Relating STAR Reading and STAR Math to Iowa Assessment (IA) Performance

Technical Report

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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 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 and repeated as often as weekly for progress monitoring.

- Highly rated for progress monitoring by the ***National Center on Intensive Intervention***
- Highly rated for screening and progress monitoring by the ***National Center on Response to Intervention***
- Meet all criteria for scientifically based progress-monitoring tools set by the ***National Center on Student Progress Monitoring***.

NCII NATIONAL CENTER ON INTENSIVE INTERVENTION at American Institutes for Research

Student Progress Monitoring studentprogress.org

National Center on Response to Intervention
www.rti4success.org

RENAISSANCE LEARNING
P.O. Box 8036
Wisconsin Rapids, WI 54495-8036
(800) 338-4204
www.renlearn.com
answers@renlearn.com

Project Purpose

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 about which students are on track to meet important performance standards and which students may 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:

- 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 Iowa Assessments (IA).
- 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.
- 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 project 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, the purpose of this project is to explore statistical linkages between Renaissance Learning interim assessments[1] (STAR Reading and STAR Math) and the Iowa Assessment (IA). If these linkages are sufficiently strong, they may be useful for

1) the early identification of students at risk of failing to make yearly progress goals in reading and math, which could help teachers decide to adjust instruction for selected students.

2) forecasting percentages of students at each performance level on the state assessments sufficiently in advance to permit redirection of resources; which might serve as an early warning system for administrators at the building and district level.

Assessments

Iowa Assessment

This report is concerned with the Iowa Assessment (IA) in reading and math, in grades 3 through 8. The choice of those two school subjects was made because they coincide with the content of the STAR interim assessments of concern here, STAR Reading and STAR Math.

Students may only take the IA once, but can test during one of three different time frames: Fall, MidYear, or Spring. For each time period, the IA testing program reports standard scores to describe a student's location on the achievement continuum ranging from approximately 125 to 385 (as of the 2012 test).

Scores on the IA tests are used to classify students into three achievement levels: *Not Proficient*, *Proficient*, or *Advanced*. The three achievement levels are defined by ranges of students' standard scores, displayed for reading and math in Tables 1a and 1b, respectively.

[1] For an overview of the STAR tests and how they work, please see the References section for a link to download the technical manuals for STAR Reading and STAR Math.

Table 1a. Iowa Assessment Achievement Level Score Ranges: Reading

Grade	Fall			MidYear			Spring		
	Not Proficient	Proficient	Advanced	Not Proficient	Proficient	Advanced	Not Proficient	Proficient	Advanced
3	< 166	166-200	> 200	< 170	170-208	> 208	< 175	175-217	> 217
4	< 182	182-223	> 223	< 185	185-230	> 230	< 189	189-235	> 235
5	< 194	194-242	> 242	< 198	198-247	> 247	< 202	202-253	> 253
6	< 207	207-258	> 258	< 210	210-261	> 261	< 213	213-264	> 264
7	< 220	220-277	> 277	< 223	223-282	> 282	< 226	226-287	> 287
8	< 232	232-292	> 292	< 236	236-298	> 298	< 239	239-303	> 303

Table 1b. Iowa Assessment Achievement Level Score Ranges: Math

Grade	Fall			MidYear			Spring		
	Not Proficient	Proficient	Advanced	Not Proficient	Proficient	Advanced	Not Proficient	Proficient	Advanced
3	< 168	168-192	> 192	< 173	173-197	> 197	< 177	177-204	> 204
4	< 181	181-210	> 210	< 185	185-216	> 216	< 189	189-223	> 223
5	< 193	193-228	> 228	< 197	197-235	> 235	< 200	200-242	> 242
6	< 206	206-245	> 245	< 209	209-251	> 251	< 212	212-257	> 257
7	< 217	217-264	> 264	< 219	219-270	> 270	< 222	222-276	> 276
8	< 229	229-281	> 281	< 231	231-286	> 286	< 236	236-290	> 290

STAR Reading and STAR Math

Both STAR Reading and STAR Math are computer-administered, adaptive measures of general achievement in their respective subjects. Their adaptive nature permits these tests to be administered to students in grades 1 through 12. They are intended for use as interim assessments that can be administered at multiple points throughout the school year for purposes such as screening, placement, progress monitoring, and outcomes assessment. Renaissance Learning recommends that STAR tests be administered two to five times a year for most purposes, and more frequently when used in progress monitoring programs. Additionally, analysis has shown that the most recent changes to the STAR test item banks and software make it possible to test as often as weekly, for short term progress monitoring in programs such as RTI (response to intervention).

STAR Reading and STAR Math fully automate every aspect of a testing program, including test administration, scoring, record-keeping, and report preparation. A core component of these assessment systems is a longitudinal database that contains permanent records of every test administered to a student, both within and across school years.

STAR Reading and STAR Math are standardized, nationally normed, computer-adaptive, assessments. Both are, by design, brief. Both place a minimal burden on teacher time, as they can be self-administered, are automatically scored by their internal software, and generate a variety of reports instantly and on demand. Furthermore, each student's test is adapted according to his or her previous responses, increasing the accuracy and reliability.

