September 1, 2013

Pathway to Proficiency:

Linking the STAR Reading™ and STAR Math™ Scales with Performance Levels on the New York State Assessment Program (NYSTP) for English Language Arts and Mathematics

RENAISSANCE LEARNING

Quick reference guide to the STAR™ assessments

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.

National Center on INTENSIVE INTERVENTION at American Institutes for Research

National Center on Response to Intervention
www.rti4success.org

Student Progress Monitoring
studentprogress.org

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

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Introduction

Educators face many challenges; chief among them is making decisions regarding how to allocate limited resources to best serve diverse student needs. A good assessment system supports teachers by providing timely, relevant information that can help address key questions such as *which students are on track to meet important performance standards?* And *which students are not on track and thus need additional help?* Different educational assessments serve different purposes, but those that can identify students early in the school year as being at-risk to miss academic standards can be especially useful because they can help inform instructional decisions that can improve student performance and reduce gaps in achievement. Assessments that can do that while taking little time away from instruction are particularly valuable.

Indicating which students are on track to meet later expectations is one of the potential capabilities of a category of educational assessments called "interim" (Perie, Marian, Gong, & Wurtzel, 2007). They are one of three broad categories of assessment:

1. Summative – typically annual tests that evaluate the extent to which students have met a set of standards. Most common are state-mandated tests such as the New York State Assessment Program (NYSTP) assessments.
2. Formative – short and frequent processes embedded in the instructional program that support learning by providing feedback on student performance and identifying specific things students know and can do as well as gaps in their knowledge.
3. Interim – assessments that fall in between formative and summative in terms of their duration and frequency. Some interim tests can serve one or more purposes, including informing instruction, evaluating curriculum and student responsiveness to intervention, and forecasting likely performance on a high-stakes summative test later in the year.

This study focuses on the application of interim test results, notably their power to inform educators about which students are on track to succeed on the year-end summative state test and which students might need additional assistance to reach proficiency. Specifically, it involves linking the NYSTP performance levels Reading and Mathematics with scales from two interim tests, STAR Reading and STAR Math. The STAR tests are the most widely used assessments in the U.S., are computer adaptive and use item response theory, require very little time (on average, less than 10–15 minutes group administration time), and may be given repeatedly throughout the school year.[1]

An outcome of this study is that New York educators using the STAR Reading Enterprise or STAR Math Enterprise assessments can access **STAR Performance Reports** focusing on the **Pathway to Proficiency** (see *Sample Reports,* pp. 12–15) that indicate whether individual students or groups of students (by class, grade, or demographic characteristics) are on track to meet the New York English Language Arts and Mathematics standards of proficiency as measured by the NYSTP. These reports allow instructors to evaluate student progress toward proficiency and make instructional decisions based on data—well in advance of your annual state tests. Additional reports automatically generated by the STAR tests help educators **screen** for later difficulties and **progress monitor** students' responsiveness to interventions.

[1] For an overview of the STAR tests and how they work, please see the References section for a link to download *The Foundation of the STAR Assessments* report. For additional information, full technical manuals are available for each STAR assessment by contacting Renaissance Learning at research@renlearn.com

Sources of Data

STAR Reading and STAR Math data were gathered from schools that use those assessments on the Renaissance Place hosted platform.[2] Performance-level distributions from the NYSTP for English Language Arts and Mathematics were retrieved from the New York Department of Education.

NYSTP assessments use four performance levels: *Below Standard, Meets Basic Standard, Meets Proficiency Standard*, and *Exceeds Proficiency Standard*. Students scoring in the *Meets Proficiency Standard* and *Exceeds Proficiency Standard* categories would be counted as meeting proficiency standards for state and federal performance-level reporting.

This study uses STAR Reading, STAR Math, and NYSTP data from the 2012–13 school year.

NYSTP Performance Levels:

1. Below Standard
2. Meets Basic Standard
3. Meets Proficiency Standard
4. Exceeds Proficiency Standard

Methodology

Many of the ways to link scores between two tests require that the scores from each test be available at a student level. Obtaining a sufficient sample of student-level data can be a lengthy and difficult process. However, there is an alternative technique that produces similar results without requiring us to know each individual student's NYSTP score and STAR scaled score. The alternative involves using school-level data to determine the STAR scaled scores that correspond to each NYSTP performance level cutscore. School level NYSTP data are publically available, allowing us to streamline the linking process and complete linking studies more rapidly.

