Linking the Kentucky K-PREP Assessments to NWEA MAP Tests

April 2016

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Northwest Evaluation Association

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Introduction

Northwest Evaluation Association™ (NWEA™) is committed to providing partners with useful tools to help make inferences from the Measures of Academic Progress® (MAP®) interim assessment scores. One important tool is the concordance table between MAP and state summative assessments. 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 the test is redesigned or changed. Concordance tables are helpful for educators, parents, administrators, researchers, and policy makers to evaluate and formulate academic standing and growth.

Recently, NWEA completed a concordance study to connect the scales of the Kentucky Performance Rating for Educational Progress (K-PREP) reading and math 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 K-PREP reading and math tests. Information about the consistency rate of classification based on the estimated MAP cut scores is also provided, along with a series of tables that predict the probability of receiving a Level 3 (i.e., "Proficient") or higher performance designation on the K-PREP assessments, based on the observed MAP scores taken during the same school year. A detailed description of the data and analysis method used in this study is provided in the Appendix.

Overview of Assessments

K-PREP includes a series of achievement tests aligned to the Common Core State Standards (CCSS) in reading, math, and writing and the Kentucky state standards in science and social studies. K-PREP tests are delivered in the paper-and-pencil form. For each grade and subject, there are three cut scores that distinguish between performance levels: Level 1: *Novice*, Level 2: *Apprentice*, Level 3: *Proficient*, and Level 4: *Distinguished*. The Level 3 cut score demarks the minimum level of performance considered to be "Proficient" for accountability purposes.

MAP are interim assessments that are administered in the form of a computerized adaptive test (CAT). MAP tests are constructed to measure student achievement from Grades K to 12 in math, reading, language usage, and science and aligned to the CCSS. Unlike K-PREP, MAP assessments are vertically scaled across grades, a feature that supports direct measurement of

academic growth and change. MAP scores are reported on a **R**asch Un**it** (RIT) scale with a range from 100 to 350. Each subject has its own RIT scale.

To aid interpretation of MAP scores, NWEA periodically conducts norming studies of student and school performance on MAP. For example, the 2015 RIT Scale norming study (Thum & Hauser, 2015) employed multi-level growth models on nearly 500,000 longitudinal test scores from over 100,000 students that were weighted to create large, nationally representative norms for math, reading, language usage, and general science.

Estimated MAP Cut Scores Associated with K-PREP Readiness Levels

Tables 1 to 4 report the K-PREP scaled scores associated with each of the four performance levels, as well as the estimated cut scores on the MAP tests associated with the K-PREP performance levels. Specifically, Tables 1 and 2 apply to MAP scores obtained during the spring testing season for reading and math, respectively. Tables 3 and 4 apply to MAP tests taken in a prior testing season (fall or winter) for reading and math, respectively. The tables also report the percentile rank (based on the *NWEA 2015 MAP Norms*) associated with each estimated MAP cut score. The MAP cut scores can be used to predict students' most probable K-PREP performance level, based on their observed MAP scores. For example, a 6th grade student who obtained a MAP math score of 235 in the spring testing season is likely to be at the very high end of Level 3 (Proficient) on the K-PREP taken during that same testing season (see Table 2). Similarly, a 3rd grade student who obtained a MAP reading score of 210 in the fall testing season is likely to be at Level 4 (Distinguished) on the K-PREP taken in the spring of 3rd grade (see Table 3).

TABLE 1. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN K-PREP AND MAP READING (WHEN MAP IS TAKEN IN SPRING)

Grade	K-PREP			
	Level 1 *Novice*	Level 2 *Apprentice*	Level 3 *Proficient*	Level 4 *Distinguished*
3	100-197	198-209	**210**-225	226-300
4	100-196	197-209	**210**-226	227-300
5	100-197	198-209	**210**-225	226-300
6	100-198	199-209	**210**-226	227-300
7	100-198	199-209	**210**-225	226-300
8	100-198	199-209	**210**-224	225-300

Grade	MAP							
	Level 1 *Novice*		Level 2 *Apprentice*		Level 3 *Proficient*		Level 4 *Distinguished*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-190	1-29	191-200	30-54	**201**-210	55-78	211-350	79-99
4	100-196	1-26	197-207	27-54	**208**-219	55-81	220-350	82-99
5	100-201	1-24	202-212	25-51	**213**-225	52-82	226-350	83-99
6	100-206	1-26	207-215	27-49	**216**-228	50-80	229-350	81-99
7	100-208	1-26	209-218	27-50	**219**-230	51-79	231-350	80-99
8	100-212	1-31	213-222	32-56	**223**-236	57-85	237-350	86-99

Notes. 1. %ile=percentile.

2. Bolded numbers indicate the cut scores considered to be at least "proficient" for accountability purposes.

TABLE 2. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN K-PREP AND MAP MATH (WHEN MAP IS TAKEN IN SPRING)

Grade	K-PREP							
	Level 1 Novice		Level 2 Apprentice		Level 3 Proficient		Level 4 Distinguished	
3	100-191		192-209		**210**-233		234-300	
4	100-193		194-209		**210**-228		229-300	
5	100-191		192-209		**210**-228		229-300	
6	100-190		191-209		**210**-230		231-300	
7	100-191		192-209		**210**-230		231-300	
8	100-191		192-209		**210**-231		232-300	

Grade	MAP							
	Level 1 Novice		Level 2 Apprentice		Level 3 Proficient		Level 4 Distinguished	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-191	1-19	192-204	20-53	**205**-217	54-84	218-350	85-99
4	100-198	1-15	199-212	16-47	**213**-225	48-78	226-350	79-99
5	100-202	1-12	203-220	13-47	**221**-235	48-80	236-350	81-99
6	100-205	1-11	206-223	12-45	**224**-238	46-78	239-350	79-99
7	100-212	1-18	213-230	19-54	**231**-245	55-83	246-350	84-99
8	100-214	1-19	215-234	20-57	**235**-252	58-87	253-350	88-99

Notes. 1. %ile=percentile.

