Linking the Smarter Balanced Assessments to NWEA MAP Assessments

Introduction

Concordance tables have been used for decades to relate scores on different tests measuring similar but distinct constructs. These tables, typically derived from statistical linking procedures, provide a direct link between scores on different tests and serve various purposes. Aside from describing how a score on one test relates to performance on another test, they can also be used to identify benchmark scores on one test corresponding to performance categories on another test, or to maintain continuity of scores on a test after a redesign or change. Concordance tables provide a useful tool for educators, parents, administrators, researchers, and policy makers to evaluate and formulate academic standing and growth.

Northwest Evaluation Association™ (NWEA™) is committed to providing partners with useful tools to help make inferences from the Measures of Academic Progress® (MAP®) scores. One important tool is the concordance table between MAP and state summative assessments. Recently, NWEA completed a concordance study to connect the scales of Smarter Balanced Assessment Consortium (Smarter Balanced) English Language Arts (ELA) and Mathematics tests with those of the MAP Reading and MAP for Mathematics assessments. In this report, we present the 3rd through 8th grade cut scores on MAP reading and mathematics scales that correspond to the benchmarks on the Smarter Balanced ELA and Mathematics tests. Information about classification accuracy of the estimated MAP cut scores is also provided, along with a series of tables that estimate the probability of receiving a Level 3 or higher score on the Smarter Balanced assessments, based on the observed MAP scores taken during the same school year. A detailed description of the data and analysis method used this study is provided in the Appendix.

Overview of Assessments

Smarter Balanced Assessments are summative assessments administered in the form of computerized adaptive tests (CATs) and developed according to the Common Core State Standards (CCSS) in ELA and mathematics for grades 3-8 and 11. Smarter Balanced uses a vertical scale that assumes student proficiency is increased across different grade levels and reports scaled scores with a range between 2000 and 3000. For each grade and subject, there are three cut scores that classify student performance into four levels. The Level 3 cut score demarks the minimum level of performance considered to be "Proficient" for accountability purposes (Smart Balanced Technical Report, 2015). Level 1 (Not Met) indicates students have not met the achievement standards for that grade; Level 2 (Nearly Met) indicates students have nearly met the achievement standards; Level 3 (Met) indicates students have met the

achievement standards; and Level 4 (Exceeded) indicates students have exceeded the achievement standards for that grade.

MAP tests are vertically scaled interim assessments that are also administered in the form of CAT. MAP tests are constructed to measure student achievements from grades K to 12 in reading, mathematics, language usage, and science and aligned to the CCSS. MAP scores are reported with Rasch Unit (RIT) scale with a range from 100 to 350. Each subject has its own RIT scale.

Estimated MAP Cut Scores Associated with 4 Smarter Balanced Performance Levels

Tables 1 to 4 report the Smarter Balanced scaled scores associated with each of the four performance levels, as well as the estimated cut scores on the MAP tests associated with the Smarter Balanced performance levels. Tables 1 and 2 apply to MAP scores obtained during spring testing season for reading and mathematics, respectively. Tables 3 and 4 apply to MAP tests taken in a prior testing season (fall or winter) for reading and mathematics, respectively. The tables also show the percentile rank (based on the *NWEA 2015 MAP Norms*) associated with each estimated MAP cut score. The cut scores can be used to predict students' most probable Smarter Balanced performance category, based on their observed MAP scores. For example, a 3rd grade student who obtained a MAP mathematics score of 204 in the spring testing season would be predicted to be at the very low end of Level 3 (Met) on the Smarter Balanced taken during that same testing season (see Table 2). Similarly, a 6th grade student who obtained a MAP reading score of 207 in the fall testing season would be predicted to be at Level 2 (Nearly Met) on the Smarter Balanced taken in the spring of 6th grade (see Table 3).

TABLE 1. CONCORDANCE BETWEEN SMARTER BALANCED ELA AND MAP READING CUT SCORES (WHEN MAP IS TAKEN IN SPRING)

Grade	SMARTER BALANCED			
	Level1 Not Met	Level2 Nearly Met	Level3 Met	Level4 Exceeded
3	2114-2366	2367-2431	2432-2489	2490-2623
4	2131-2415	2416-2472	2473-2532	2533-2663
5	2201-2441	2442-2501	2502-2581	2582-2701
6	2210-2456	2457-2530	2531-2617	2618-2724
7	2258-2478	2479-2551	2552-2648	2649-2745
8	2288-2486	2487-2566	2567-2667	2668-2769

Grade	MAP							
	Level 1 Not Met		Level 2 Nearly Met		Level 3 Met		Level 4 Exceeded	
	RIT	%tile	RIT	%tile	RIT	%tile	RIT	%tile
3	100-190	1-30	191-201	31-58	202-210	59-78	211-350	79-99
4	100-199	1-34	200-208	35-47	209-216	58-76	217-350	77-99
5	100-203	1-29	204-213	30-55	214-224	56-81	225-350	82-99
6	100-205	1-24	206-217	25-55	218-230	56-84	231-350	85-99
7	100-209	1-28	210-221	29-59	222-234	60-86	235-350	87-99
8	100-211	1-29	212-224	30-61	225-238	62-88	239-350	89-99

Note. %ile=percentile

TABLE 2. CONCORDANCE BETWEEN SMARTER BALANCED MATHEMATICS AND MAP MATHEMATICS CUT SCORES (WHEN MAP IS TAKEN IN SPRING)

Grade	SMARTER BALANCED			
	Level1 Not Met	Level2 Nearly Met	Level3 Met	Level4 Exceeded
3	2114-2366	2367-2431	2432-2489	2490-2623
4	2131-2415	2416-2472	2473-2532	2533-2663
5	2201-2441	2442-2501	2502-2581	2582-2701
6	2210-2456	2457-2530	2531-2617	2618-2724
7	2258-2478	2479-2551	2552-2648	2649-2745
8	2288-2486	2487-2566	2567-2667	2668-2769

Grade	MAP MATHEMATICS							
	Level 1 Not Met		Level 2 Nearly Met		Level 3 Met		Level 4 Exceeded	
	RIT	%tile	RIT	%tile	RIT	%tile	RIT	%tile
3	100-193	1-24	194-203	25-51	204-214	52-79	215-350	80-99
4	100-201	1-21	202-216	22-58	217-228	59-84	229-350	85-99
5	100-213	1-31	214-228	32-67	229-237	68-84	238-350	85-99
6	100-216	1-30	217-229	31-60	230-239	61-80	240-350	81-99
7	100-220	1-32	221-234	33-63	235-245	64-83	246-350	84-99
8	100-227	1-43	228-241	44-71	242-251	72-85	252-350	86-99

TABLE 3. CONCORDANCE BETWEEN SMARTER BALANCED ELA AND MAP READING CUT SCORES (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING SMARTER BALANCED TESTS)

Grade	SMARTER BALANCED			
	Level1 Not Met	Level2 Nearly Met	Level3 Met	Level4 Exceeded
3	2114-2366	2367-2431	2432-2489	2490-2623
4	2131-2415	2416-2472	2473-2532	2533-2663
5	2201-2441	2442-2501	2502-2581	2582-2701
6	2210-2456	2457-2530	2531-2617	2618-2724
7	2258-2478	2479-2551	2552-2648	2649-2745
8	2288-2486	2487-2566	2567-2667	2668-2769