The STAR scores used in this analysis were "projected" scaled scores. Each observed STAR score was projected to the mid-point of the NYSTP administration window using STAR Reading and STAR Math decile-based growth norms. The growth norms are both grade- and subject-specific and are based on the growth patterns of more than one million students using STAR assessments over a three-year period. They provide typical growth rates for students based on their starting STAR test score, making predictions much more accurate than a "one-size-fits-all" growth rate.

For each observed score, the number of weeks between the STAR test administration date and the mid-point of the NYSTP window was calculated. To get the total expected growth from the date of the STAR test to the NYSTP, the number of weeks between the two tests was multiplied by the student's expected weekly scaled score growth (from our decile-based growth norms, which take into account grade and starting observed score). The total expected growth was then added to the observed scaled score to determine their projected score at the time of the NYSTP. If a student took multiple STAR tests during the school year, all their projected scores were averaged.

This method used to link our STAR scale to the NYSTP proficiency levels is equivalent groups equipercentile equating. This method looks at the distribution of NYSTP performance levels in the sample and compares that to the distribution of projected STAR scores for the sample; the STAR scaled score that cuts off the same percentage of students as each NYSTP performance level is taken to be the cutscore for each respective proficiency level. For several different states, we compared the results from the equivalent groups

[2] Renaissance Place is a service that involves "hosting" schools' data from the STAR tests and other products. For more information about Renaissance Place, see http://www.renlearn.com/rp/

equipercentile equating to results from student-level data and found the accuracy of the two methods to be nearly identical (Renaissance Learning, 2013a, 2013b). McLaughlin and Bandeira de Mello (2002) employed a similar method in their comparison of NAEP scores and state assessment results, and this method has been used multiple times since 2002 (Bandeira de Mello, Blankenship, & McLaughlin, 2009; McLaughlin & Bandeira de Mello, 2003; McLaughlin & Bandeira de Mello, 2006; McLaughlin, Bandeira de Mello, Blankenship, Chaney, Esra, Hikawa, Rojas, William, & Wolman, 2008). Additionally, Cronin et al. (2007) found this method was able to determine performance level cutscore estimates very similar to the cutscores generated by statistical methods requiring student-level data.

Sample Selection

To find a sample of students who were assessed by both the NYSTP and STAR, we began by gathering all hosted STAR Reading and STAR Math test records for New York. Then, each school's STAR Reading and STAR Math data were aggregated by grade and subject area. The next step was to match STAR data with the NYSTP data. To do this, performance level distribution data from the NYSTP was obtained from the New York Department of Education website. The file included the number of students tested in each grade and the percentage of students in each performance level. STAR Reading and STAR Math data were matched to the NYSTP English Language Arts and Mathematics data by district and school name.

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

Through the New York Department of Education website, demographic information was available for the schools in our sample; we aggregated this data to the grade level to create Table 1 on the following page and Table 3 on page 7.

Sample Description: Reading

A total of 180 unique schools across grades 3 through 8 met the sample requirements for reading (explained in *Sample Selection*). Racial/ethnic characteristics for each grade of the sample are presented along with statewide averages in Table 1 and suggest that White students were slightly over-represented.

Table 2 displays by-grade test summaries for the reading sample. It includes counts of students taking STAR Reading and the NYSTP Reading. It also includes percentages of students in each performance level, both for the sample and statewide. Despite White students being over-represented, students in the reading sample had similar NYSTP performance to the statewide population.