2. Bolded numbers indicate the cut scores considered to be at least "proficient" for accountability purposes.

TABLE 3. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN K-PREP AND MAP READING (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING K-PREP TESTS)

	K-PREP			
Grade	Level 1 *Novice*	Level 2 *Apprentice*	Level 3 *Proficient*	Level 4 *Distinguished*
3	100-197	198-209	**210**-225	226-300
4	100-196	197-209	**210**-226	227-300
5	100-197	198-209	**210**-225	226-300
6	100-198	199-209	**210**-226	227-300
7	100-198	199-209	**210**-225	226-300
8	100-198	199-209	**210**-224	225-300

	MAP FALL							
Grade	Level 1 *Novice*		Level 2 *Apprentice*		Level 3 *Proficient*		Level 4 *Distinguished*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-178	1-26	179-190	27-55	**191**-202	56-81	203-350	82-99
4	100-187	1-24	188-199	25-53	**200**-213	54-83	214-350	84-99
5	100-193	1-21	194-206	22-52	**207**-221	53-85	222-350	86-99
6	100-200	1-24	201-210	25-48	**211**-225	49-83	226-350	84-99
7	100-203	1-23	204-214	24-50	**215**-228	51-82	229-350	83-99
8	100-208	1-28	209-220	29-58	**221**-234	59-86	235-350	87-99

	MAP WINTE**R**							
Grade	Level 1 *Novice*		Level 2 *Apprentice*		Level 3 *Proficient*		Level 4 *Distinguished*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-186	1-27	187-197	28-54	**198**-208	55-80	209-350	81-99
4	100-193	1-24	194-205	25-55	**206**-218	56-84	219-350	85-99
5	100-198	1-21	199-210	22-51	**211**-224	52-84	225-350	85-99
6	100-204	1-25	205-213	26-48	**214**-227	49-81	228-350	82-99
7	100-206	1-24	207-217	25-51	**218**-229	52-79	230-350	80-99
8	100-211	1-31	212-221	32-56	**222**-235	57-85	236-350	86-99

Notes. 1. %ile=percentile.
    2. Bolded numbers indicate the cut scores considered to be at least "proficient" for accountability purposes.

TABLE 4. CONCORDANCE OF PERFORMANCE LEVEL SCORE RANGES BETWEEN K-PREP AND MAP MATH (WHEN MAP IS TAKEN IN FALL OR WINTER PRIOR TO SPRING K-PREP TESTS)

	K-PREP			
Grade	Level 1 *Novice*	Level 2 *Apprentice*	Level 3 *Proficient*	Level 4 *Distinguished*
3	100-191	192-209	**210**-233	234-300
4	100-193	194-209	**210**-228	229-300
5	100-191	192-209	**210**-228	229-300
6	100-190	191-209	**210**-230	231-300
7	100-191	192-209	**210**-230	231-300
8	100-191	192-209	**210**-231	232-300

	MAP FALL							
Grade	Level 1 *Novice*		Level 2 *Apprentice*		Level 3 *Proficient*		Level 4 *Distinguished*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-177	1-16	178-191	17-53	**192**-205	54-87	206-350	88-99
4	100-186	1-13	187-200	14-45	**201**-214	46-81	215-350	82-99
5	100-192	1-9	193-210	10-47	**211**-225	48-83	226-350	84-99
6	100-197	1-9	198-215	10-44	**216**-231	45-81	232-350	82-99
7	100-206	1-16	207-224	17-54	**225**-239	55-84	240-350	85-99
8	100-209	1-17	210-229	18-57	**230**-248	58-89	249-350	90-99

	MAP WINTER							
Grade	Level 1 *Novice*		Level 2 *Apprentice*		Level 3 *Proficient*		Level 4 *Distinguished*	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
3	100-186	1-18	187-199	19-53	**200**-212	54-85	213-350	86-99
4	100-193	1-14	194-207	15-46	**208**-220	47-79	221-350	80-99
5	100-198	1-11	199-216	12-48	**217**-231	49-82	232-350	83-99
6	100-202	1-11	203-220	12-46	**221**-235	47-79	236-350	80-99
7	100-210	1-18	211-228	19-55	**229**-243	56-84	244-350	85-99
8	100-212	1-18	213-232	19-57	**233**-250	58-87	251-350	88-99

Notes. 1. %ile=percentile.