Grade	MAP FALL							
	Level 1 Not Met		Level 2 Nearly Met		Level 3 Met		Level 4 Exceeded	
	RIT	%tile	RIT	%tile	RIT	%tile	RIT	%tile
3	100-178	1-27	179-191	28-58	192-202	59-81	203-350	82-99
4	100-190	1-31	191-201	32-59	202-210	60-79	211-350	80-99
5	100-196	1-27	197-207	28-55	208-220	56-83	221-350	84-99
6	100-199	1-22	200-213	23-57	214-228	58-88	229-350	89-99
7	100-204	1-26	205-218	27-61	219-232	62-88	233-350	89-99
8	100-207	1-27	208-222	28-63	223-236	64-89	237-350	90-99

Grade	MAP WINTER							
	Level 1 Not Met		Level 2 Nearly Met		Level 3 Met		Level 4 Exceeded	
	RIT	%tile	RIT	%tile	RIT	%tile	RIT	%tile
3	100-186	1-27	187-198	28-58	199-208	59-80	209-350	81-99
4	100-196	1-32	197-206	33-58	207-214	59-77	215-350	78-99
5	100-201	1-29	202-211	30-55	212-223	56-82	224-350	83-99
6	100-203	1-23	204-216	24-58	217-229	58-85	230-350	86-99
7	100-207	1-27	208-220	28-60	221-233	61-86	234-350	87-99
8	100-210	1-29	211-223	30-62	224-237	63-88	238-350	89-99

TABLE 4. CONCORDANCE BETWEEN SMARTER BALANCED MATHEMATICS AND MAP MATHEMATICS CUT SCORES (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING SMARTER BALANCED TESTS)

Grade	SMARTER BALANCED			
	Level1 Not Met	Level2 Nearly Met	Level3 Met	Level4 Exceeded
3	2114-2366	2367-2431	2432-2489	2490-2623
4	2131-2415	2416-2472	2473-2532	2533-2663
5	2201-2441	2442-2501	2502-2581	2582-2701
6	2210-2456	2457-2530	2531-2617	2618-2724
7	2258-2478	2479-2551	2552-2648	2649-2745
8	2288-2486	2487-2566	2567-2667	2668-2769

Grade	MAP FALL							
	Level 1 Not Met		Level 2 Nearly Met		Level 3 Met		Level 4 Exceeded	
	RIT	%tile	RIT	%tile	RIT	%tile	RIT	%tile
3	100-179	1-20	180-190	21-51	191-202	52-82	203-350	83-99
4	100-189	1-18	190-205	19-61	206-217	62-87	218-350	88-99
5	100-203	1-30	204-218	31-69	219-227	70-86	228-350	87-99
6	100-208	1-28	209-221	29-60	222-232	61-83	233-350	84-99
7	100-214	1-31	215-228	32-64	229-239	65-84	240-350	85-99
8	100-222	1-42	223-237	43-73	238-247	74-88	248-350	89-99

Grade	MAP WINTER							
	Level 1 Not Met		Level 2 Nearly Met		Level 3 Met		Level 4 Exceeded	
	RIT	%tile	RIT	%tile	RIT	%tile	RIT	%tile
3	100-188	1-23	189-198	24-51	199-209	52-80	210-350	81-99
4	100-196	1-20	197-211	21-58	212-223	59-85	224-350	86-99
5	100-209	1-31	210-224	32-68	225-233	69-85	234-350	86-99
6	100-213	1-30	214-226	31-61	227-236	62-81	237-350	82-99
7	100-218	1-33	219-232	34-65	233-243	66-84	244-350	85-99
8	100-225	1-42	226-239	43-71	240-249	72-86	250-350	87-99

Classification Accuracy

Classification accuracy, expressed in the form of a rate between 0 and 1, measures the extent to which MAP scores (and the estimated MAP cut scores) accurately predicted whether students in the sample achieved proficiency (i.e., Level 3 or higher) on the Smarter Balanced. Higher classification accuracy indicates stronger congruence between MAP and Smarter Balanced scores. The results in Table 5 indicate that MAP scores accurately predicted students' proficiency (Level 3 or higher) status on Smarter Balanced with about 83-89% accuracy, depending on grade and subject. MAP reading scores accurately predicted ELA proficiency on Smarter Balanced about 84% of the time, whereas MAP mathematics scores accurately predicted Smarter Balanced mathematics proficiency about 88% of the time. In general, false positive and false negative predictions occurred with about equal frequency, and were relatively low.

TABLE 5. CLASSIFICATION ACCURACY WHEN PREDICTING SMARTER BALANCED LEVEL 3 FROM MAP

Grade	ELA			Mathematics		
	Classification Accuracy	False		Classification Accuracy	False	
		Positives	Negatives		Positives	Negatives
3	0.84	0.09	0.07	0.85	0.08	0.07
4	0.84	0.08	0.08	0.87	0.06	0.07
5	0.84	0.08	0.08	0.88	0.06	0.06
6	0.83	0.09	0.08	0.88	0.06	0.06
7	0.83	0.08	0.09	0.89	0.06	0.05
8	0.83	0.09	0.08	0.89	0.05	0.06

Proficiency Projection

The results of proficiency projection are reported in Tables 6 to 8. These tables estimate the probability of scoring at Level 3 or higher on the Smarter Balanced in the spring, based on an observed MAP score from the spring or the prior fall or winter testing season. For example, if a 3rd grade student obtained a MAP mathematics score of 197 in the fall, the probability of obtaining a Level 3 or higher Smarter Balanced score in the spring of 3rd grade is 81%. Table 6 presents the estimated probability of meeting Level 3 benchmark when MAP is taken in the spring, whereas Tables 7 and 8 present the estimated probability of meeting Level 3 benchmark when MAP is taken in the fall or winter prior to the Smarter Balanced tests.

TABLE 6. PROFICIENCY PROJECTION FOR PASSING SMARTER BALANCED ELA LEVEL 3 (MET) WHEN MAP IS TAKEN IN THE SPRING

Grade	ELA					Mathematics				
	Start %tile	RIT Spring	Projected Proficiency			Start %tile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
3	5	174	202	No	0.00	5	181	204	No	0.00
	10	179	202	No	0.00	10	186	204	No	0.00
	15	183	202	No	0.00	15	189	204	No	0.00
	20	186	202	No	0.00	20	192	204	No	0.00
	25	189	202	No	0.00	25	194	204	No	0.00
	30	191	202	No	0.00	30	196	204	No	0.00
	35	193	202	No	0.00	35	198	204	No	0.02
	40	195	202	No	0.01	40	200	204	No	0.08
	45	197	202	No	0.06	45	202	204	No	0.25
	50	199	202	No	0.17	50	204	204	Yes	0.50
	55	201	202	No	0.38	55	205	204	Yes	0.63
	60	203	202	Yes	0.62	60	207	204	Yes	0.85
	65	205	202	Yes	0.83	65	209	204	Yes	0.96
	70	207	202	Yes	0.94	70	211	204	Yes	0.99
	75	209	202	Yes	0.99	75	213	204	Yes	1.00
	80	212	202	Yes	1.00	80	215	204	Yes	1.00
	85	214	202	Yes	1.00	85	218	204	Yes	1.00
	90	218	202	Yes	1.00	90	221	204	Yes	1.00
	95	224	202	Yes	1.00	95	226	204	Yes	1.00
4	5	182	209	No	0.00	5	189	217	No	0.00
	10	187	209	No	0.00	10	194	217	No	0.00
	15	191	209	No	0.00	15	198	217	No	0.00
	20	194	209	No	0.00	20	201	217	No	0.00
	25	196	209	No	0.00	25	204	217	No	0.00
	30	198	209	No	0.00	30	206	217	No	0.00
	35	200	209	No	0.00	35	208	217	No	0.00
	40	202	209	No	0.01	40	210	217	No	0.01
	45	204	209	No	0.06	45	212	217	No	0.04
	50	206	209	No	0.17	50	214	217	No	0.15
	55	208	209	No	0.38	55	216	217	No	0.37
	60	210	209	Yes	0.62	60	218	217	Yes	0.63
	65	212	209	Yes	0.83	65	220	217	Yes	0.85
	70	214	209	Yes	0.94	70	222	217	Yes	0.96
	75	216	209	Yes	0.99	75	224	217	Yes	0.99
	80	219	209	Yes	1.00	80	226	217	Yes	1.00
	85	222	209	Yes	1.00	85	229	217	Yes	1.00
	90	225	209	Yes	1.00	90	233	217	Yes	1.00
	95	231	209	Yes	1.00	95	238	217	Yes	1.00

