

Linking the Michigan M-STEP Assessments to NWEA MAP Tests

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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 Michigan Student Test of Educational Progress (M-STEP) English language arts (ELA) and math with those of the MAP Reading and MAP for Mathematics assessments. In this report, we present the 2nd through 8th grade cut scores on MAP reading and mathematics scales that correspond to the benchmarks on the M-STEP ELA 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 M-STEP 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

M-STEP includes a series of achievement tests aligned to the Michigan Core Standards in ELA and math for grades 3-8; science for grades 4, 7, and 11; and social studies for grades 5, 8, and 11. M-STEP tests are delivered both online and in the paper-and-pencil form. For each grade and subject, there are three cut scores that distinguish between performance levels: Level 1: *Not Proficient*, Level 2: *Partially Proficient*, Level 3: *Proficient*, and Level 4: *Advanced*. The Level 3 cut score demarks the minimum level of performance considered to be “Proficient” for accountability purposes.

MAP tests are interim assessments that are administered in the form of 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 Common Core State

Standards (CCSS). MAP assessments are vertically scaled across grades, a feature that supports direct measurement of academic growth and change. MAP scores are reported on a **Rasch Unit** (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 M-STEP Readiness Levels

Tables 1 to 4 report the M-STEP scaled scores associated with each of the four performance levels, as well as the estimated cut scores on the MAP tests associated with the M-STEP 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 M-STEP performance level, based on their observed MAP scores. For example, a 5th grade student who obtained a MAP math score of 230 in the spring testing season is likely to be at the very high end of Level 3 (Proficient) on the M-STEP 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 (Advanced) on the M-STEP taken in the spring of 3rd grade (see Table 3).

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

		M-STEP							
Grade	Level 1		Level 2		Level 3		Level 4		
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>		
3	1203-1279		1280-1299		1300-1316		1317-1357		
4	1301-1382		1383-1399		1400-1416		1417-1454		
5	1409-1480		1481-1499		1500-1523		1524-1560		
6	1508-1577		1578-1599		1600-1623		1624-1655		
7	1618-1678		1679-1699		1700-1725		1726-1753		
8	1721-1776		1777-1799		1800-1827		1828-1857		

		MAP							
Grade	Level 1		Level 2		Level 3		Level 4		
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>		
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	
2	100-180	1-29	181-191	30-57	192-200	58-78	201-350	79-99	
3	100-190	1-29	191-201	30-57	202-210	58-78	211-350	79-99	
4	100-199	1-33	200-208	34-56	209-216	57-76	217-350	77-99	
5	100-201	1-24	202-212	25-51	213-224	52-80	225-350	81-99	
6	100-207	1-28	208-219	29-60	220-229	61-82	230-350	83-99	
7	100-210	1-30	211-221	31-58	222-233	59-84	234-350	85-99	
8	100-212	1-31	213-224	32-61	225-236	62-85	237-350	86-99	

Notes. 1. %ile=percentile.

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

3. High-lighted text denotes Grade 2 benchmarks are extrapolated from Grade 3 cut scores.

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

		M-STEP						
Grade	Level 1		Level 2		Level 3		Level 4	
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>	
3	1217-1280		1281-1299		1300-1320		1321-1361	
4	1310-1375		1376-1399		1400-1419		1420-1455	
5	1409-1477		1478-1499		1500-1514		1515-1550	
6	1518-1578		1579-1599		1600-1613		1614-1650	
7	1621-1678		1679-1699		1700-1715		1716-1752	
8	1725-1779		1780-1799		1800-1814		1815-1850	

		MAP							
Grade	Level 1		Level 2		Level 3		Level 4		
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>		
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile	
2	100-182	1-23	183-192	24-51	193-202	52-77	203-350	78-99	
3	100-194	1-25	195-204	26-53	205-214	54-78	215-350	79-99	
4	100-200	1-19	201-213	20-50	214-224	51-76	225-350	77-99	
5	100-213	1-31	214-226	32-62	227-234	63-79	235-350	80-99	
6	100-217	1-31	218-229	32-59	230-237	60-76	238-350	77-99	
7	100-221	1-34	222-235	35-65	236-246	66-84	247-350	85-99	
8	100-227	1-42	228-242	43-72	243-251	73-85	252-350	86-99	

Notes. 1. %ile=percentile.