Method

Analysis plans included the evaluation of correlations and statistical linkages between scores on the Iowa Assessment (IA), and STAR Reading and STAR Math. Such analyses require matched data, with student records that include both the IA and STAR test scores. Using a secure data-matching procedure compliant with both the federal Family Educational Rights and Privacy Act (FERPA) and Iowa Department of Education (IA DOE) policies, staff provided Renaissance Learning with state test scores for students in grades 3–8 who had

taken STAR Reading and/or STAR Math during the 2011/12 school year on Renaissance Learning's Real Time platform.[2] Each record in the resulting data file included a student's IA scores as well as scores on any STAR Reading or STAR Math tests taken during that same year.

Linkages between the STAR and IA score scales were developed by applying equipercentile linking analysis (Kolen & Brennan, 2004) at each grade. The IA score scale was linked to the STAR score scale yielding a table of equivalent IA scores for each possible STAR score. This type of analysis requires students take both assessments at about the same time. To account for the fact that STAR and IA tests were often not taken at the same time, projected STAR scores were calculated.

Specifically, STAR test scaled scores were projected to the date of each IA test using national growth norms (Renaissance Learning, 2012a, 2012b). National growth norms are based on grade and initial performance, and are calculated annually using a five-year period of data which includes millions of students. They provide typical growth rates for students based on their starting STAR test score. Projected scores were averaged for students who took more than one test during the school year.

For each STAR score, the number of weeks between the STAR test administration date and the IA administration date was calculated. Then the number of weeks between the two tests was multiplied by the student's expected weekly scaled score growth (based on national growth norms). The expected growth was then added to the observed scaled score to determine the projected STAR score at the time of the IA. If a student took multiple STAR tests during the school year, all their projected scores were averaged.

Tables 2a through 2f contain sample sizes and descriptive statistics for each assessment for each subject and time frame.

Table 2a. Descriptive Statistics for STAR and IA Reading Test Scores by Grade (Fall Testing Window)

Grade	*n*	IA Reading		STAR Reading	
		M	*SD*	*M*	*SD*
3	1,299	391.07	132.87	180.66	15.87
4	997	498.68	159.71	196.21	19.07
5	923	601.37	190.54	209.88	22.73
6	918	686.32	224.58	221.77	26.43
7	620	803.64	240.84	238.67	27.12
8	470	876.60	253.45	249.27	29.53

Table 2b. Descriptive Statistics for STAR and IA Math Test Scores by Grade (Fall Testing Window)

Grade	*n*	IA Math		STAR Math	
		M	*SD*	*M*	*SD*
3	299	550.11	75.07	182.68	21.05
4	301	624.06	84.27	200.07	26.67
5	268	679.51	89.86	213.81	25.45
6	204	726.34	117.22	218.24	29.47
7	172	754.54	101.42	230.47	34.91
8	164	797.78	117.57	246.02	39.69

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

Table 2c. Descriptive Statistics for STAR and IA Reading Test Scores by Grade (MidYear Testing Window)

Grade	*n*	IA Reading		STAR Reading	
		M	*SD*	*M*	*SD*
3	1,763	420.77	138.32	186.07	16.14
4	1,826	521.66	162.92	202.02	20.90
5	1,926	630.82	189.78	215.44	22.67
6	1,554	728.86	219.20	224.85	26.58
7	1,264	829.03	239.23	242.49	27.66
8	905	929.02	255.35	258.70	29.16

Table 2d. Descriptive Statistics for STAR and IA Math Test Scores by Grade (MidYear Testing Window)

Grade	*n*	IA Math		STAR Math	
		M	*SD*	*M*	*SD*
3	548	593.26	75.77	186.59	22.26
4	661	660.97	84.67	201.00	25.80
5	493	717.45	78.63	212.33	25.83
6	428	767.83	90.27	223.35	30.46
7	118	772.36	113.94	239.73	37.34
8	72	798.39	105.81	251.83	38.62

Table 2e. Descriptive Statistics for STAR and IA Reading Test Scores by Grade (Spring Testing Window)

Grade	*n*	IA Math		STAR Math	
		M	*SD*	*M*	*SD*
3	1,808	449.19	135.78	190.35	17.89
4	1,900	559.66	178.26	203.27	21.29
5	1,842	656.59	197.85	217.31	24.31
6	1,610	744.34	226.02	223.56	27.12
7	1,326	842.46	252.09	241.70	28.75
8	1,250	920.23	268.58	253.02	31.96

Table 2f. Descriptive Statistics for STAR and IA Math Test Scores by Grade (Spring Testing Window)

Grade	*n*	IA Reading		STAR Reading	
		M	*SD*	*M*	*SD*
3	770	619.32	76.43	191.71	22.89
4	885	685.98	83.09	209.36	26.90
5	896	735.25	86.69	219.97	28.11
6	732	758.41	100.09	221.11	31.81
7	809	784.57	99.65	239.70	37.12
8	787	801.89	100.48	248.98	37.77

Results

Correlations

Two sets of correlations were obtained from the sample: one between the IA scores and STAR scores, and another between IA scores and the IA score equivalents (obtained from the linking). Tables 3a and 3b display these correlations for reading and math respectively.