TABLE 6. (CONTINUED)

Grade	ELA					Mathematics				
	Start %tile	RIT Spring	Projected Proficiency			Start %tile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
5	5	188	214	No	0.00	5	195	229	No	0.00
	10	193	214	No	0.00	10	201	229	No	0.00
	15	197	214	No	0.00	15	205	229	No	0.00
	20	200	214	No	0.00	20	208	229	No	0.00
	25	202	214	No	0.00	25	211	229	No	0.00
	30	204	214	No	0.00	30	213	229	No	0.00
	35	206	214	No	0.01	35	215	229	No	0.00
	40	208	214	No	0.03	40	218	229	No	0.00
	45	210	214	No	0.11	45	220	229	No	0.00
	50	212	214	No	0.27	50	222	229	No	0.01
	55	214	214	Yes	0.50	55	224	229	No	0.04
	60	216	214	Yes	0.73	60	226	229	No	0.15
	65	218	214	Yes	0.89	65	228	229	No	0.37
	70	220	214	Yes	0.97	70	230	229	Yes	0.63
	75	222	214	Yes	0.99	75	233	229	Yes	0.92
	80	224	214	Yes	1.00	80	235	229	Yes	0.98
	85	227	214	Yes	1.00	85	238	229	Yes	1.00
	90	231	214	Yes	1.00	90	242	229	Yes	1.00
	95	236	214	Yes	1.00	95	248	229	Yes	1.00
6	5	192	218	No	0.00	5	198	230	No	0.00
	10	197	218	No	0.00	10	204	230	No	0.00
	15	201	218	No	0.00	15	208	230	No	0.00
	20	204	218	No	0.00	20	211	230	No	0.00
	25	206	218	No	0.00	25	214	230	No	0.00
	30	208	218	No	0.00	30	217	230	No	0.00
	35	210	218	No	0.01	35	219	230	No	0.00
	40	212	218	No	0.03	40	221	230	No	0.00
	45	214	218	No	0.11	45	224	230	No	0.02
	50	216	218	No	0.27	50	226	230	No	0.08
	55	218	218	Yes	0.50	55	228	230	No	0.25
	60	220	218	Yes	0.73	60	230	230	Yes	0.50
	65	222	218	Yes	0.89	65	232	230	Yes	0.75
	70	224	218	Yes	0.97	70	234	230	Yes	0.92
	75	226	218	Yes	0.99	75	237	230	Yes	0.99
	80	228	218	Yes	1.00	80	240	230	Yes	1.00
	85	231	218	Yes	1.00	85	243	230	Yes	1.00
	90	235	218	Yes	1.00	90	247	230	Yes	1.00
	95	240	218	Yes	1.00	95	253	230	Yes	1.00

TABLE 6. (CONTINUED)

Grade	ELA					Mathematics				
	Start %tile	RIT Spring	Projected Proficiency			Start %tile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
7	5	193	222	No	0.00	5	200	235	No	0.00
	10	199	222	No	0.00	10	206	235	No	0.00
	15	203	222	No	0.00	15	210	235	No	0.00
	20	206	222	No	0.00	20	214	235	No	0.00
	25	208	222	No	0.00	25	217	235	No	0.00
	30	211	222	No	0.00	30	220	235	No	0.00
	35	213	222	No	0.00	35	222	235	No	0.00
	40	215	222	No	0.01	40	224	235	No	0.00
	45	217	222	No	0.06	45	227	235	No	0.00
	50	218	222	No	0.11	50	229	235	No	0.02
	55	220	222	No	0.27	55	231	235	No	0.08
	60	222	222	Yes	0.50	60	233	235	No	0.25
	65	224	222	Yes	0.73	65	236	235	Yes	0.63
	70	226	222	Yes	0.89	70	238	235	Yes	0.85
	75	229	222	Yes	0.99	75	241	235	Yes	0.98
	80	231	222	Yes	1.00	80	244	235	Yes	1.00
	85	234	222	Yes	1.00	85	247	235	Yes	1.00
	90	238	222	Yes	1.00	90	251	235	Yes	1.00
	95	243	222	Yes	1.00	95	258	235	Yes	1.00
8	5	194	225	No	0.00	5	200	242	No	0.00
	10	200	225	No	0.00	10	206	242	No	0.00
	15	204	225	No	0.00	15	211	242	No	0.00
	20	207	225	No	0.00	20	215	242	No	0.00
	25	210	225	No	0.00	25	218	242	No	0.00
	30	212	225	No	0.00	30	221	242	No	0.00
	35	214	225	No	0.00	35	224	242	No	0.00
	40	216	225	No	0.00	40	226	242	No	0.00
	45	218	225	No	0.01	45	229	242	No	0.00
	50	220	225	No	0.06	50	231	242	No	0.00
	55	222	225	No	0.17	55	234	242	No	0.00
	60	224	225	No	0.38	60	236	242	No	0.02
	65	226	225	Yes	0.62	65	239	242	No	0.15
	70	229	225	Yes	0.89	70	241	242	No	0.37
	75	231	225	Yes	0.97	75	244	242	Yes	0.75
	80	234	225	Yes	1.00	80	247	242	Yes	0.96
	85	237	225	Yes	1.00	85	251	242	Yes	1.00
	90	240	225	Yes	1.00	90	255	242	Yes	1.00
	95	246	225	Yes	1.00	95	263	242	Yes	1.00

TABLE 7. PROFICIENCY PROJECTION FOR PASSING SMARTER BALANCED ELA LEVEL 3 (MET) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING SMARTER BALANCED TESTS