2. Bolded numbers indicate the cut scores considered to be at least "proficient" for accountability purposes.

Consistency Rate of Classification

Consistency rate of classification (Pommerich, Hanson, Harris, & Sconing, 2004), expressed in the form of a rate between 0 and 1, provides a means to measure the departure from equity for concordances (Hanson et al., 2001). This index can also be used as an indicator for the predictive validity of the MAP tests, i.e., how accurately the MAP scores can predict a student's proficiency status in the K-PREP test. For each pair of concordant scores, a classification is considered consistent if the examinee is classified into the same performance category regardless of the test used for making a decision. Consistency rate provided in this report can be calculated as, for the "proficient" performance category concordant scores, the percentage of examinees who score at or above both concordant scores plus the percentage of examinees who score below both concordant scores on each test. Higher consistency rate indicates stronger congruence between K-PREP and MAP scores. The results in Table 5 demonstrate that on average, MAP reading scores can consistently classify students' proficiency (Level 3 or higher) status on K-PREP reading test approximately 81% of the time and MAP math scores can consistently classify students on K-PREP math test approximately 84% of the time. Those numbers are high suggesting that both MAP reading and math tests are great predictors of the students' proficiency status on the K-PREP tests.

TABLE 5. CONSISTENCY RATE OF CLASSIFICATION FOR MAP AND K-PREP LEVEL 3 EQUIPERCENTILE CONCORDANCES

Grade	Reading			Math		
	Consistency Rate	False		Consistency Rate	False	
		Positives	Negatives		Positives	Negatives
3	0.82	0.09	0.09	0.82	0.08	0.10
4	0.80	0.11	0.09	0.83	0.10	0.07
5	0.80	0.10	0.10	0.84	0.08	0.08
6	0.81	0.10	0.09	0.84	0.08	0.08
7	0.81	0.09	0.10	0.85	0.07	0.08
8	0.80	0.10	0.10	0.84	0.08	0.08

Proficiency Projection

Proficiency projection tells how likely a student is classified as "proficient" on K-PREP tests based on his/her observed MAP scores. The conditional growth norms provided in the 2015 MAP Norms were used to calculate this information (Thum & Hauser, 2015). The results of proficiency

projection and corresponding probability of achieving "proficient" on the K-PREP tests are presented in Tables 6 to 8. These tables estimate the probability of scoring at Level 3 or above on K-PREP in the spring and the prior fall or winter testing season. For example, if a 3rd grade student obtained a MAP math score of 197 in the fall, the probability of obtaining a Level 3 or higher K-PREP score in the spring of 3rd grade is 78%. 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 taking the K-PREP tests.

TABLE 6. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING K-PREP LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE SPRING

Grade	Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
3	5	174	201	No	<0.01	5	181	205	No	<0.01
	10	179	201	No	<0.01	10	186	205	No	<0.01
	15	183	201	No	<0.01	15	189	205	No	<0.01
	20	186	201	No	<0.01	20	192	205	No	<0.01
	25	188	201	No	<0.01	25	194	205	No	<0.01
	30	191	201	No	<0.01	30	196	205	No	<0.01
	35	193	201	No	0.01	35	198	205	No	0.01
	40	195	201	No	0.03	40	200	205	No	0.04
	45	197	201	No	0.11	45	202	205	No	0.15
	50	199	201	No	0.27	50	203	205	No	0.25
	55	201	201	Yes	0.50	55	205	205	Yes	0.50
	60	202	201	Yes	0.62	60	207	205	Yes	0.75
	65	204	201	Yes	0.83	65	209	205	Yes	0.92
	70	207	201	Yes	0.97	70	211	205	Yes	0.98
	75	209	201	Yes	0.99	75	213	205	Yes	>0.99
	80	211	201	Yes	>0.99	80	215	205	Yes	>0.99
	85	214	201	Yes	>0.99	85	218	205	Yes	>0.99
	90	218	201	Yes	>0.99	90	221	205	Yes	>0.99
	95	223	201	Yes	>0.99	95	226	205	Yes	>0.99
4	5	181	208	No	<0.01	5	189	213	No	<0.01
	10	187	208	No	<0.01	10	194	213	No	<0.01
	15	190	208	No	<0.01	15	198	213	No	<0.01
	20	193	208	No	<0.01	20	201	213	No	<0.01
	25	196	208	No	<0.01	25	203	213	No	<0.01
	30	198	208	No	<0.01	30	206	213	No	0.01
	35	200	208	No	0.01	35	208	213	No	0.04
	40	202	208	No	0.03	40	210	213	No	0.15
	45	204	208	No	0.11	45	212	213	No	0.37
	50	206	208	No	0.27	50	213	213	Yes	0.50
	55	208	208	Yes	0.50	55	215	213	Yes	0.75
	60	210	208	Yes	0.73	60	217	213	Yes	0.92
	65	212	208	Yes	0.89	65	219	213	Yes	0.98
	70	214	208	Yes	0.97	70	221	213	Yes	>0.99
	75	216	208	Yes	0.99	75	224	213	Yes	>0.99
	80	218	208	Yes	>0.99	80	226	213	Yes	>0.99
	85	221	208	Yes	>0.99	85	229	213	Yes	>0.99
	90	225	208	Yes	>0.99	90	233	213	Yes	>0.99
	95	230	208	Yes	>0.99	95	238	213	Yes	>0.99

TABLE 6. (CONTINUED)