For reading, the correlations between the IA and STAR averaged between .61 and .65 depending on the time period, and ranged from .59 to .68. The correlations between IA and IA score equivalents were similar, averaging from .62 to .65 depending on the time period and ranging from .60 to .68.

Table 3a. Pearson Correlations Between STAR Reading Scale Scores and IA Reading Scale Scores

Grade	IA Reading Score Correlation With:					
	STAR Reading Scale Scores			IA Reading Score Equivalents		
	Fall	MidYear	Spring	Fall	MidYear	Spring
3	0.61	0.60	0.63	0.62	0.60	0.64
4	0.61	0.62	0.63	0.62	0.64	0.62
5	0.59	0.64	0.65	0.60	0.64	0.66
6	0.64	0.65	0.63	0.65	0.66	0.63
7	0.60	0.66	0.68	0.60	0.66	0.68
8	0.63	0.67	0.66	0.64	0.67	0.67
Average	0.61	0.64	0.65	0.62	0.65	0.65

For math, correlations between the IA and STAR averaged between .60 and .65 depending on the time period, with a larger range stemming from .48 to .73. The correlations between IA and IA score equivalents were similar, averaging between .64 and .67 and ranging .49 to .93.

Table 3b. Pearson Correlations Between STAR Math Scale Scores and IA Math Scale Scores

Grade	IA Math Score Correlation With:					
	STAR Math Scale Scores			IA Math Score Equivalents		
	Fall	MidYear	Spring	Fall	MidYear	Spring
3	0.67	0.61	0.66	0.69	0.62	0.65
4	0.65	0.62	0.67	0.68	0.61	0.67
5	0.56	0.58	0.62	0.93	0.58	0.63
6	0.48	0.64	0.62	0.49	0.63	0.64
7	0.61	0.66	0.67	0.61	0.67	0.68
8	0.65	0.73	0.67	0.65	0.74	0.68
Average	0.60	0.64	0.65	0.67	0.64	0.66

Scale Linkage

Equipercentile linking was used to develop linkages between STAR and IA scale scores for reading and math. The result of the analysis was a set of tables yielding equivalent IA scores for each possible STAR score. These results allow the user to look up the IA reading or math test score that corresponds to every possible STAR Reading or STAR Math score. The linked score tables are contained in Excel spreadsheets embedded in Appendix A. Graphical summaries of the results for each time period can be found in Figures 1a through 1f.

Figure 1a. Linkage of IA Reading to the STAR Reading Scale for the Fall Testing Window