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
3	5	162	202	No	0.00	5	171	202	No	0.00
	10	168	202	No	0.00	10	176	202	No	0.00
	15	172	202	No	0.01	15	180	202	No	0.00
	20	175	202	No	0.02	20	183	202	No	0.00
	25	178	202	No	0.04	25	185	202	No	0.01
	30	180	202	No	0.07	30	188	202	No	0.02
	35	182	202	No	0.12	35	190	202	No	0.05
	40	184	202	No	0.17	40	192	202	No	0.09
	45	186	202	No	0.24	45	194	202	No	0.16
	50	188	202	No	0.32	50	196	202	No	0.26
	55	190	202	No	0.41	55	198	202	No	0.38
	60	192	202	No	0.48	60	199	202	No	0.48
	65	194	202	Yes	0.60	65	201	202	Yes	0.65
	70	197	202	Yes	0.69	70	204	202	Yes	0.78
	75	199	202	Yes	0.78	75	206	202	Yes	0.88
	80	202	202	Yes	0.86	80	208	202	Yes	0.95
	85	205	202	Yes	0.93	85	211	202	Yes	0.98
	90	209	202	Yes	0.97	90	215	202	Yes	1.00
	95	215	202	Yes	1.00	95	221	202	Yes	1.00
4	5	173	209	No	0.00	5	179	209	No	0.00
	10	178	209	No	0.00	10	184	209	No	0.00
	15	182	209	No	0.01	15	188	209	No	0.00
	20	185	209	No	0.02	20	191	209	No	0.00
	25	188	209	No	0.04	25	194	209	No	0.01
	30	190	209	No	0.07	30	196	209	No	0.02
	35	192	209	No	0.11	35	198	209	No	0.05
	40	194	209	No	0.17	40	200	209	No	0.10
	45	196	209	No	0.24	45	202	209	No	0.17
	50	198	209	No	0.32	50	204	209	No	0.27
	55	200	209	No	0.42	55	205	209	No	0.40
	60	202	209	Yes	0.52	60	207	209	Yes	0.54
	65	204	209	Yes	0.62	65	209	209	Yes	0.68
	70	206	209	Yes	0.72	70	211	209	Yes	0.80
	75	209	209	Yes	0.81	75	214	209	Yes	0.89
	80	211	209	Yes	0.89	80	216	209	Yes	0.96
	85	214	209	Yes	0.95	85	219	209	Yes	0.99
	90	218	209	Yes	0.98	90	223	209	Yes	1.00

TABLE 7. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	Prob.
5	5	181	214	No	0.00	5	186	214	No	0.00
	10	186	214	No	0.00	10	191	214	No	0.00
	15	190	214	No	0.01	15	195	214	No	0.00
	20	193	214	No	0.03	20	197	214	No	0.00
	25	195	214	No	0.05	25	200	214	No	0.01
	30	198	214	No	0.09	30	202	214	No	0.03
	35	200	214	No	0.15	35	204	214	No	0.07
	40	202	214	No	0.21	40	206	214	No	0.13
	45	204	214	No	0.29	45	208	214	No	0.22
	50	206	214	No	0.37	50	210	214	No	0.33
	55	208	214	No	0.47	55	212	214	No	0.46
	60	210	214	Yes	0.56	60	214	214	Yes	0.60
	65	212	214	Yes	0.66	65	215	214	Yes	0.73
	70	214	214	Yes	0.75	70	218	214	Yes	0.84
	75	216	214	Yes	0.83	75	220	214	Yes	0.92
	80	218	214	Yes	0.90	80	222	214	Yes	0.97
	85	221	214	Yes	0.95	85	225	214	Yes	0.99
	90	225	214	Yes	0.98	90	229	214	Yes	1.00
	95	231	214	Yes	1.00	95	234	214	Yes	1.00
6	5	187	218	No	0.00	5	190	218	No	0.00
	10	192	218	No	0.00	10	196	218	No	0.00
	15	196	218	No	0.01	15	199	218	No	0.00
	20	198	218	No	0.03	20	202	218	No	0.00
	25	201	218	No	0.06	25	204	218	No	0.01
	30	203	218	No	0.10	30	207	218	No	0.03
	35	205	218	No	0.15	35	209	218	No	0.07
	40	207	218	No	0.21	40	211	218	No	0.13
	45	209	218	No	0.29	45	212	218	No	0.22
	50	211	218	No	0.37	50	214	218	No	0.33
	55	213	218	No	0.46	55	216	218	No	0.46
	60	215	218	Yes	0.56	60	218	218	Yes	0.59
	65	217	218	Yes	0.65	65	220	218	Yes	0.72
	70	219	218	Yes	0.74	70	222	218	Yes	0.83
	75	221	218	Yes	0.83	75	224	218	Yes	0.91
	80	224	218	Yes	0.89	80	226	218	Yes	0.96
	85	226	218	Yes	0.95	85	229	218	Yes	0.99
	90	230	218	Yes	0.98	90	233	218	Yes	1.00
	95	235	218	Yes	1.00	95	238	218	Yes	1.00

TABLE 7. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	Prob.
7	5	189	222	No	0.00	5	192	222	No	0.00
	10	195	222	No	0.00	10	198	222	No	0.00
	15	199	222	No	0.01	15	202	222	No	0.00
	20	202	222	No	0.01	20	204	222	No	0.00
	25	204	222	No	0.03	25	207	222	No	0.00
	30	206	222	No	0.06	30	209	222	No	0.01
	35	209	222	No	0.09	35	211	222	No	0.04
	40	211	222	No	0.15	40	213	222	No	0.07
	45	213	222	No	0.21	45	215	222	No	0.14
	50	214	222	No	0.29	50	217	222	No	0.23
	55	216	222	No	0.38	55	219	222	No	0.34
	60	218	222	No	0.48	60	221	222	Yes	0.51
	65	220	222	Yes	0.58	65	223	222	Yes	0.62
	70	222	222	Yes	0.68	70	225	222	Yes	0.76
	75	225	222	Yes	0.78	75	227	222	Yes	0.87
	80	227	222	Yes	0.86	80	230	222	Yes	0.94
	85	230	222	Yes	0.93	85	232	222	Yes	0.98
	90	234	222	Yes	0.97	90	236	222	Yes	1.00
	95	240	222	Yes	1.00	95	242	222	Yes	1.00
8	5	192	225	No	0.00	5	194	225	No	0.00
	10	197	225	No	0.00	10	199	225	No	0.00
	15	201	225	No	0.01	15	203	225	No	0.00
	20	204	225	No	0.02	20	206	225	No	0.00
	25	207	225	No	0.04	25	209	225	No	0.00
	30	209	225	No	0.06	30	211	225	No	0.01
	35	211	225	No	0.10	35	213	225	No	0.03
	40	213	225	No	0.14	40	215	225	No	0.06
	45	215	225	No	0.20	45	217	225	No	0.11
	50	217	225	No	0.27	50	219	225	No	0.18
	55	219	225	No	0.34	55	221	225	No	0.29
	60	221	225	No	0.43	60	223	225	No	0.41
	65	223	225	Yes	0.52	65	225	225	Yes	0.56
	70	225	225	Yes	0.61	70	227	225	Yes	0.70
	75	228	225	Yes	0.70	75	229	225	Yes	0.82
	80	230	225	Yes	0.80	80	232	225	Yes	0.92
	85	234	225	Yes	0.88	85	235	225	Yes	0.97
	90	237	225	Yes	0.94	90	239	225	Yes	0.99
	95	243	225	Yes	0.99	95	245	225	Yes	1.00

TABLE 8. PROFICIENCY PROJECTION FOR PASSING SMARTER BALANCED MATHEMATICS LEVEL 3 (MET) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING SMARTER BALANCED TESTS