Grade	Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
5	5	188	213	No	<0.01	5	195	221	No	<0.01
	10	193	213	No	<0.01	10	201	221	No	<0.01
	15	197	213	No	<0.01	15	205	221	No	<0.01
	20	199	213	No	<0.01	20	208	221	No	<0.01
	25	202	213	No	<0.01	25	210	221	No	<0.01
	30	204	213	No	<0.01	30	213	221	No	<0.01
	35	206	213	No	0.01	35	215	221	No	0.02
	40	208	213	No	0.06	40	217	221	No	0.08
	45	210	213	No	0.17	45	219	221	No	0.25
	50	212	213	No	0.38	50	221	221	Yes	0.50
	55	214	213	Yes	0.62	55	223	221	Yes	0.75
	60	216	213	Yes	0.83	60	225	221	Yes	0.92
	65	217	213	Yes	0.89	65	228	221	Yes	0.99
	70	220	213	Yes	0.99	70	230	221	Yes	>0.99
	75	222	213	Yes	>0.99	75	232	221	Yes	>0.99
	80	224	213	Yes	>0.99	80	235	221	Yes	>0.99
	85	227	213	Yes	>0.99	85	238	221	Yes	>0.99
	90	231	213	Yes	>0.99	90	242	221	Yes	>0.99
	95	236	213	Yes	>0.99	95	248	221	Yes	>0.99
6	5	192	216	No	<0.01	5	198	224	No	<0.01
	10	197	216	No	<0.01	10	204	224	No	<0.01
	15	201	216	No	<0.01	15	208	224	No	<0.01
	20	203	216	No	<0.01	20	211	224	No	<0.01
	25	206	216	No	<0.01	25	214	224	No	<0.01
	30	208	216	No	0.01	30	217	224	No	0.01
	35	210	216	No	0.03	35	219	224	No	0.04
	40	212	216	No	0.11	40	221	224	No	0.15
	45	214	216	No	0.27	45	223	224	No	0.37
	50	216	216	Yes	0.50	50	225	224	Yes	0.63
	55	218	216	Yes	0.73	55	227	224	Yes	0.85
	60	219	216	Yes	0.83	60	230	224	Yes	0.98
	65	221	216	Yes	0.94	65	232	224	Yes	>0.99
	70	223	216	Yes	0.99	70	234	224	Yes	>0.99
	75	226	216	Yes	>0.99	75	237	224	Yes	>0.99
	80	228	216	Yes	>0.99	80	239	224	Yes	>0.99
	85	231	216	Yes	>0.99	85	243	224	Yes	>0.99
	90	235	216	Yes	>0.99	90	247	224	Yes	>0.99
	95	240	216	Yes	>0.99	95	253	224	Yes	>0.99

TABLE 6. (CONTINUED)

Grade	Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
7	5	193	219	No	<0.01	5	199	231	No	<0.01
	10	199	219	No	<0.01	10	206	231	No	<0.01
	15	202	219	No	<0.01	15	210	231	No	<0.01
	20	205	219	No	<0.01	20	214	231	No	<0.01
	25	208	219	No	<0.01	25	217	231	No	<0.01
	30	210	219	No	<0.01	30	219	231	No	<0.01
	35	212	219	No	0.01	35	222	231	No	<0.01
	40	214	219	No	0.06	40	224	231	No	0.01
	45	216	219	No	0.17	45	226	231	No	0.04
	50	218	219	No	0.38	50	229	231	No	0.25
	55	220	219	Yes	0.62	55	231	231	Yes	0.50
	60	222	219	Yes	0.83	60	233	231	Yes	0.75
	65	224	219	Yes	0.94	65	235	231	Yes	0.92
	70	226	219	Yes	0.99	70	238	231	Yes	0.99
	75	228	219	Yes	>0.99	75	241	231	Yes	>0.99
	80	231	219	Yes	>0.99	80	244	231	Yes	>0.99
	85	234	219	Yes	>0.99	85	247	231	Yes	>0.99
	90	238	219	Yes	>0.99	90	251	231	Yes	>0.99
	95	243	219	Yes	>0.99	95	258	231	Yes	>0.99
8	5	194	223	No	<0.01	5	199	235	No	<0.01
	10	200	223	No	<0.01	10	206	235	No	<0.01
	15	204	223	No	<0.01	15	211	235	No	<0.01
	20	207	223	No	<0.01	20	215	235	No	<0.01
	25	209	223	No	<0.01	25	218	235	No	<0.01
	30	212	223	No	<0.01	30	221	235	No	<0.01
	35	214	223	No	<0.01	35	224	235	No	<0.01
	40	216	223	No	0.01	40	226	235	No	<0.01
	45	218	223	No	0.06	45	229	235	No	0.02
	50	220	223	No	0.17	50	231	235	No	0.08
	55	222	223	No	0.38	55	233	235	No	0.25
	60	224	223	Yes	0.62	60	236	235	Yes	0.63
	65	226	223	Yes	0.83	65	238	235	Yes	0.85
	70	228	223	Yes	0.94	70	241	235	Yes	0.98
	75	231	223	Yes	0.99	75	244	235	Yes	>0.99
	80	233	223	Yes	>0.99	80	247	235	Yes	>0.99
	85	236	223	Yes	>0.99	85	251	235	Yes	>0.99
	90	240	223	Yes	>0.99	90	255	235	Yes	>0.99
	95	246	223	Yes	>0.99	95	262	235	Yes	>0.99