Table 1. Characteristics of reading sample: Racial/ethnic statistics

Grade	Number of Schools	Percent of students by racial/ethnic category				
		American Indian	Asian	Black	Hispanic	White
3	73	0.6%	3.1%	8.5%	14.4%	73.4%
4	83	0.6%	3.8%	9.1%	12.2%	74.3%
5	67	0.3%	3.9%	9.5%	12.6%	73.7%
6	62	0.3%	3.9%	9.0%	11.3%	75.5%
7	46	0.4%	2.9%	8.9%	10.3%	77.5%
8	41	0.4%	2.8%	11.3%	13.1%	72.3%
Statewide		**0.3%**	**4.8%**	**11.6%**	**10.6%**	**68.6%**

Table 2. Characteristics of reading sample: Performance on STAR Reading™ and the NYSTP Reading

Grade	Students taking STAR Reading	Students taking NYSTP ELA	Level 1: Below Standard		Level 2: Basic		Level 3: Proficiency		Level 4: Exceeds	
			Sample	State	Sample	State	Sample	State	Sample	State
3	5,936	5,789	31%	36%	33%	33%	31%	27%	5%	4%
4	6,883	6,755	25%	31%	40%	39%	24%	21%	11%	9%
5	5,987	5,841	28%	34%	37%	35%	25%	22%	10%	9%
6	7,684	7,519	22%	29%	43%	42%	20%	16%	15%	13%
7	6,970	6,818	26%	32%	38%	37%	27%	23%	9%	8%
8	6,519	6,374	22%	30%	38%	37%	27%	23%	13%	10%

Sample Description: Math

A total of 146 unique schools across grades 3 through 8 met the sample requirements for math (explained in *Sample Selection*). Tables 3 and 4 present demographic and achievement data from the math sample, along with comparisons to state averages. Like reading, White students were over-represented, but the math sample was similar to the statewide student population in terms of NYSTP performance.

Table 3. Characteristics of math sample: Racial/ethnic statistics

Grade	Number of Schools	Percent of students by racial/ethnic category				
		American Indian	Asian	Black	Hispanic	White
3	54	0.2%	3.6%	7.9%	14.7%	73.5%
4	57	0.2%	4.6%	8.0%	13.1%	74.0%
5	55	0.2%	4.1%	4.9%	13.5%	77.4%
6	59	0.4%	4.1%	4.9%	13.5%	77.4%
7	44	0.4%	3.0%	7.0%	8.0%	81.6%
8	32	0.4%	2.8%	7.4%	12.8%	76.5%
Statewide		**0.3%**	**4.8%**	**11.6%**	**10.6%**	**68.6%**