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	Prob.
3	5	169	204	No	0.00	5	176	204	No	0.00
	10	174	204	No	0.01	10	181	204	No	0.00
	15	177	204	No	0.02	15	185	204	No	0.00
	20	179	204	No	0.04	20	187	204	No	0.01
	25	182	204	No	0.09	25	189	204	No	0.02
	30	184	204	No	0.15	30	191	204	No	0.05
	35	185	204	No	0.19	35	193	204	No	0.11
	40	187	204	No	0.28	40	195	204	No	0.21
	45	189	204	No	0.38	45	197	204	No	0.35
	50	190	204	No	0.44	50	198	204	No	0.43
	55	192	204	Yes	0.55	55	200	204	Yes	0.60
	60	194	204	Yes	0.67	60	202	204	Yes	0.75
	65	195	204	Yes	0.72	65	203	204	Yes	0.81
	70	197	204	Yes	0.81	70	205	204	Yes	0.90
	75	199	204	Yes	0.88	75	207	204	Yes	0.95
	80	201	204	Yes	0.93	80	209	204	Yes	0.98
	85	204	204	Yes	0.97	85	212	204	Yes	1.00
	90	207	204	Yes	0.99	90	215	204	Yes	1.00
	95	212	204	Yes	1.00	95	220	204	Yes	1.00
4	5	179	217	No	0.00	5	185	217	No	0.00
	10	184	217	No	0.00	10	190	217	No	0.00
	15	188	217	No	0.00	15	194	217	No	0.00
	20	190	217	No	0.01	20	197	217	No	0.00
	25	193	217	No	0.03	25	199	217	No	0.00
	30	195	217	No	0.05	30	201	217	No	0.01
	35	197	217	No	0.10	35	203	217	No	0.03
	40	198	217	No	0.12	40	205	217	No	0.06
	45	200	217	No	0.20	45	207	217	No	0.13
	50	202	217	No	0.30	50	209	217	No	0.25
	55	204	217	No	0.41	55	211	217	No	0.40
	60	205	217	No	0.47	60	212	217	Yes	0.48
	65	207	217	Yes	0.59	65	214	217	Yes	0.64
	70	209	217	Yes	0.70	70	216	217	Yes	0.79
	75	211	217	Yes	0.80	75	218	217	Yes	0.89
	80	214	217	Yes	0.90	80	221	217	Yes	0.97
	85	216	217	Yes	0.95	85	224	217	Yes	0.99
	90	220	217	Yes	0.99	90	227	217	Yes	1.00
	95	225	217	Yes	1.00	95	232	217	Yes	1.00

TABLE 8. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	Prob.
5	5	187	229	No	0.00	5	192	229	No	0.00
	10	193	229	No	0.00	10	198	229	No	0.00
	15	196	229	No	0.00	15	202	229	No	0.00
	20	199	229	No	0.00	20	204	229	No	0.00
	25	202	229	No	0.01	25	207	229	No	0.00
	30	204	229	No	0.01	30	209	229	No	0.00
	35	206	229	No	0.03	35	211	229	No	0.00
	40	208	229	No	0.05	40	213	229	No	0.01
	45	210	229	No	0.09	45	215	229	No	0.02
	50	211	229	No	0.12	50	217	229	No	0.05
	55	213	229	No	0.19	55	219	229	No	0.11
	60	215	229	No	0.27	60	221	229	No	0.21
	65	217	229	No	0.38	65	223	229	No	0.35
	70	219	229	No	0.49	70	225	229	Yes	0.52
	75	221	229	Yes	0.61	75	228	229	Yes	0.75
	80	224	229	Yes	0.77	80	230	229	Yes	0.86
	85	227	229	Yes	0.88	85	233	229	Yes	0.96
	90	230	229	Yes	0.95	90	237	229	Yes	0.99
	95	236	229	Yes	0.99	95	243	229	Yes	1.00
6	5	192	230	No	0.00	5	196	230	No	0.00
	10	198	230	No	0.00	10	202	230	No	0.00
	15	202	230	No	0.00	15	206	230	No	0.00
	20	205	230	No	0.01	20	209	230	No	0.00
	25	207	230	No	0.01	25	211	230	No	0.00
	30	209	230	No	0.03	30	214	230	No	0.00
	35	212	230	No	0.07	35	216	230	No	0.01
	40	214	230	No	0.11	40	218	230	No	0.03
	45	216	230	No	0.18	45	220	230	No	0.08
	50	218	230	No	0.26	50	222	230	No	0.16
	55	220	230	No	0.37	55	224	230	No	0.28
	60	222	230	No	0.48	60	226	230	No	0.44
	65	224	230	Yes	0.59	65	228	230	Yes	0.60
	70	226	230	Yes	0.70	70	230	230	Yes	0.75
	75	228	230	Yes	0.79	75	233	230	Yes	0.90
	80	231	230	Yes	0.90	80	236	230	Yes	0.97
	85	234	230	Yes	0.96	85	239	230	Yes	0.99
	90	238	230	Yes	0.99	90	243	230	Yes	1.00
	95	243	230	Yes	1.00	95	249	230	Yes	1.00

TABLE 8. (CONTINUED)

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut-Score	Level 3	Prob.			Cut-Score	Level 3	Prob.
7	5	196	235	No	0.00	5	198	235	No	0.00
	10	201	235	No	0.00	10	204	235	No	0.00
	15	206	235	No	0.00	15	209	235	No	0.00
	20	209	235	No	0.00	20	212	235	No	0.00
	25	211	235	No	0.00	25	215	235	No	0.00
	30	214	235	No	0.01	30	217	235	No	0.00
	35	216	235	No	0.02	35	220	235	No	0.00
	40	218	235	No	0.05	40	222	235	No	0.01
	45	221	235	No	0.11	45	224	235	No	0.04
	50	223	235	No	0.18	50	226	235	No	0.08
	55	225	235	No	0.27	55	228	235	No	0.17
	60	227	235	No	0.37	60	230	235	No	0.30
	65	229	235	No	0.49	65	233	235	Yes	0.54
	70	231	235	Yes	0.61	70	235	235	Yes	0.70
	75	234	235	Yes	0.77	75	238	235	Yes	0.88
	80	237	235	Yes	0.88	80	240	235	Yes	0.94
	85	240	235	Yes	0.95	85	244	235	Yes	0.99
	90	244	235	Yes	0.99	90	248	235	Yes	1.00
	95	250	235	Yes	1.00	95	255	235	Yes	1.00
8	5	197	242	No	0.00	5	199	242	No	0.00
	10	203	242	No	0.00	10	206	242	No	0.00
	15	208	242	No	0.00	15	210	242	No	0.00
	20	211	242	No	0.00	20	214	242	No	0.00
	25	214	242	No	0.00	25	217	242	No	0.00
	30	217	242	No	0.00	30	220	242	No	0.00
	35	219	242	No	0.01	35	222	242	No	0.00
	40	222	242	No	0.02	40	225	242	No	0.00
	45	224	242	No	0.04	45	227	242	No	0.00
	50	226	242	No	0.07	50	229	242	No	0.01
	55	229	242	No	0.14	55	231	242	No	0.03
	60	231	242	No	0.20	60	234	242	No	0.11
	65	233	242	No	0.28	65	236	242	No	0.20
	70	236	242	No	0.42	70	239	242	No	0.41
	75	238	242	Yes	0.52	75	242	242	Yes	0.64
	80	241	242	Yes	0.67	80	245	242	Yes	0.83
	85	245	242	Yes	0.83	85	248	242	Yes	0.94
	90	249	242	Yes	0.93	90	253	242	Yes	0.99
	95	256	242	Yes	0.99	95	260	242	Yes	1.00

Summary and Discussion

This study produced a set of cut scores on MAP Reading and MAP for Mathematics assessments for Grades 3 to 8 that correspond to each Smarter Balanced performance level. By using matched score data from a sample of students from three Smarter Balanced states, the study demonstrates that MAP scores can accurately predict whether a student could be proficient or above on the basis of his/her MAP scores. This study also used the 2015 NWEA norms study results to project a student's probability to meet proficiency based on that student's prior MAP scores in fall and winter. These results can help educators to predict student performance in Smarter Balanced tests as early as possible and to identify those students who are at risk of failing to meet required standards so that they can receive necessary resources and assistance to meet their goals.