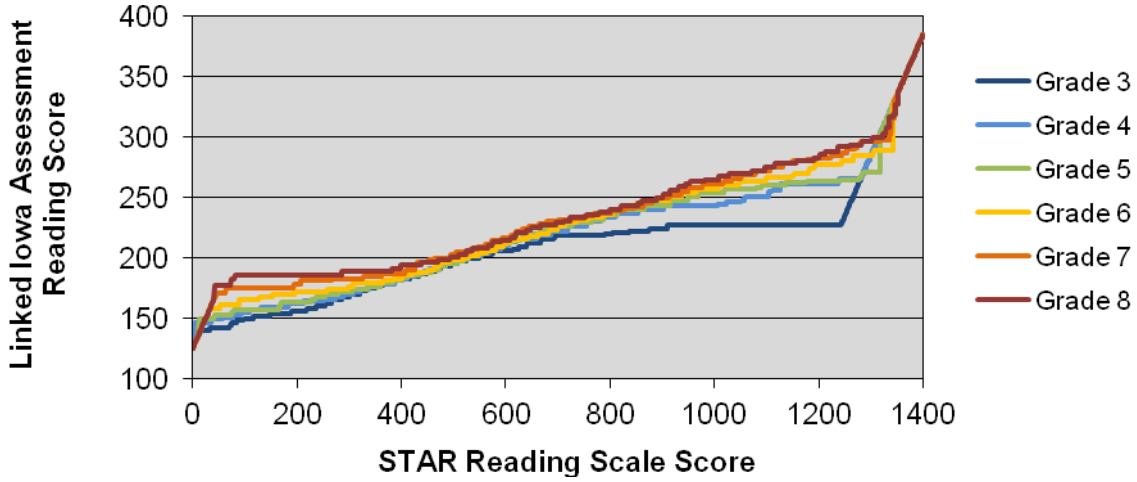


Figure 1b. Linkage of IA Math to the STAR Math Scale for the Fall Testing Window

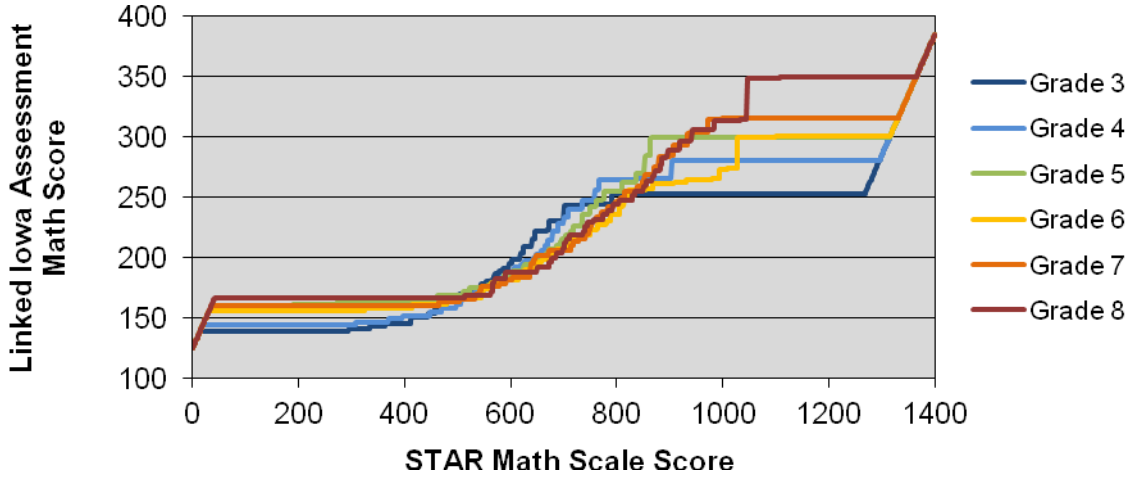


Figure 1c. Linkage of IA Reading to the STAR Reading Scale for the MidYear Testing Window

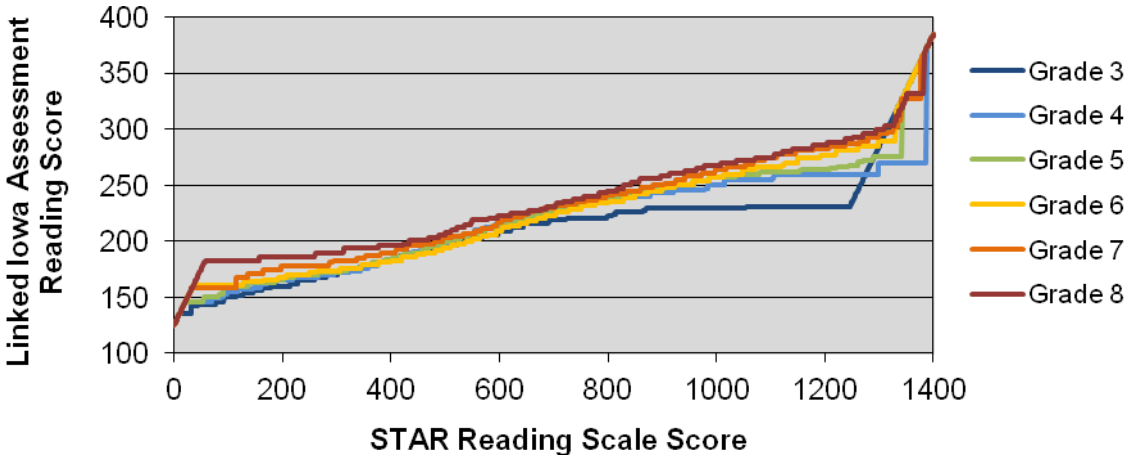


Figure 1d. Linkage of IA Math to the STAR Math Scale for the MidYear Testing Window

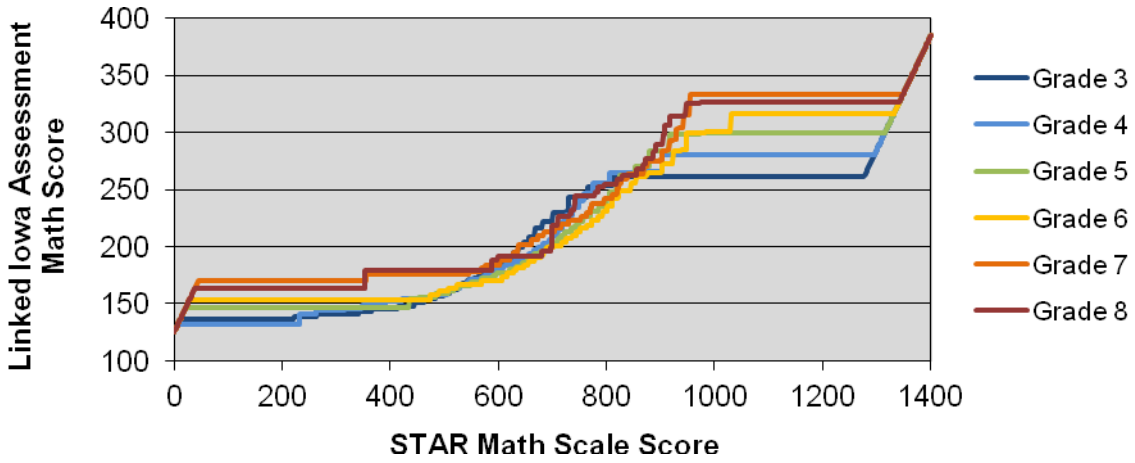


Figure 1e. Linkage of IA Reading to the STAR Reading Scale for the Spring Testing Window