Note. %ile=percentile

ABLE 7. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING K-PREP READING LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING K-PREP 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	201	No	<0.01	5	171	201	No	<0.01
	10	168	201	No	<0.01	10	176	201	No	<0.01
	15	172	201	No	0.01	15	180	201	No	<0.01
	20	175	201	No	0.03	20	183	201	No	<0.01
	25	178	201	No	0.06	25	185	201	No	0.01
	30	180	201	No	0.10	30	188	201	No	0.04
	35	182	201	No	0.13	35	190	201	No	0.06
	40	184	201	No	0.20	40	192	201	No	0.13
	45	186	201	No	0.29	45	194	201	No	0.22
	50	188	201	No	0.34	50	196	201	No	0.35
	55	190	201	No	0.44	55	198	201	Yes	0.50
	60	192	201	Yes	0.56	60	199	201	Yes	0.58
	65	194	201	Yes	0.61	65	201	201	Yes	0.72
	70	197	201	Yes	0.76	70	204	201	Yes	0.87
	75	199	201	Yes	0.84	75	206	201	Yes	0.91
	80	202	201	Yes	0.90	80	208	201	Yes	0.96
	85	205	201	Yes	0.95	85	211	201	Yes	0.99
	90	209	201	Yes	0.98	90	215	201	Yes	>0.99
	95	214	201	Yes	>0.99	95	221	201	Yes	>0.99
4	5	173	208	No	<0.01	5	179	208	No	<0.01
	10	178	208	No	<0.01	10	184	208	No	<0.01
	15	182	208	No	0.01	15	188	208	No	<0.01
	20	185	208	No	0.03	20	191	208	No	<0.01
	25	188	208	No	0.05	25	194	208	No	0.02
	30	190	208	No	0.09	30	196	208	No	0.04
	35	192	208	No	0.15	35	198	208	No	0.08
	40	194	208	No	0.18	40	200	208	No	0.16
	45	196	208	No	0.27	45	202	208	No	0.22
	50	198	208	No	0.38	50	204	208	No	0.35
	55	200	208	No	0.44	55	205	208	No	0.42
	60	202	208	Yes	0.56	60	207	208	Yes	0.58
	65	204	208	Yes	0.67	65	209	208	Yes	0.72
	70	206	208	Yes	0.77	70	211	208	Yes	0.84
	75	209	208	Yes	0.85	75	214	208	Yes	0.94
	80	211	208	Yes	0.91	80	216	208	Yes	0.98
	85	214	208	Yes	0.95	85	219	208	Yes	0.99
	90	218	208	Yes	0.99	90	223	208	Yes	>0.99
	95	224	208	Yes	>0.99	95	228	208	Yes	>0.99

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	213	No	<0.01	5	186	213	No	<0.01
	10	186	213	No	<0.01	10	191	213	No	<0.01
	15	190	213	No	0.01	15	195	213	No	<0.01
	20	193	213	No	0.04	20	197	213	No	0.01
	25	195	213	No	0.07	25	200	213	No	0.03
	30	198	213	No	0.12	30	202	213	No	0.04
	35	200	213	No	0.19	35	204	213	No	0.09
	40	202	213	No	0.28	40	206	213	No	0.17
	45	204	213	No	0.33	45	208	213	No	0.28
	50	206	213	No	0.44	50	210	213	No	0.42
	55	208	213	Yes	0.56	55	212	213	Yes	0.58
	60	210	213	Yes	0.67	60	214	213	Yes	0.72
	65	212	213	Yes	0.72	65	215	213	Yes	0.78
	70	214	213	Yes	0.81	70	218	213	Yes	0.91
	75	216	213	Yes	0.88	75	220	213	Yes	0.94
	80	218	213	Yes	0.91	80	222	213	Yes	0.97
	85	221	213	Yes	0.96	85	225	213	Yes	0.99
	90	225	213	Yes	0.99	90	229	213	Yes	>0.99
	95	231	213	Yes	>0.99	95	234	213	Yes	>0.99
6	5	186	216	No	<0.01	5	190	216	No	<0.01
	10	192	216	No	0.01	10	196	216	No	<0.01
	15	196	216	No	0.03	15	199	216	No	<0.01
	20	198	216	No	0.04	20	202	216	No	0.01
	25	201	216	No	0.10	25	204	216	No	0.03
	30	203	216	No	0.16	30	207	216	No	0.09
	35	205	216	No	0.23	35	209	216	No	0.17
	40	207	216	No	0.28	40	211	216	No	0.28
	45	209	216	No	0.39	45	212	216	No	0.35
	50	211	216	Yes	0.50	50	214	216	Yes	0.50
	55	213	216	Yes	0.61	55	216	216	Yes	0.58
	60	215	216	Yes	0.67	60	218	216	Yes	0.72
	65	217	216	Yes	0.77	65	220	216	Yes	0.83
	70	219	216	Yes	0.84	70	222	216	Yes	0.91
	75	221	216	Yes	0.88	75	224	216	Yes	0.96
	80	224	216	Yes	0.94	80	226	216	Yes	0.98
	85	226	216	Yes	0.97	85	229	216	Yes	>0.99
	90	230	216	Yes	0.99	90	233	216	Yes	>0.99
	95	236	216	Yes	>0.99	95	238	216	Yes	>0.99