While concordance tables can be helpful and informative, they have general limitations. First, the concordance tables provide information about score comparability on different tests, but the scores cannot be assumed to be interchangeable. In the case for Smarter Balanced and MAP tests, as they are not parallel in content, scores from these two tests should not be directly compared. Second, the sample data used in this study were collected from three states, which may limit the generalizability of the results to test takers who differ significantly from this sample. NWEA will continue to gather information about Smarter Balanced performance from other schools in other states to enhance the quality and generalizability of the study.

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Appendix

Data and Analysis

Data

Data used in this study were collected from 87 schools in California, 44 schools in Washington, and 7 schools in Maine. The sample contained matched Smarter Balanced Mathematics and MAP for Mathematics scores from 39,582 students in Grades 3 to 8 and matched Smarter Balanced ELA and MAP Reading scores from 39,530 students in Grades 3 to 8. The students completed both Smarter Balanced and MAP in the spring of 2015.

To understand the statistical characteristics of the test scores, descriptive statistics are provided in Tables A1 and A2 below. Scatterplots between MAP and Smarter Balanced scores are provided in Figures A1-A3. As Table A1 indicates, the overall correlation coefficients between MAP and Smarter Balanced test scores are 0.85 and 0.88 for reading/ELA and mathematics respectively. For each individual grade, as Table A2 indicates, the correlation coefficients between MAP reading and Smarter Balanced ELA scores range from 0.80 to 0.83, and the correlation coefficients between MAP and Smarter Balanced mathematics scores range from 0.85 to 0.89. All these correlations indicate a strong relationship between MAP and Smarter Balanced test scores.

TABLE A1. DESCRIPTIVE STATISTICS OF THE OVERALL SAMPLE DATA

			SMARTER BALANCED				MAP			
Subject	**N**	***r***	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
ELA	39,530	0.85	2484	100.88	2114	2769	209	17.71	139	262
Mathematics	39,582	0.88	2480	96.98	2189	2802	217	19.45	139	305

TABLE A2. DESCRIPTIVE STATISTICS OF THE SAMPLE DATA BY GRADE

				SMARTER BALANCED				MAP			
Subject	**Grade**	**N**	***r***	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
ELA	3	7,000	0.81	2403.04	83.88	2114	2623	195.47	16.16	141	237
	4	6,581	0.82	2448.16	89.10	2167	2663	203.55	15.70	144	252
	5	7,050	0.83	2486.67	90.44	2201	2701	209.83	15.56	149	250
	6	6,672	0.81	2503.29	87.20	2210	2724	212.57	15.59	139	256
	7	6,308	0.80	2531.21	90.92	2258	2745	217.22	15.23	140	262
	8	5,919	0.80	2546.67	88.30	2266	2769	220.46	15.38	146	259
Mathematics	3	6,993	0.86	2416.34	76.36	2189	2621	199.82	14.00	142	254
	4	6,665	0.88	2457.17	77.05	2204	2659	210.48	16.00	140	285
	5	7,116	0.88	2483.06	84.24	2219	2700	219.24	17.48	144	285
	6	7,042	0.89	2502.05	97.45	2235	2748	221.61	16.67	149	276
	7	6,141	0.87	2508.92	100.24	2250	2778	224.90	17.61	149	305
	8	5,625	0.85	2520.07	106.21	2265	2802	229.94	18.88	139	305