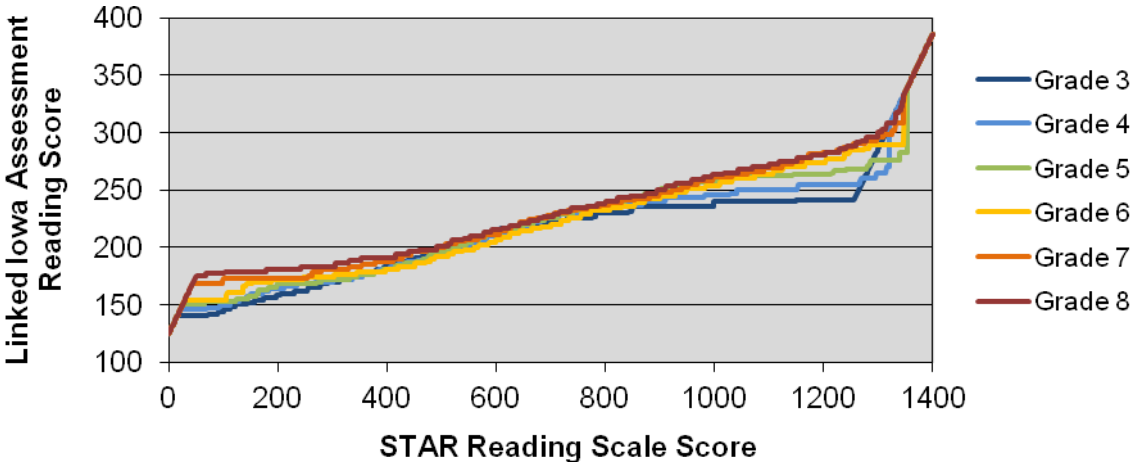
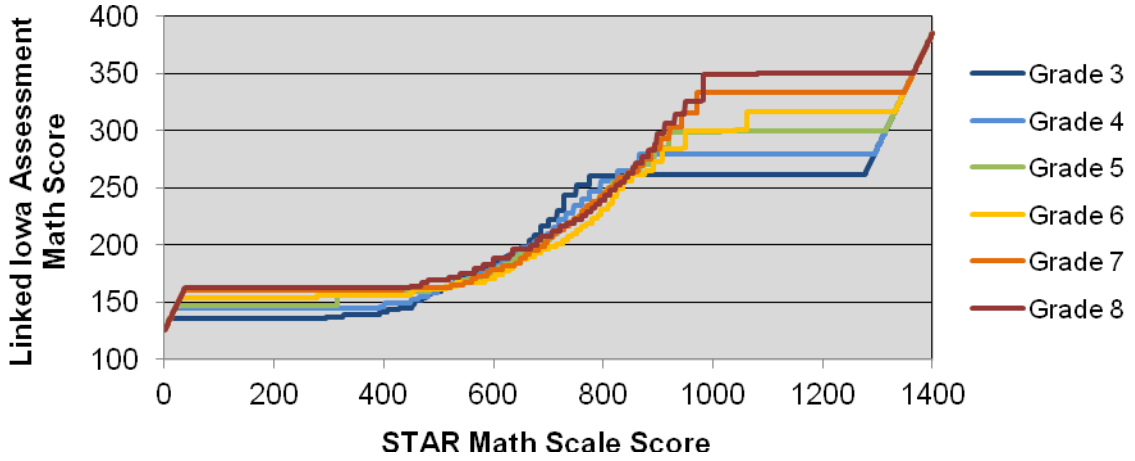


Figure 1f. Linkage of IA Math to the STAR Math Scale for the Spring Testing Window



STAR Equivalents to Iowa Achievement Level Cut Scores

A principal purpose of the linkage between STAR and IA reading and math test scores was to identify the scores on STAR Reading and STAR Math that are approximately equivalent to the cut-off scores that separate achievement levels on the IA tests. Tables 4a and 4b display those cut scores for reading and math in grades 3 through 8, respectively.

Because the linking was done using small samples from just one year of data, these cutcores should be considered approximations that can be updated with greater precision as more data become available in the future. Particular caution should be used when applying the italicized STAR cut points which represent "dips", meaning that these cut points are irregular in that they are either below the cutcores for a lower grade or below the cutcores for a previous testing period in the same grade.

Table 4a. Equivalent STAR Score Achievement Level Ranges: Reading

Grade	Fall			MidYear			Spring		
	Not Proficient	Proficient	Advanced	Not Proficient	Proficient	Advanced	Not Proficient	Proficient	Advanced
3	< 286	286 - 549	> 549	*< 282*	*282 - 597*	> 597	< 331	331 - 631	> 631
4	< 402	402 - 719	> 719	< 405	405 - 727	> 727	< 455	455 - 800	> 800
5	< 485	485 - 866	> 866	< 499	499 - 904	> 904	< 533	533 - 931	> 931
6	< 581	581 - 1009	> 1009	< 606	606 - 1048	> 1048	< 643	643 - 1108	> 1108
7	< 619	619 - 1131	> 1131	< 642	642 - 1177	> 1177	< 675	675 - 1254	> 1254
8	< 724	724 - 1258	> 1258	***< 718***	***718 - 1293***	> 1293	< 801	801 - 1315	> 1315