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	219	No	<0.01	5	192	219	No	<0.01
	10	195	219	No	<0.01	10	198	219	No	<0.01
	15	199	219	No	0.02	15	201	219	No	<0.01
	20	202	219	No	0.04	20	204	219	No	0.01
	25	204	219	No	0.07	25	207	219	No	0.03
	30	206	219	No	0.12	30	209	219	No	0.06
	35	209	219	No	0.19	35	211	219	No	0.12
	40	211	219	No	0.28	40	213	219	No	0.17
	45	213	219	No	0.39	45	215	219	No	0.28
	50	214	219	No	0.44	50	217	219	No	0.42
	55	216	219	Yes	0.50	55	219	219	Yes	0.58
	60	218	219	Yes	0.61	60	221	219	Yes	0.72
	65	220	219	Yes	0.72	65	223	219	Yes	0.83
	70	222	219	Yes	0.81	70	225	219	Yes	0.91
	75	225	219	Yes	0.88	75	227	219	Yes	0.96
	80	227	219	Yes	0.93	80	230	219	Yes	0.99
	85	230	219	Yes	0.97	85	232	219	Yes	0.99
	90	234	219	Yes	0.99	90	236	219	Yes	>0.99
	95	240	219	Yes	>0.99	95	242	219	Yes	>0.99
8	5	191	223	No	<0.01	5	194	223	No	<0.01
	10	197	223	No	0.01	10	199	223	No	<0.01
	15	201	223	No	0.02	15	203	223	No	<0.01
	20	204	223	No	0.04	20	206	223	No	<0.01
	25	207	223	No	0.06	25	209	223	No	0.01
	30	209	223	No	0.10	30	211	223	No	0.02
	35	211	223	No	0.16	35	213	223	No	0.05
	40	213	223	No	0.19	40	215	223	No	0.10
	45	215	223	No	0.26	45	217	223	No	0.18
	50	217	223	No	0.35	50	219	223	No	0.29
	55	219	223	No	0.45	55	221	223	No	0.43
	60	221	223	Yes	0.50	60	223	223	Yes	0.57
	65	223	223	Yes	0.60	65	225	223	Yes	0.71
	70	225	223	Yes	0.69	70	227	223	Yes	0.82
	75	228	223	Yes	0.78	75	229	223	Yes	0.90
	80	230	223	Yes	0.84	80	232	223	Yes	0.95
	85	234	223	Yes	0.94	85	235	223	Yes	0.99
	90	237	223	Yes	0.96	90	239	223	Yes	>0.99
	95	243	223	Yes	0.99	95	244	223	Yes	>0.99

Note. %ile=percentile

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	205	No	<0.01	5	176	205	No	<0.01
	10	174	205	No	<0.01	10	181	205	No	<0.01
	15	177	205	No	0.01	15	184	205	No	<0.01
	20	179	205	No	0.03	20	187	205	No	<0.01
	25	182	205	No	0.08	25	189	205	No	0.01
	30	184	205	No	0.11	30	191	205	No	0.03
	35	185	205	No	0.14	35	193	205	No	0.07
	40	187	205	No	0.22	40	195	205	No	0.14
	45	189	205	No	0.32	45	197	205	No	0.26
	50	190	205	No	0.38	50	198	205	No	0.34
	55	192	205	Yes	0.50	55	200	205	Yes	0.50
	60	194	205	Yes	0.62	60	202	205	Yes	0.66
	65	195	205	Yes	0.68	65	203	205	Yes	0.74
	70	197	205	Yes	0.78	70	205	205	Yes	0.86
	75	199	205	Yes	0.83	75	207	205	Yes	0.93
	80	201	205	Yes	0.89	80	209	205	Yes	0.97
	85	204	205	Yes	0.96	85	212	205	Yes	0.99
	90	207	205	Yes	0.99	90	215	205	Yes	>0.99
	95	212	205	Yes	>0.99	95	220	205	Yes	>0.99
4	5	179	213	No	<0.01	5	185	213	No	<0.01
	10	184	213	No	<0.01	10	190	213	No	<0.01
	15	188	213	No	0.02	15	194	213	No	<0.01
	20	190	213	No	0.04	20	197	213	No	0.01
	25	193	213	No	0.11	25	199	213	No	0.03
	30	195	213	No	0.17	30	201	213	No	0.07
	35	197	213	No	0.27	35	203	213	No	0.14
	40	198	213	No	0.32	40	205	213	No	0.26
	45	200	213	No	0.44	45	207	213	No	0.42
	50	202	213	Yes	0.56	50	209	213	Yes	0.58
	55	204	213	Yes	0.68	55	211	213	Yes	0.74
	60	205	213	Yes	0.68	60	212	213	Yes	0.80
	65	207	213	Yes	0.78	65	214	213	Yes	0.90
	70	209	213	Yes	0.86	70	216	213	Yes	0.95
	75	211	213	Yes	0.92	75	218	213	Yes	0.98
	80	214	213	Yes	0.97	80	221	213	Yes	>0.99
	85	216	213	Yes	0.99	85	223	213	Yes	>0.99
	90	220	213	Yes	>0.99	90	227	213	Yes	>0.99
	95	225	213	Yes	>0.99	95	232	213	Yes	>0.99