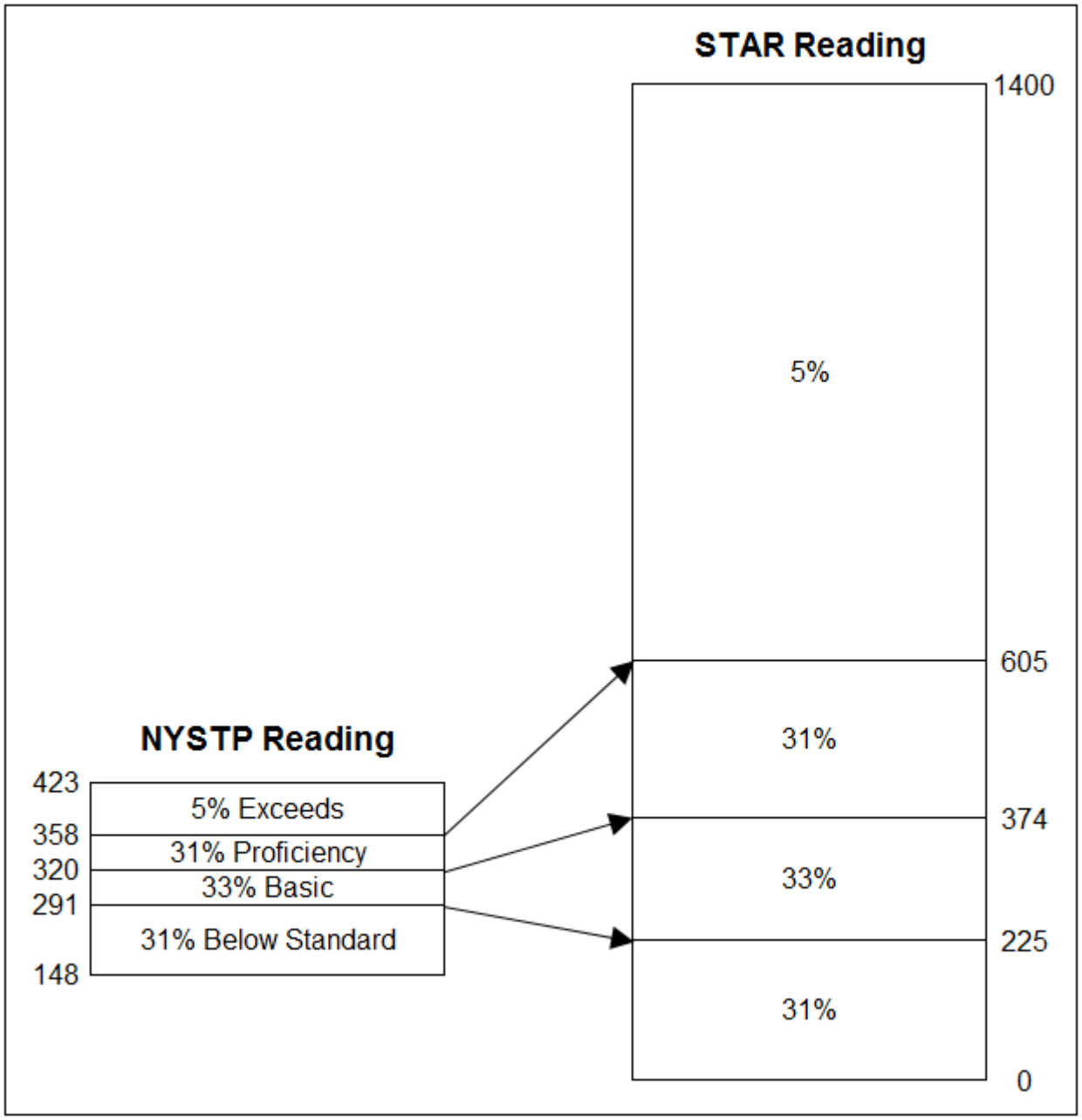
Table 4. Characteristics of math sample: Performance on STAR Math™ and the NYSTP for Mathematics

Grade	Students taking STAR Math	Students taking NYSTP Math	Level 1: Below Standard		Level 2: Basic		Level 3: Proficiency		Level 4: Exceeds	
			Sample	State	Sample	State	Sample	State	Sample	State
3	4,953	4,837	26%	30%	36%	36%	24%	22%	14%	12%
4	5,299	5,190	21%	29%	36%	35%	28%	23%	15%	13%
5	5,121	5,004	34%	40%	33%	30%	24%	21%	9%	9%
6	6,985	6,834	23%	29%	44%	41%	21%	18%	12%	12%
7	6,246	6,094	30%	38%	38%	34%	25%	20%	7%	8%
8	5,042	4,919	27%	31%	46%	42%	21%	20%	6%	7%

Analysis

First, we aggregated the sample of schools for each subject to grade level. Next, we calculated the percentage of students scoring in each NYSTP performance level for each grade. Finally, we ordered STAR scores and analyzed the distribution to determine the scaled score at the same percentile as the NYSTP achievement level. For example, in our third grade reading sample, 31% of students were *Below Standard*, 33% *Met Basic*, 31% *Met Proficiency*, and 5% *Exceeded Proficiency*. Therefore, the cut scores for achievement levels in the third grade are at the 31st percentile for *Met Basic*, the 64th percentile for *Met Proficiency*, and the 95th percentile for *Exceeded Proficiency*.

Figure 1. Illustration of linked STAR Reading™ and the third-grade NYSTP Reading scale



Results and Reporting

Table 5 presents estimates of equivalent scores on the STAR Reading score scale and the NYSTP Reading. Table 6 presents estimates of equivalent scores on the STAR Math score scale and the NYSTP for Mathematics. These results will be incorporated into STAR Performance Reports (see *Sample Reports,* pp. 12–15) that can be used to help educators determine early and periodically which students are on track to reach the Proficient status or higher and to make instructional decisions accordingly.