Table 4b. Equivalent STAR Score Achievement Level Ranges: Math

Grade	Fall			MidYear			Spring		
	Not Proficient	Proficient	Advanced	Not Proficient	Proficient	Advanced	Not Proficient	Proficient	Advanced
3	< 498	498 - 596	> 596	< 554	554 - 636	> 636	< 583	583 - 672	> 672
4	< 580	580 - 669	> 669	< 620	620 - 718	> 718	< 632	632 - 731	> 731
5	< 626	626 - 733	> 733	< 687	687 - 785	> 785	*< 685*	*685 - 805*	> 805
6	< 686	686 - 813	> 813	< 736	736 - 844	> 844	< 752	752 - 851	> 851
7	< 742	742 - 851	> 851	***< 716***	***716 - 875***	> 875	***< 746***	***746 - 886***	**> 886**
8	< 745	745 - 884	> 884	***< 735***	***735 - 890***	> 890	< 786	786 - 897	> 897

Classification Accuracy

For each subject and timeframe, overall classification accuracy (the percentage of correct classifications) was calculated (see Table 5). On average, students were correctly classified as either proficient (Proficient or Advanced) or Not Proficient 80% of the time for reading and 77% for math. The forecasts were accurate between 76% and 84% of the time for reading and between 68% and 84% of the time for math.

Table 5 . Overall Classification Accuracy

Testing Window	Subject	Grade					
		3	4	5	6	7	8
Fall	Reading	83%	81%	79%	76%	79%	78%
	Math	84%	81%	79%	68%	71%	75%
MidYear	Reading	85%	83%	79%	78%	80%	83%
	Math	78%	78%	73%	74%	77%	79%
Spring	Reading	85%	81%	79%	76%	79%	78%
	Math	82%	82%	76%	75%	79%	77%

Conclusions and Applications

The equipercentile linking method was used to link the STAR Reading and STAR Math score scales to their counterpart Iowa Assessment score scales. The linkage analyses were based on small samples (less than the preferred sample size of 2,000 students) of IA and projected STAR scores from the 2011/12 school year. The result of each linkage analysis was a table of all possible STAR scores, and an estimate of the approximately equivalent IA score for that grade.

Using the tables of linked scores, we identified STAR Reading and STAR Math scores that were linked to the cutscores for IA achievement levels (reported in Tables 7a and 7b). Because the linking was done using small samples from just one year of data, the STAR cutcores should be applied cautiously and be considered approximations that can be updated with greater precision as more data become available in the future.

Correlations indicated a moderate relationship between the STAR and IA tests. On average, the correlation between IA and STAR was .63 for both reading and math. In a test of projecting STAR scores to estimate IA performance, students were correctly classified as either proficient or not 80% of the time for reading and 77% for math.

The statistical linkages between STAR interim assessments and the Iowa Assessments for reading and math provide a means of forecasting student achievement on the Iowa assessments based on STAR scores obtained earlier in the school year. Example STAR Reading and STAR Math reports that utilize the STAR-IA linking are provided in the Appendix. They include individualized Pathway to Proficiency reports, which compare each students' STAR performance to the growth trajectory that typically would lead to Proficient on the IA, as well as group-level performance reports that forecast of the number of students that are expected to score at each achievement level on the IA. Both types of reports can be used to help educators determine early and periodically which students are on track to reach Proficiency and to make decisions accordingly.

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Independent technical reviews of STAR Reading and STAR Math