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

3. High-lighted text denotes Grade 2 benchmarks are extrapolated from Grade 3 cut scores.

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

Grade	M-STEP							
	Level 1		Level 2		Level 3		Level 4	
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>	
3	1203-1279		1280-1299		1300 -1316		1317-1357	
4	1301-1382		1383-1399		1400 -1416		1417-1454	
5	1409-1480		1481-1499		1500 -1523		1524-1560	
6	1508-1577		1578-1599		1600 -1623		1624-1655	
7	1618-1678		1679-1699		1700 -1725		1726-1753	
8	1721-1776		1777-1799		1800 -1827		1828-1857	
Grade	MAP FALL							
	Level 1		Level 2		Level 3		Level 4	
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
2	100-164	1-25	165-178	26-59	179 -188	60-81	189-350	82-99
3	100-178	1-26	179-191	27-58	192 -202	59-81	203-350	82-99
4	100-190	1-31	191-201	32-58	202 -210	59-78	211-350	79-99
5	100-193	1-21	194-206	22-52	207 -220	53-83	221-350	84-99
6	100-201	1-26	202-215	27-61	216 -226	62-85	227-350	86-99
7	100-205	1-27	206-218	28-60	219 -231	61-86	232-350	87-99
8	100-208	1-28	209-222	29-63	223 -234	64-86	235-350	87-99
Grade	MAP WINTER							
	Level 1		Level 2		Level 3		Level 4	
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
2	100-175	1-28	176-187	29-58	188 -196	59-79	197-350	80-99
3	100-186	1-27	187-198	28-57	199 -208	58-80	209-350	81-99
4	100-196	1-31	197-206	32-57	207 -214	58-76	215-350	77-99
5	100-198	1-21	199-210	22-51	211 -223	52-82	224-350	83-99
6	100-205	1-27	206-218	28-61	219 -228	62-83	229-350	84-99
7	100-208	1-28	209-220	29-59	221 -232	60-85	233-350	86-99
8	100-211	1-31	212-223	32-61	224 -235	62-85	236-350	86-99

Notes. 1. %ile=percentile.

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

3. High-lighted text denotes Grade 2 benchmarks are extrapolated from Grade 3 cut scores.

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

Grade	M-STEP							
	Level 1		Level 2		Level 3		Level 4	
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>	
3	1217-1280		1281-1299		1300-1320		1321-1361	
4	1310-1375		1376-1399		1400-1419		1420-1455	
5	1409-1477		1478-1499		1500-1514		1515-1550	
6	1518-1578		1579-1599		1600-1613		1614-1650	
7	1621-1678		1679-1699		1700-1715		1716-1752	
8	1725-1779		1780-1799		1800-1814		1815-1850	
Grade	MAP FALL							
	Level 1		Level 2		Level 3		Level 4	
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
2	100-165	1-19	166-177	20-51	178-188	52-80	189-350	81-99
3	100-180	1-22	181-191	23-53	192-202	54-82	203-350	83-99
4	100-188	1-16	189-201	17-48	202-213	49-79	214-350	80-99
5	100-203	1-29	204-216	30-63	217-224	64-81	225-350	82-99
6	100-209	1-30	210-221	31-59	222-229	60-77	230-350	78-99
7	100-215	1-33	216-229	34-66	230-240	67-85	241-350	86-99
8	100-222	1-41	223-238	42-75	239-247	76-88	248-350	89-99
Grade	MAP WINTER							
	Level 1		Level 2		Level 3		Level 4	
	<i>Not Proficient</i>		<i>Partially Proficient</i>		<i>Proficient</i>		<i>Advanced</i>	
	RIT	%ile	RIT	%ile	RIT	%ile	RIT	%ile
2	100-176	1-22	177-186	23-50	187-197	51-80	198-350	81-99
3	100-189	1-25	190-199	26-53	200-209	54-80	210-350	81-99
4	100-195	1-17	196-208	18-49	209-219	50-77	220-350	78-99
5	100-209	1-30	210-222	31-63	223-230	64-80	231-350	81-99
6	100-214	1-31	215-226	32-60	227-234	61-78	235-350	79-99
7	100-219	1-34	220-233	35-66	234-244	67-85	245-350	86-99
8	100-225	1-42	226-240	43-73	241-249	74-86	250-350	87-99

Notes. 1. %ile=percentile.

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

3. High-lighted text denotes Grade 2 benchmarks are extrapolated from Grade 3 cut scores.

Consistency Rate of Classification

Consistency rate of classification (Pommerich, Hanson, Harris, & Scoring, 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 M-STEP 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 M-STEP and MAP cut scores. The results in Table 5 demonstrate that MAP reading scores can consistently classify students’ proficiency (Level 3 or higher) status on M-STEP ELA test 84-86% of the time and MAP math scores can consistently classify students on M-STEP math test 86-91% 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 M-STEP tests.