Table 5. Estimated STAR Reading™ cut scores for the NYSTP Reading performance levels

Grade	Below	Basic		Proficiency		Exceeds	
	Cut Score	Cut score	Percentile	Cut score	Percentile	Cut score	Percentile
3	< 378	378	31	500	64	702	95
4	< 449	449	25	613	65	778	89
5	< 541	541	28	731	65	933	90
6	< 566	566	22	835	65	991	85
7	< 661	661	26	928	64	1215	91
8	< 533	689	22	989	60	1240	87

Table 6. Estimated STAR Math™ cut scores for the NYSTP Mathematics performance levels

Grade	Below	Basic		Proficiency		Exceeds	
	Cut Score	Cut score	Percentile	Cut score	Percentile	Cut score	Percentile
3	< 574	574	26	641	62	682	86
4	< 639	639	21	710	57	758	85
5	< 721	721	34	781	67	833	91
6	< 734	734	23	822	67	863	88
7	< 775	775	30	849	68	905	93
8	< 776	776	27	874	73	925	94

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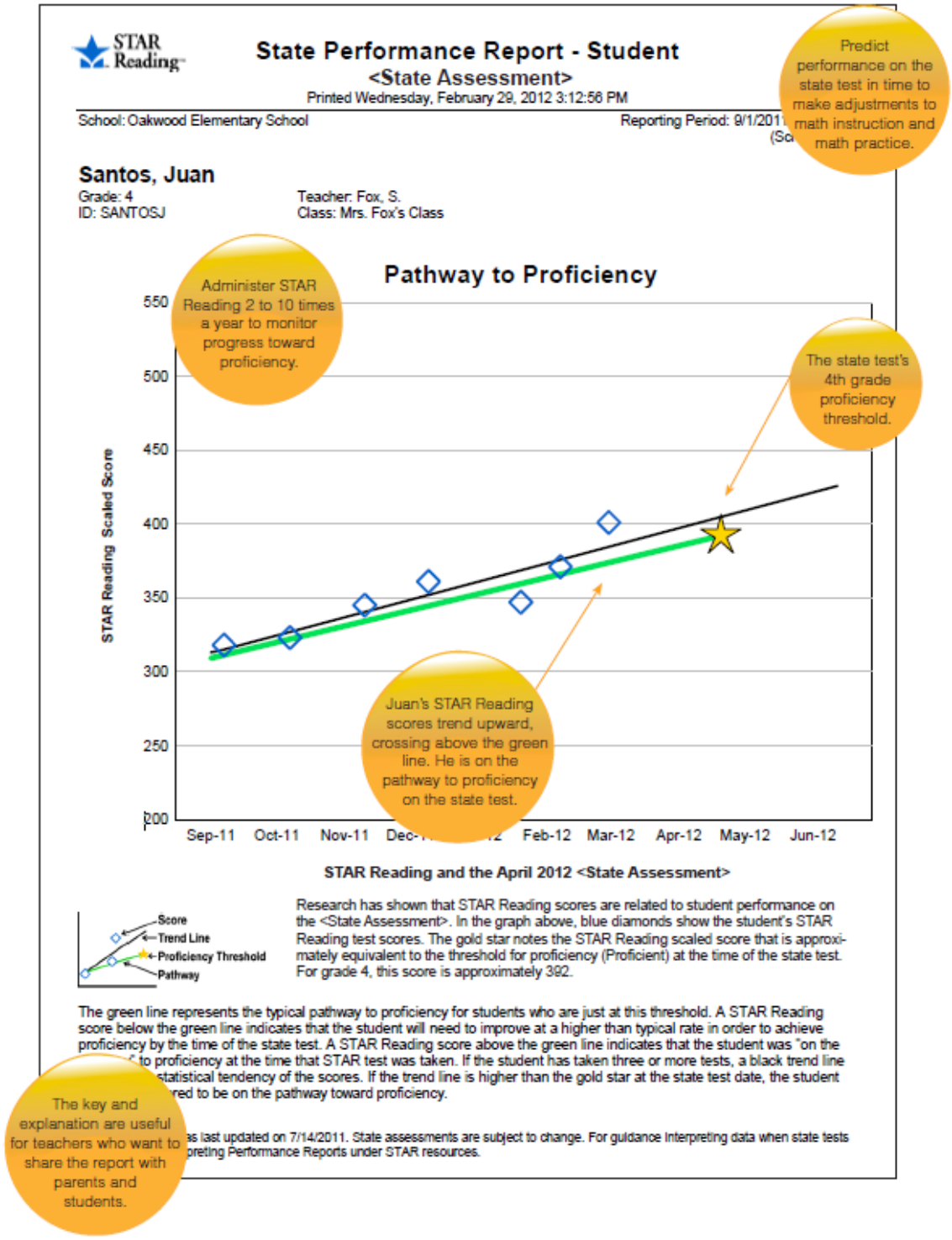
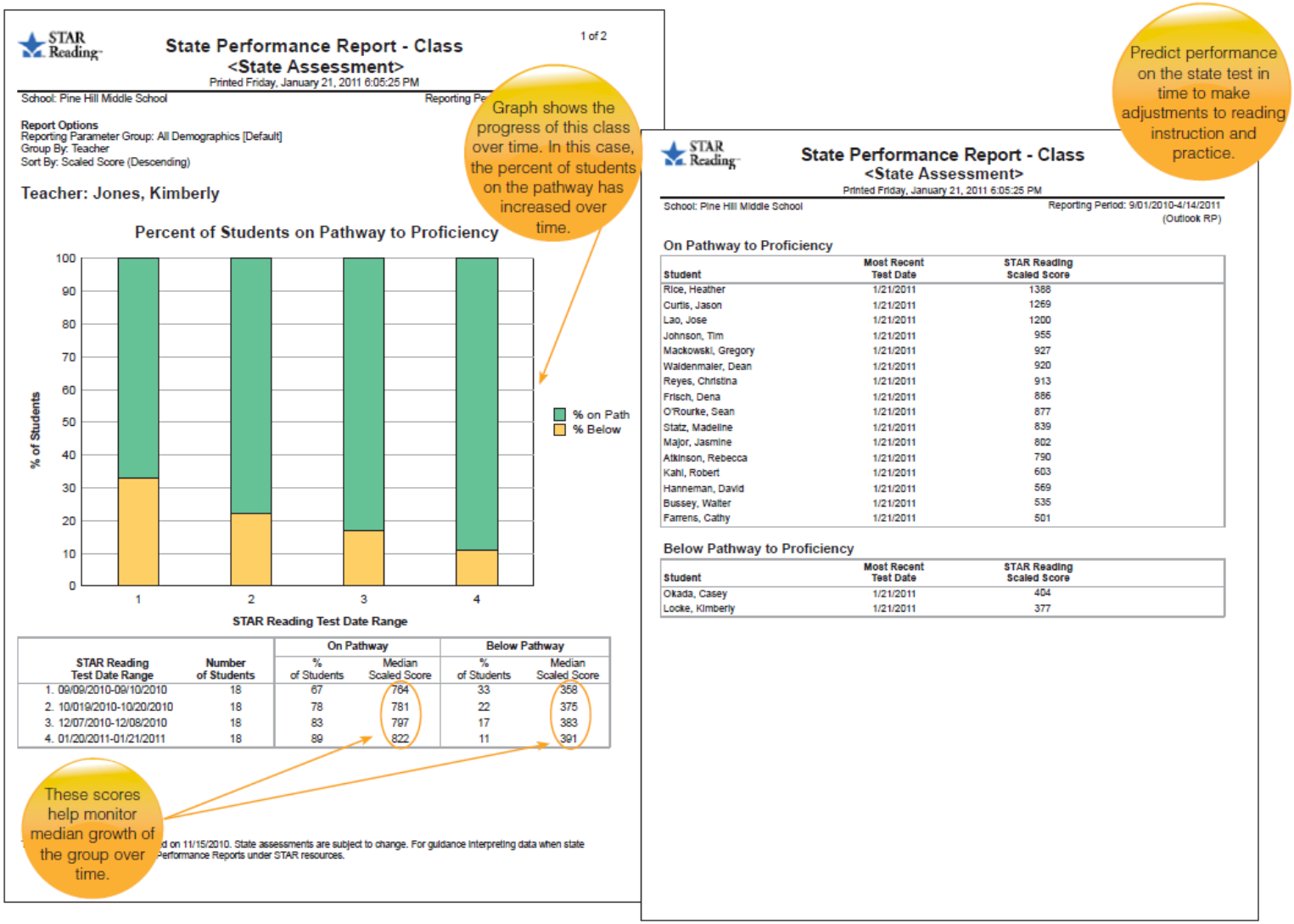
Sample Reports[3]