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	221	No	<0.01	5	192	221	No	<0.01
	10	193	221	No	<0.01	10	198	221	No	<0.01
	15	196	221	No	0.01	15	201	221	No	<0.01
	20	199	221	No	0.04	20	204	221	No	<0.01
	25	202	221	No	0.09	25	207	221	No	0.02
	30	204	221	No	0.15	30	209	221	No	0.05
	35	206	221	No	0.23	35	211	221	No	0.11
	40	208	221	No	0.33	40	213	221	No	0.20
	45	210	221	No	0.44	45	215	221	No	0.34
	50	211	221	Yes	0.50	50	217	221	Yes	0.50
	55	213	221	Yes	0.62	55	219	221	Yes	0.66
	60	215	221	Yes	0.72	60	221	221	Yes	0.80
	65	217	221	Yes	0.81	65	223	221	Yes	0.89
	70	219	221	Yes	0.88	70	225	221	Yes	0.95
	75	221	221	Yes	0.93	75	228	221	Yes	0.99
	80	224	221	Yes	0.97	80	230	221	Yes	>0.99
	85	227	221	Yes	0.99	85	233	221	Yes	>0.99
	90	230	221	Yes	>0.99	90	237	221	Yes	>0.99
	95	236	221	Yes	>0.99	95	242	221	Yes	>0.99
6	5	192	224	No	<0.01	5	196	224	No	<0.01
	10	198	224	No	<0.01	10	202	224	No	<0.01
	15	202	224	No	0.02	15	205	224	No	<0.01
	20	205	224	No	0.05	20	209	224	No	0.01
	25	207	224	No	0.09	25	211	224	No	0.02
	30	209	224	No	0.15	30	214	224	No	0.07
	35	212	224	No	0.28	35	216	224	No	0.15
	40	214	224	No	0.38	40	218	224	No	0.27
	45	216	224	Yes	0.50	45	220	224	No	0.42
	50	218	224	Yes	0.62	50	222	224	Yes	0.58
	55	220	224	Yes	0.72	55	224	224	Yes	0.73
	60	222	224	Yes	0.81	60	226	224	Yes	0.85
	65	224	224	Yes	0.88	65	228	224	Yes	0.93
	70	226	224	Yes	0.93	70	230	224	Yes	0.97
	75	228	224	Yes	0.96	75	233	224	Yes	0.99
	80	231	224	Yes	0.99	80	236	224	Yes	>0.99
	85	234	224	Yes	0.99	85	239	224	Yes	>0.99
	90	238	224	Yes	>0.99	90	243	224	Yes	>0.99
	95	243	224	Yes	>0.99	95	248	224	Yes	>0.99

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	195	231	No	<0.01	5	198	231	No	<0.01
	10	201	231	No	<0.01	10	204	231	No	<0.01
	15	205	231	No	<0.01	15	208	231	No	<0.01
	20	209	231	No	0.01	20	212	231	No	<0.01
	25	211	231	No	0.02	25	215	231	No	<0.01
	30	214	231	No	0.05	30	217	231	No	0.01
	35	216	231	No	0.08	35	220	231	No	0.03
	40	218	231	No	0.14	40	222	231	No	0.07
	45	221	231	No	0.27	45	224	231	No	0.15
	50	223	231	No	0.38	50	226	231	No	0.26
	55	225	231	Yes	0.50	55	228	231	No	0.42
	60	227	231	Yes	0.62	60	230	231	Yes	0.58
	65	229	231	Yes	0.73	65	233	231	Yes	0.80
	70	231	231	Yes	0.82	70	235	231	Yes	0.90
	75	234	231	Yes	0.92	75	238	231	Yes	0.97
	80	237	231	Yes	0.97	80	240	231	Yes	0.99
	85	240	231	Yes	0.99	85	244	231	Yes	>0.99
	90	244	231	Yes	>0.99	90	248	231	Yes	>0.99
	95	250	231	Yes	>0.99	95	254	231	Yes	>0.99
8	5	197	235	No	<0.01	5	199	235	No	<0.01
	10	203	235	No	<0.01	10	206	235	No	<0.01
	15	208	235	No	<0.01	15	210	235	No	<0.01
	20	211	235	No	0.01	20	214	235	No	<0.01
	25	214	235	No	0.02	25	217	235	No	<0.01
	30	217	235	No	0.04	30	220	235	No	<0.01
	35	219	235	No	0.08	35	222	235	No	0.01
	40	222	235	No	0.15	40	225	235	No	0.06
	45	224	235	No	0.22	45	227	235	No	0.12
	50	226	235	No	0.30	50	229	235	No	0.21
	55	229	235	No	0.45	55	231	235	No	0.35
	60	231	235	Yes	0.55	60	234	235	Yes	0.58
	65	233	235	Yes	0.65	65	236	235	Yes	0.72
	70	236	235	Yes	0.74	70	239	235	Yes	0.88
	75	238	235	Yes	0.82	75	241	235	Yes	0.94
	80	241	235	Yes	0.90	80	245	235	Yes	0.99
	85	245	235	Yes	0.97	85	248	235	Yes	>0.99
	90	249	235	Yes	0.99	90	253	235	Yes	>0.99
	95	256	235	Yes	>0.99	95	259	235	Yes	>0.99

Note. %ile=percentile

Summary and Discussion

This study produced a set of cut scores on MAP reading and math tests for Grades 3 to 8 that correspond to each K-PREP performance level. By using matched score data from a sample of students from Kentucky, 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 norming 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 will help educators predict student performance in K-PREP tests as early as possible and 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 K-PREP 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 27 school districts in Kentucky, which may limit the generalizability of the results to test takers who differ significantly from this sample. Finally, cautions should also be exercised if the concorded scores are used for a subpopulation. NWEA will continue to gather information about K-PREP performance from other school districts to enhance the quality and generalizability of the study.

References

Hanson, B. A., Harris, D. J., Pommerich, M., Sconing, J. A., & Yi, Q. (2001). *Suggestions for the evaluation and use of concordance results*. (ACT Research Report No. 2001-1). Iowa City, IA: ACT, Inc.