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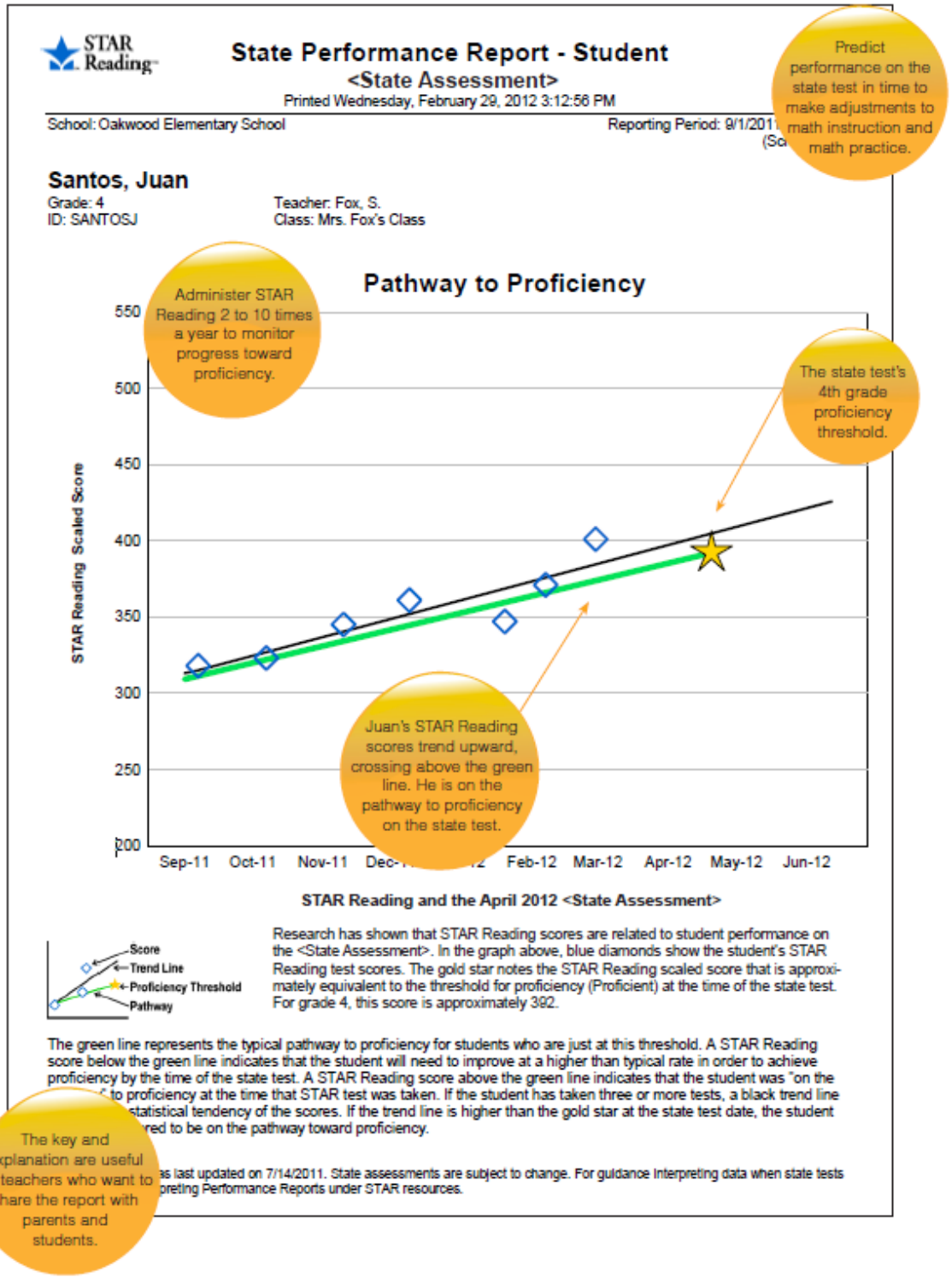
Appendix: Sample Reports[3]

Sample STAR Performance Reports focusing on the Pathway to Proficiency

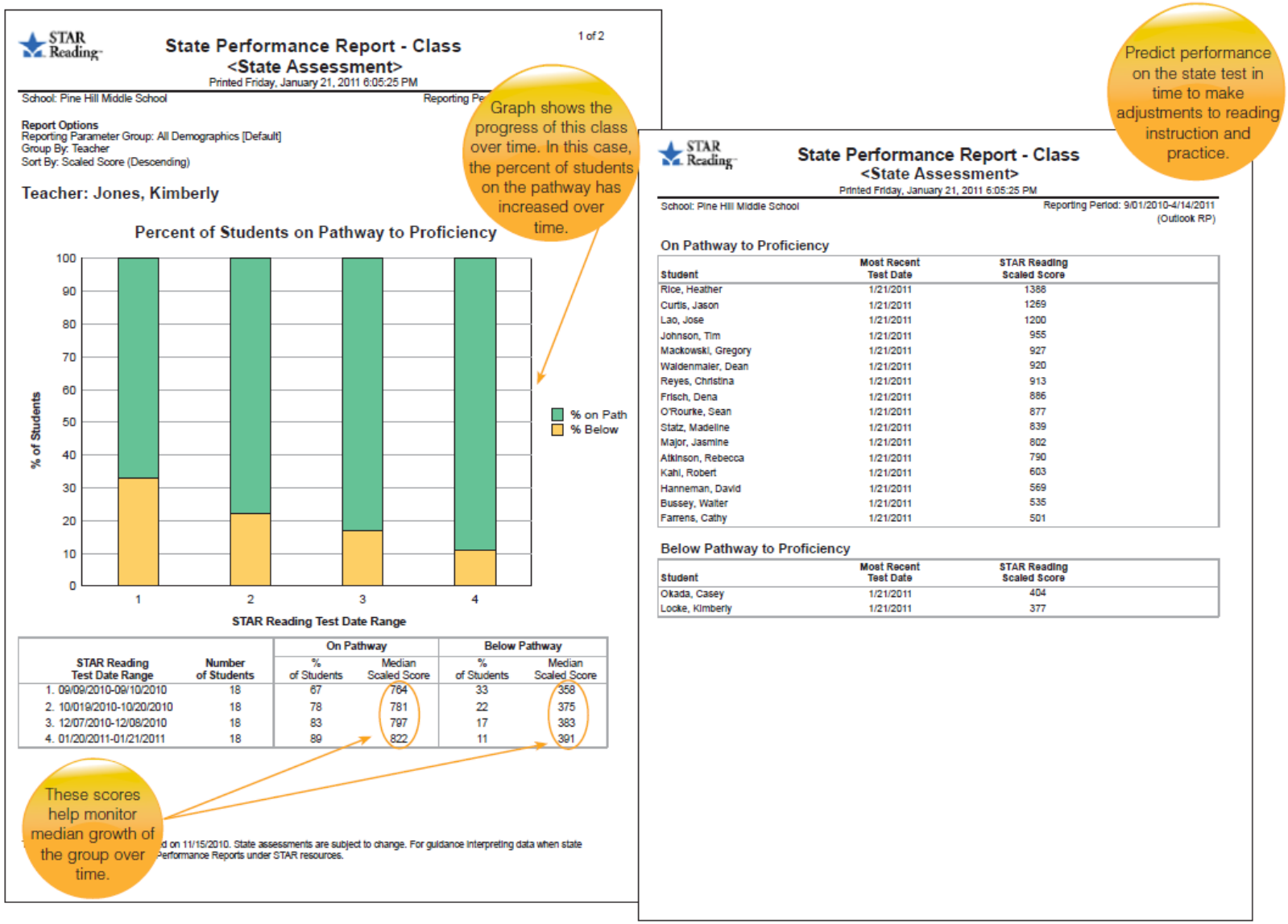
This report will be available to schools using STAR Reading Enterprise or STAR Math Enterprise. The report graphs the student's STAR Reading or STAR Math scores and trend line (projected growth) for easy comparison with the pathway to proficiency.



