviews of mathematics curricular content, principally in connection with the preparation of a wide variety of educational tests, including the Stanford Diagnostic Mathematics Test, Stanford Modern Mathematics Test, and the Metropolitan Achievement Test. Hogan has published articles in the *Journal for Research in Mathematics Education* and *Mathematical Thinking and Learning*, and he has authored two textbooks and more than 100 scholarly publications in the areas of measurement and evaluation. He has also served as consultant to a wide variety of school systems, states, and other organizations on matters of educational assessment, program evaluation, and research design.



**James R. McBride, Ph.D.**, is vice president and chief psychometrician for Renaissance Learning. He was a leader of the pioneering work related to computerized adaptive testing (CAT) conducted by the Department of Defense. McBride has been instrumental in the practical application of item response theory (IRT) and since 1976 has conducted test development and personnel research for a variety of organizations. At Renaissance Learning, he has contributed to the psychometric research and development of STAR Math, STAR Reading, and STAR Early Literacy. McBride is co-editor of a leading book on the development of CAT and has authored numerous journal articles, professional papers, book chapters, and technical reports.



**Michael Milone, Ph.D.**, is a research psychologist and award-winning educational writer and consultant to publishers and school districts. He earned a Ph.D. in 1978 from The Ohio State University and has served in an adjunct capacity at Ohio State, the University of Arizona, Gallaudet University, and New Mexico State University. He has taught in regular and special education programs at all levels, holds a Master of Arts degree from Gallaudet University, and is fluent in American Sign Language. Milone served on the board of directors of the Association of Educational Publishers and was a member of the Literacy Assessment Committee and a past chair of the Technology and Literacy Committee of the International Reading Association. He has contributed to both [readingonline.org](http://readingonline.org) and *Technology & Learning* magazine on a regular basis. Over the past 30 years, he has been involved in a broad range of publishing projects, including the SRA reading series, assessments developed for Academic Therapy Publications, and software published by The Learning Company and LeapFrog. He has completed 34 marathons and 2 Ironman races.



**Sharif M. Shakrani, Ph.D.**, is co-director of the Education Policy Center at Michigan State University and professor of measurement and quantitative methods in the Department of Counseling, Educational Psychology and Special Education. Before coming to Michigan State University, Shakrani served eight years as the deputy executive director of the National Assessment Governing Board in the U.S. Department of Education. He was responsible for technical and policy direction for the National Assessment of Educational Programs (NAEP). He has also worked for the National Center for Education Statistics in the U.S. Department of Education where he guided the design and analysis of federal educational assessments. In his work in the Michigan Department of Education, Shakrani was responsible for K–12 general curriculum and assessment and was instrumental in revising the Michigan Educational Assessment Program (MEAP).