Sample STAR™ Performance Reports focusing on the Pathway to Proficiency. This report will be available to New York schools using STAR Reading Enterprise™ or STAR Math Enterprise™. The report graphs the student's STAR Reading or STAR Math scores and trend line (projected growth) for easy comparison with the pathway to proficiency on the NYSTP.



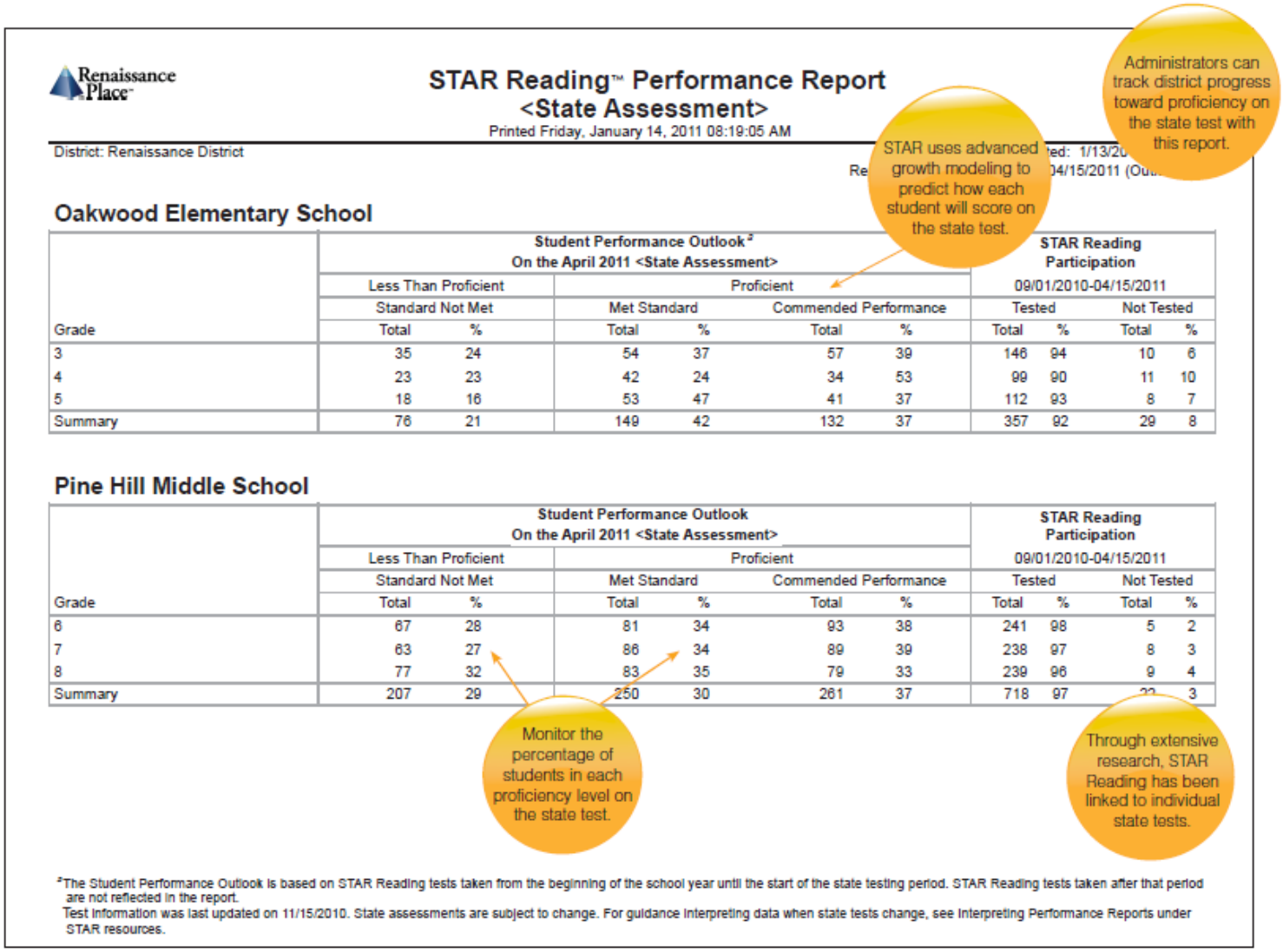
[3] Reports are regularly reviewed and may vary from those shown as enhancements are made.