Kolen, M. J., & Brennan, R. L. (2004). *Test equating, scaling, and linking*. New York: Springer.

Pommerich, M., Hanson, B., Harris, D., & Sconing, J. (2004). Issues in conducting linkage between distinct tests. *Applied Psychological Measurement*, *28*(4), 247-273.

Thum Y. M., & Hauser, C. H. (2015). *NWEA 2015 MAP Norms for Student and School Achievement Status and Growth*. NWEA Research Report. Portland, OR: NWEA.

Appendix

Data and Analysis

Data

Data used in this study were collected from 27 school districts in Kentucky. The sample contained matched K-PREP and MAP reading scores from 60,558 students in Grades 3 to 8 and matched K-PREP and MAP math scores from 60,575 students in Grades 3 to 8 who completed both K-PREP and MAP in the spring of 2015.

To understand the statistical characteristics of the test scores, descriptive statistics are provided in Table A1. As Table A1 indicates, the correlation coefficients between MAP and K-PREP reading scores range from 0.72 to 0.74, and the correlation coefficients between MAP and K-PREP reading scores range from 0.78 to 0.81. All these correlations indicate a strong relationship between MAP and K-PREP test scores.

TABLE A1. DESCRIPTIVE STATISTICS OF THE SAMPLE DATA

Subject	Grade	N	r	K-PREP				MAP			
				Mean	SD	Min	Max	Mean	SD	Min	Max
Reading	3	9,619	0.73	211	18.72	100	287	200	14.53	140	250
	4	10,165	0.72	211	16.70	100	297	208	13.94	140	247
	5	10,013	0.70	211	15.13	100	262	214	13.84	145	254
	6	10,440	0.74	211	15.69	108	274	216	13.88	147	258
	7	10,283	0.74	212	15.07	100	300	220	13.69	146	259
	8	10,038	0.74	211	13.71	100	258	224	13.46	152	269
Math	3	9,635	0.78	210	20.13	100	300	204	12.49	141	255
	4	10,164	0.80	210	17.73	156	300	212	13.31	142	268
	5	10,011	0.81	211	17.64	100	300	221	15.36	136	275
	6	10,449	0.80	209	17.87	109	300	222	14.46	149	274
	7	10,312	0.81	208	17.58	100	300	228	15.40	151	279
	8	10,004	0.80	209	16.31	100	300	233	15.75	143	296

Equipercentile Linking Procedure

The equipercentile procedure (e.g., Kolen & Brennan, 2004) was used to establish the concordance relationship between K-PREP and MAP scores for grades 3 to 8 in reading and math. This procedure matches scores on the two scales that have the same percentile rank (i.e., the proportion of scores at or below each score).

Suppose we need to establish the concorded scores between two tests. x is a score on Test X (e.g., K-PREP). Its equipercentile equivalent score on Test Y (e.g., MAP), $e_y(x)$, can be obtained through a cumulative-distribution-based linking function defined in Equation (A1):

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

where $e_y(x)$ is the equipercentile equivalent of scores on K-PREP on the scale of MAP, $P(x)$ is the percentile rank of a given score on Test X. G^{-1} is the inverse of the percentile rank function for scores on Test Y which indicates the scores on Test Y corresponding to a given percentile. Polynomial loglinear pre-smoothing was applied to reduce irregularities of the frequency distributions as well as equipercentile linking curve.

Consistency rate of Classification

Consistency rate of 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 would be proficient (i.e., Level 3 or higher) on K-PREP tests.

To calculate consistency rate of classification, sample students were designated "Below K-PREP cut" or "At or above K-PREP cut" based on their actual K-PREP scores. Similarly, they were also designated as "Below MAP cut" or "At or above MAP cut" based on their actual MAP scores. A 2-way contingency table was then tabulated (see Table A2), classifying students as "Proficient" on the basis of K-PREP cut score and concordant MAP cut score. 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 Proficient based on the K-PREP 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 Not Proficient based on the K-PREP 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 Not Proficient based on the K-PREP 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 Proficient based on the K-PREP cut scores. The overall consistency rate of classification was computed as the proportion of correct classifications among the entire sample by (TP+TN) / (TP+TN+FP+FN).

TABLE A2. DEFINITION OF CONSISTENCY RATE FOR K-PREP TO MAP CONCORDANCE

		K-PREP Score	
		Below K-PREP cut	At or Above K-PREP cut
MAP Score	Below MAP cut	True Negative	False Positive
	At or Above MAP cut	False Negative	True Positive

Note. Shaded cells are summed to compute the consistency rate.

Proficiency Projection

MAP conditional growth norms provide student's expected gain scores across testing seasons (Thum & Hauser, 2015). This information is utilized to predict a student's performance on the K-PREP based on that student's MAP scores in prior seasons (e.g. fall and winter). The probability of a student achieving Level 3 (Proficient) on K-PREP, based on his/her fall or winter MAP score is given in Equation (A2):

$$Pr(Achieveing\ Level\ II\ in\ spring|a\ RIT\ score\ of\ x) = 1 - \Phi\left(\frac{x + g - c}{SD}\right) \qquad (A2)$$

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 K-PREP tests, based on his/her spring score s, it can be calculated by Equation (A3):

$$Pr(Achieveing\ Level\ II\ in\ spring|a\ RIT\ score\ of\ s\ in\ spring) = 1 - \Phi\left(\frac{s - c}{SE}\right) \qquad (A3)$$

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