FIGURE A1. SCATTERPLOTS BETWEEN MAP AND SMARTER BALANCED SCORES FOR OVERALL SAMPLE

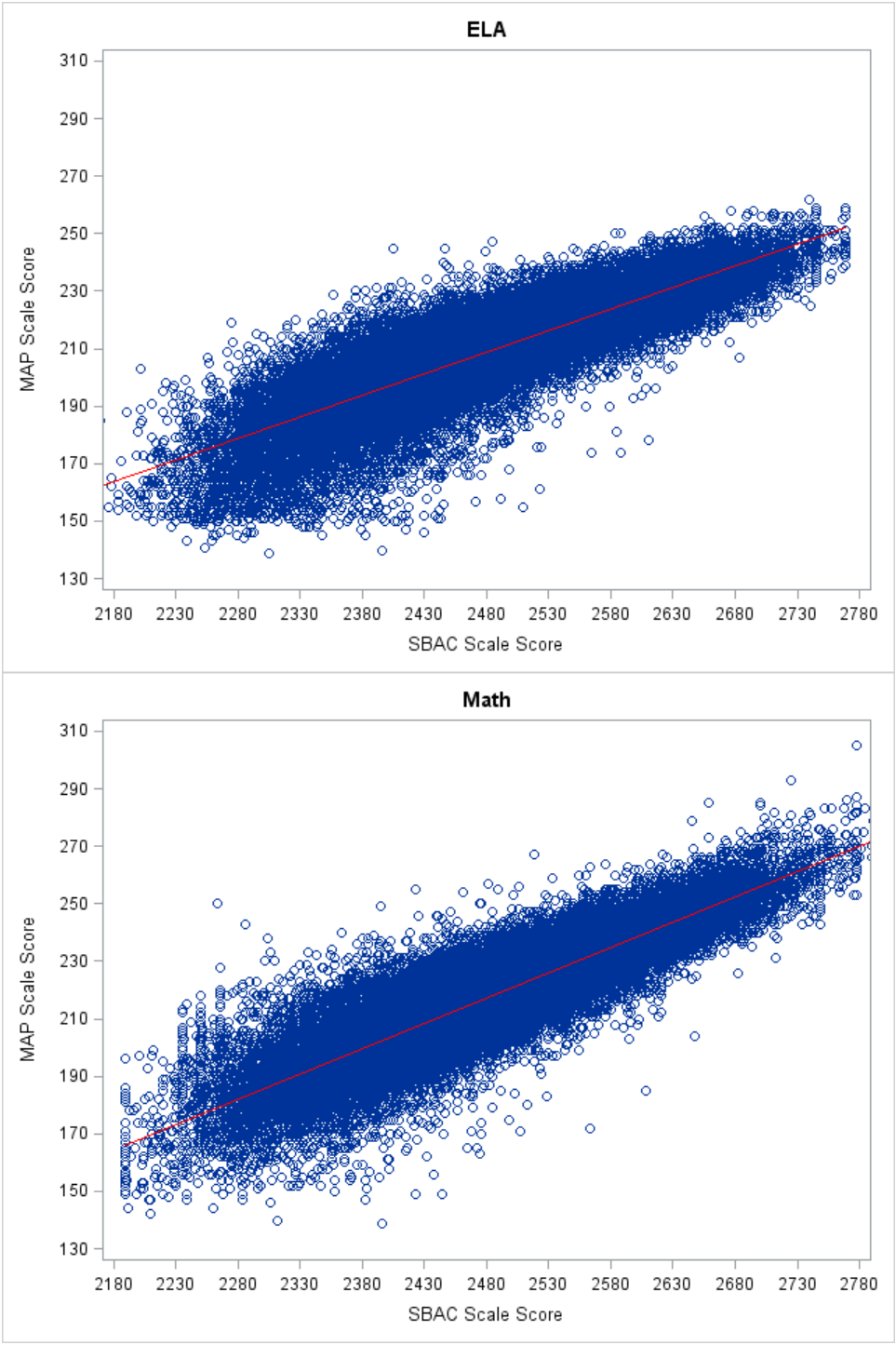
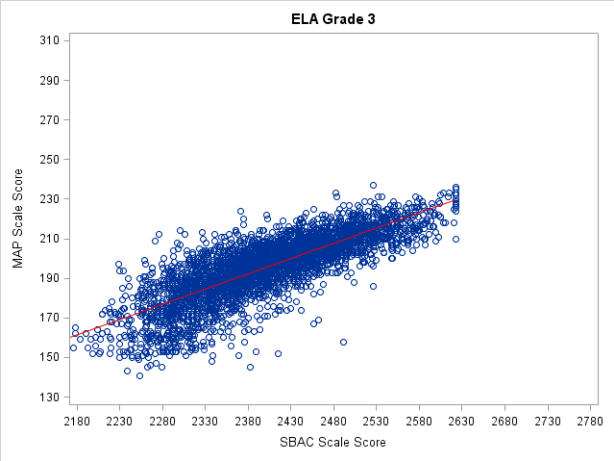
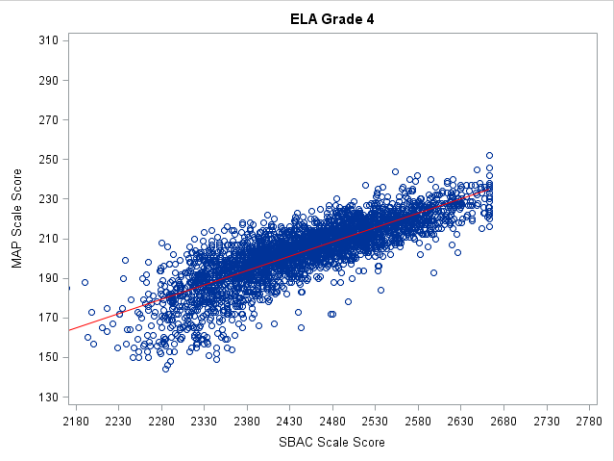
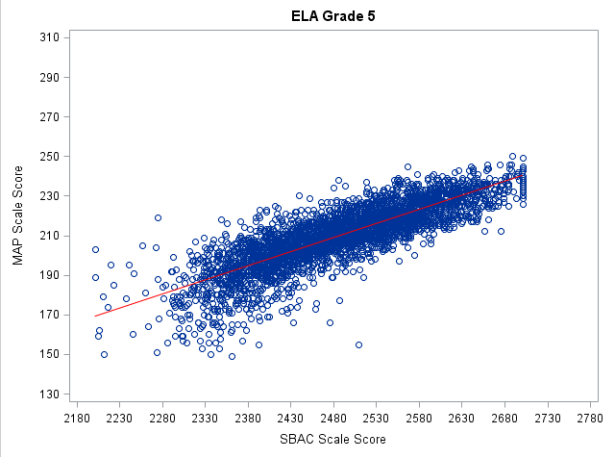
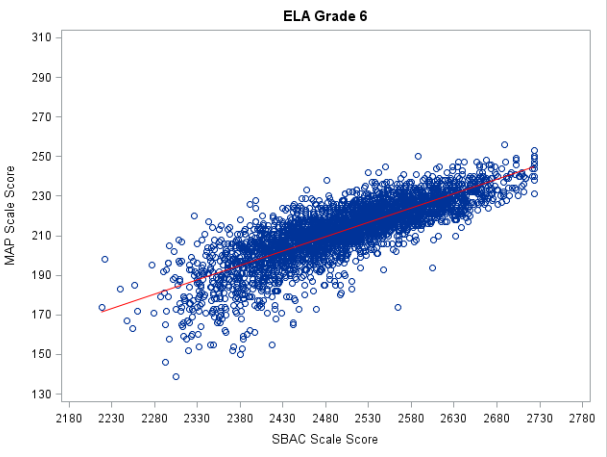


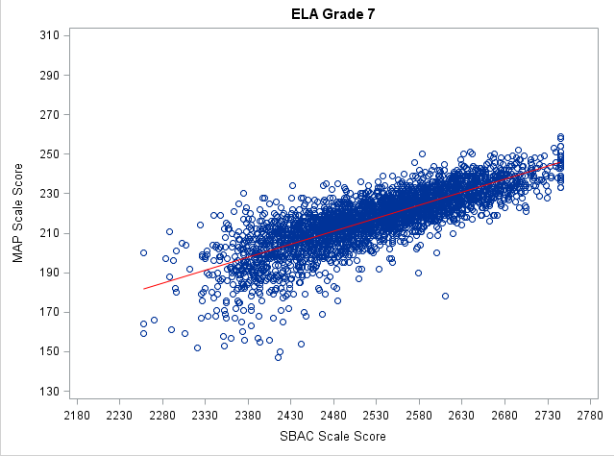
FIGURE A2. SCATTERPLOTS BETWEEN MAP READING AND SMART BALANCED ELA SCORES BY GRADE