Sample Group Performance Report. For the groups and for the STAR test date ranges identified by educators, the Group Performance Report compares your students' performance on the STAR assessments to the pathway to proficiency for your annual state tests and summarizes the results. It helps you see how groups of your students (whole class, for example) are progressing toward proficiency. The report displays the most current data as well as historical data as bar charts so that you can see patterns in the percentages of students on the pathway to proficiency and below the pathway—at a glance.



Sample Growth Proficiency Chart. Using the classroom GPC, school administrators and teachers can better identify best practices that are having a significant educational impact on student growth. Displayed on an interactive, web-based growth proficiency chart, STAR assessments' Student Growth Percentiles and expected State Assessment performance are viewable by district, school, grade, or class. In addition to Student Growth Percentiles, the Growth Report displays other key growth indicators such as grade equivalency, percentile rank, and instructional reading level.

Sample Performance Reports. This report is for administrators using STAR Reading and STAR Math assessments. It provides users with periodic, high level forecasts of student performance on your state's reading and math tests. It includes a performance outlook for each performance level of your annual state tests. The report includes options for how to group and list information. These reports are adapted to each state to indicate the appropriate number and names of performance levels.



Renaissance Place

STAR Reading™ Performance Report
<State Assessment>

Printed Friday, January 14, 2011 08:19:05 AM

District: Renaissance District

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Administrators can track district progress toward proficiency on the state test with this report.

STAR uses advanced growth modeling to predict how each student will score on the state test.

Oakwood Elementary School

	Student Performance Outlook[2] On the April 2011 <State Assessment>						STAR Reading Participation 09/01/2010-04/15/2011			
	Less Than Proficient		Proficient							
	Standard Not Met		Met Standard		Commended Performance		Tested		Not Tested	
Grade	Total	%	Total	%	Total	%	Total	%	Total	%
3	35	24	54	37	57	39	146	94	10	6
4	23	23	42	24	34	53	99	90	11	10
5	18	16	53	47	41	37	112	93	8	7
Summary	76	21	149	42	132	37	357	92	29	8

Pine Hill Middle School

	Student Performance Outlook On the April 2011 <State Assessment>						STAR Reading Participation 09/01/2010-04/15/2011			
	Less Than Proficient		Proficient							
	Standard Not Met		Met Standard		Commended Performance		Tested		Not Tested	
Grade	Total	%	Total	%	Total	%	Total	%	Total	%
6	67	28	81	34	93	38	241	98	5	2
7	63	27	86	34	89	39	238	97	8	3
8	77	32	83	35	79	33	239	96	9	4
Summary	207	29	250	30	261	37	718	97	[illegible]	3

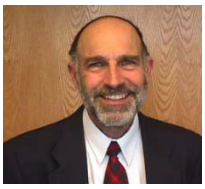
Monitor the percentage of students in each proficiency level on the state test.

Through extensive research, STAR Reading has been linked to individual state tests.

[2]The Student Performance Outlook is based on STAR Reading tests taken from the beginning of the school year until the start of the state testing period. STAR Reading tests taken after that period are not reflected in the report.
Test information was last updated on 11/15/2010. State assessments are subject to change. For guidance interpreting data when state tests change, see Interpreting Performance Reports under STAR resources.

Acknowledgments

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



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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 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.

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