[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.

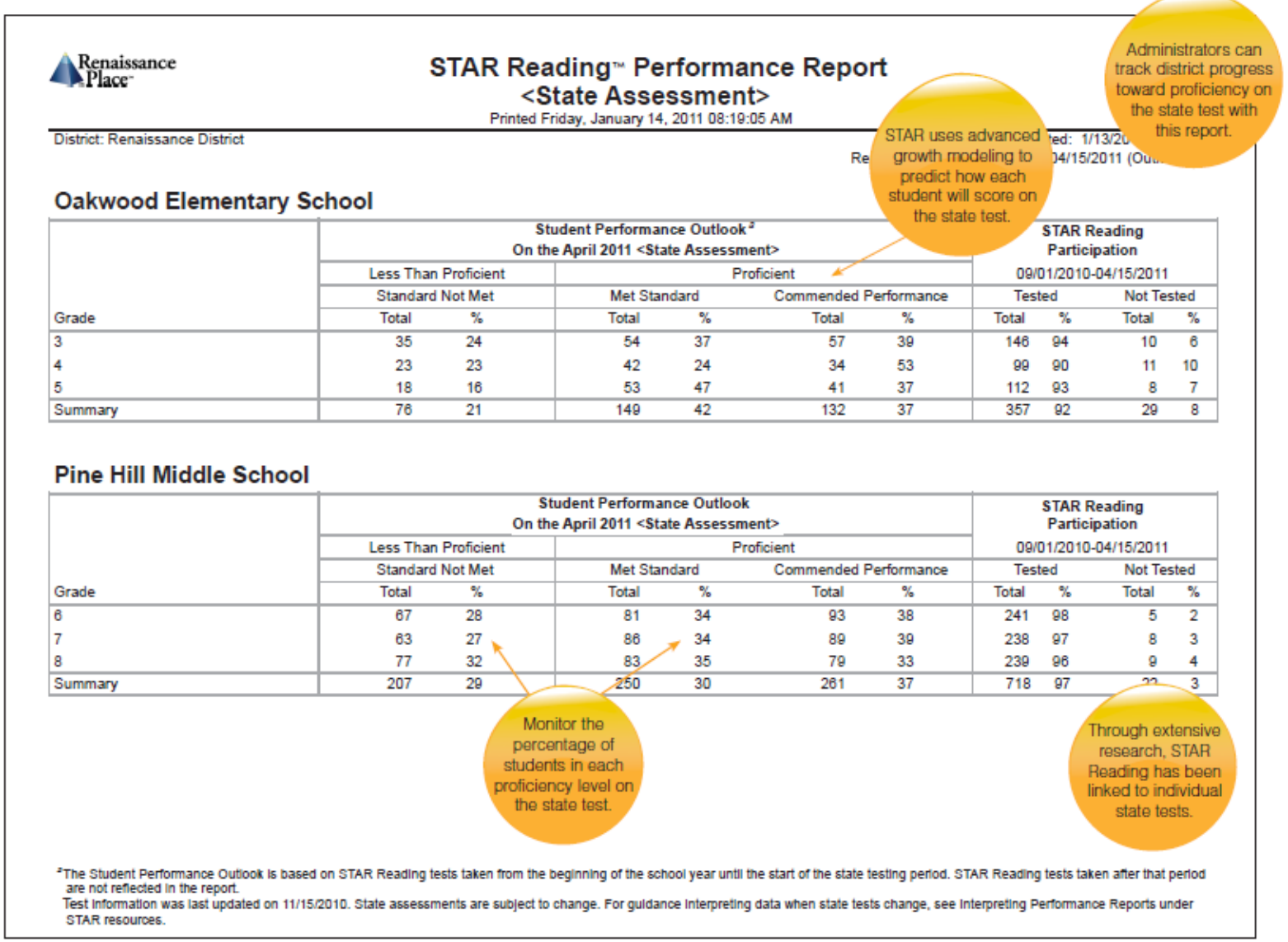


Sample Growth Proficiency Chart

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 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	22	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.