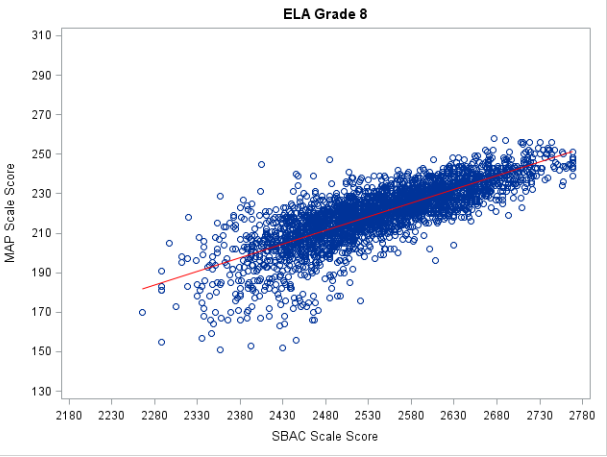
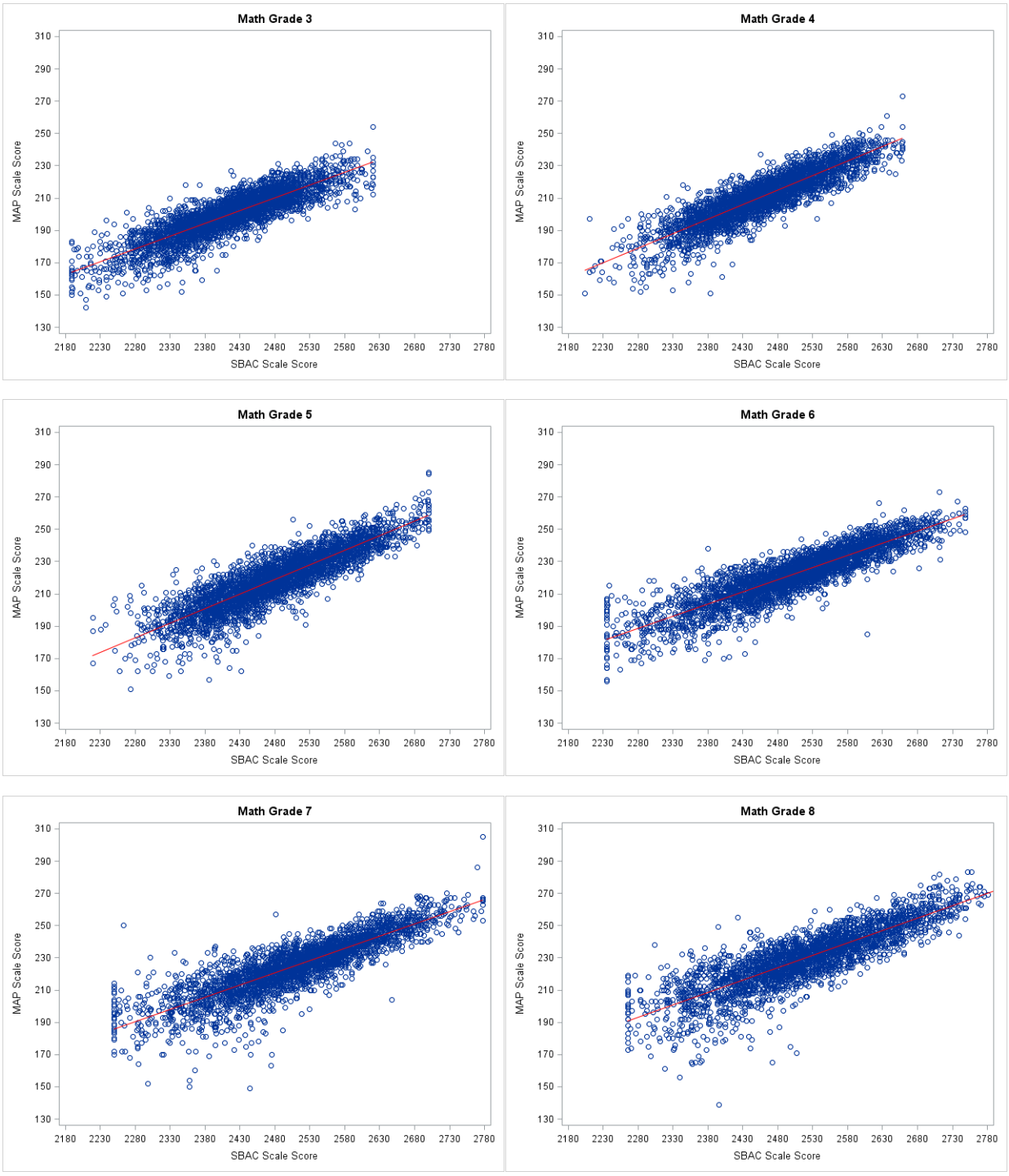


FIGURE A3. SCATTERPLOTS BETWEEN MAP AND SMARTER BALANCED MATHEMATICS SCORES BY GRADE



Equipercentile Linking

The equipercentile procedure (Kolen & Brennan, 2004) was used to establish the concordance relationship between Smarter Balanced and MAP scores for each grade and subject. This procedure uses the percentile ranks (i.e., the proportion of scores at or below each score) to define the relationship between the two scales.

To establish the concorded scores between Smarter Balanced (denoted as x) and MAP (denoted as y) scales, each score on Smarter Balanced was transformed through a cumulative-distribution-based linking function to the score on MAP that has the same percentile rank as the following in Equation (A1):

$$e_y(x) = G^{-1}[P(x)] \quad \text{(A1)}$$

where $e_y(x)$ is the equipercentile equivalent of scores on Smarter Balanced on the scale of MAP, $P(x)$ is the percentile rank function of Smarter Balanced scores which is derived from the cumulative distribution of Smarter Balanced scores and indicates the percentile of a given Smarter Balanced score, and G^{-1} is the inverse of the percentile rank function for MAP scores which indicates the MAP score for a given percentile. Polynomial loglinear pre-smoothing was applied to reduce irregularities of the frequency distributions as well as equipercentile linking curve.

Classification Accuracy

Classification accuracy, expressed in the form of a rate between 0 and 1, measures the extent to which MAP scores (and the estimated MAP cut scores) accurately predicted whether students in the sample achieved proficiency (i.e., Level 3 or higher) on the Smarter Balanced.

To calculate classification accuracy, sample students were designated "Observed Not Proficient" or "Observed Proficient" based on their Smarter Balanced scores. Similarly, they were also designated as "Predicated Not Proficient" or "Predicated Proficient" based on their MAP scores and the estimated MAP cut scores. A two-way contingency table was then tabulated as illustrated in Table A3, classifying students on the basis of their observed and predicted status. Students classified in the *true positive* (TP) category were those predicted to be Proficient based on the MAP cut scores and were also classified as Observed Proficient based on the Smarter Balanced cut scores. Students classified in the *true negative* (TN) category were those predicted to be Not Proficient based on the MAP cut scores and were also classified as Observed Not Proficient based on the Smarter Balanced cut scores. Students classified in the *false positive* (FP) category were those predicted to be Proficient based on the MAP cut scores but were classified as Observed Not Proficient based on the Smarter Balanced cut scores. Students classified in the *false negative* (FN) category were those predicated to be Not Proficient based on the MAP cut scores but were classified as Observed Proficient based on the Smarter Balanced cut scores. The overall classification accuracy was computed as the proportion of correct classifications among the entire sample by (TP+TN) / (TP+TN+FP+FN).

TABLE A3. PERFORMANCE CLASSIFICATION BASED ON SMARTER BALANCED AND MAP CUT SCORES

		MAP	
		Predicted Not Proficient	Predicted Proficient
SMARTER BALANCED	**Observed Not Proficient**	True Negative	False Positive
	Observed Proficient	False Negative	True Positive

Proficiency Projection

MAP conditional growth norms provide student's expected gain scores across testing seasons (Thum & Hauser, 2015). This information can be utilized to predict a student's performance on the Smarter Balanced based on that student's MAP scores in prior seasons (e.g. fall and winter). The probability of a student achieving Level 3 (Met) on Smarter Balanced, based on his/her fall MAP scores is given in Equation (2):

$$Pr(Achieveing\ Level\ 3\ in\ spring | a\ RIT\ score\ of\ x) = 1 - \Phi\left(\frac{x + g - c}{SD}\right) \qquad (2)$$

where, Φ is a standardized normal cumulative distribution, x is the student's RIT score in fall or winter, g is the expected growth from fall or winter to spring corresponding to x, c is the MAP cut-score for spring, and SD is the conditional standard deviation of growth from fall or winter to spring.

For the probability of a student achieving Level 3 on the Smarter Balanced tests, based on his/her spring score s, it can be calculated by Equation (3):

$$Pr(Achieveing\ Level\ 3\ in\ spring | a\ RIT\ score\ of\ s\ in\ spring) = 1 - \Phi\left(\frac{s - c}{SE}\right) \qquad (3)$$

where *SE* is standard error of measurement for MAP reading or mathematics test.

Founded by educators nearly 40 years ago, Northwest Evaluation Association (NWEA) is a global not-for-profit educational services organization known for our flagship interim assessment, Measures of Academic Progress (MAP). More than 7,800 partners in U.S. schools, school districts, education agencies, and international schools trust us to offer pre-kindergarten through grade 12 assessments that accurately measure student growth and learning needs, professional development that fosters educators' ability to accelerate student learning, and research that supports assessment validity and data interpretation. To better inform instruction and maximize every learner's academic growth, educators currently use NWEA assessments with nearly eight million students.