TABLE 5. CONSISTENCY RATE OF CLASSIFICATION FOR MAP AND M-STEP LEVEL 3 EQUIPERCENTILE CONCORDANCES

Grade	ELA/Reading			Math		
	Consistency Rate	False		Consistency Rate	False	
		Positives	Negatives		Positives	Negatives
3	0.84	0.08	0.08	0.86	0.07	0.07
4	0.84	0.08	0.08	0.86	0.07	0.07
5	0.85	0.08	0.07	0.89	0.05	0.06
6	0.86	0.07	0.07	0.90	0.05	0.05
7	0.84	0.08	0.08	0.91	0.04	0.05
8	0.84	0.08	0.08	0.90	0.04	0.06

Proficiency Projection

Proficiency projection tells how likely a student is classified as “proficient” on M-STEP 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 M-STEP

tests are presented in Tables 6 to 8. These tables estimate the probability of scoring at Level 3 or above on M-STEP in the spring and the prior fall or winter testing season. For example, if a 3rd grade student obtained a MAP reading score of 199 in the fall, the probability of obtaining a Level 3 or higher M-STEP score in the spring of 3rd grade is 80%. 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 M-STEP tests.

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

Grade	ELA/Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
2	5	164	192	No	<0.01	5	170	193	No	<0.01
	10	169	192	No	<0.01	10	175	193	No	<0.01
	15	173	192	No	<0.01	15	178	193	No	<0.01
	20	176	192	No	<0.01	20	181	193	No	<0.01
	25	178	192	No	<0.01	25	183	193	No	<0.01
	30	181	192	No	<0.01	30	185	193	No	<0.01
	35	183	192	No	<0.01	35	187	193	No	0.02
	40	185	192	No	0.01	40	189	193	No	0.08
	45	187	192	No	0.06	45	190	193	No	0.15
	50	189	192	No	0.17	50	192	193	No	0.37
	55	191	192	No	0.38	55	194	193	Yes	0.63
	60	193	192	Yes	0.62	60	196	193	Yes	0.85
	65	195	192	Yes	0.83	65	197	193	Yes	0.92
	70	197	192	Yes	0.94	70	199	193	Yes	0.98
	75	199	192	Yes	0.99	75	201	193	Yes	>0.99
	80	201	192	Yes	>0.99	80	204	193	Yes	>0.99
	85	204	192	Yes	>0.99	85	206	193	Yes	>0.99
90	208	192	Yes	>0.99	90	209	193	Yes	>0.99	
95	214	192	Yes	>0.99	95	214	193	Yes	>0.99	
3	5	174	202	No	<0.01	5	181	205	No	<0.01
	10	179	202	No	<0.01	10	186	205	No	<0.01
	15	183	202	No	<0.01	15	189	205	No	<0.01
	20	186	202	No	<0.01	20	192	205	No	<0.01
	25	188	202	No	<0.01	25	194	205	No	<0.01
	30	191	202	No	<0.01	30	196	205	No	<0.01
	35	193	202	No	<0.01	35	198	205	No	0.01
	40	195	202	No	0.01	40	200	205	No	0.04
	45	197	202	No	0.06	45	202	205	No	0.15
	50	199	202	No	0.17	50	203	205	No	0.25
	55	201	202	No	0.38	55	205	205	Yes	0.50
	60	202	202	Yes	0.50	60	207	205	Yes	0.75
	65	204	202	Yes	0.73	65	209	205	Yes	0.92
	70	207	202	Yes	0.94	70	211	205	Yes	0.98
	75	209	202	Yes	0.99	75	213	205	Yes	>0.99
	80	211	202	Yes	>0.99	80	215	205	Yes	>0.99
	85	214	202	Yes	>0.99	85	218	205	Yes	>0.99
90	218	202	Yes	>0.99	90	221	205	Yes	>0.99	
95	223	202	Yes	>0.99	95	226	205	Yes	>0.99	

TABLE 6. (CONTINUED)

Grade	ELA/Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
4	5	181	209	No	<0.01	5	189	214	No	<0.01
	10	187	209	No	<0.01	10	194	214	No	<0.01
	15	190	209	No	<0.01	15	198	214	No	<0.01
	20	193	209	No	<0.01	20	201	214	No	<0.01
	25	196	209	No	<0.01	25	203	214	No	<0.01
	30	198	209	No	<0.01	30	206	214	No	<0.01
	35	200	209	No	<0.01	35	208	214	No	0.02
	40	202	209	No	0.01	40	210	214	No	0.08
	45	204	209	No	0.06	45	212	214	No	0.25
	50	206	209	No	0.17	50	213	214	No	0.37
	55	208	209	No	0.38	55	215	214	Yes	0.63
	60	210	209	Yes	0.62	60	217	214	Yes	0.85
	65	212	209	Yes	0.83	65	219	214	Yes	0.96
	70	214	209	Yes	0.94	70	221	214	Yes	0.99
	75	216	209	Yes	0.99	75	224	214	Yes	>0.99
	80	218	209	Yes	>0.99	80	226	214	Yes	>0.99
85	221	209	Yes	>0.99	85	229	214	Yes	>0.99	
90	225	209	Yes	>0.99	90	233	214	Yes	>0.99	
95	230	209	Yes	>0.99	95	238	214	Yes	>0.99	
5	5	188	213	No	<0.01	5	195	227	No	<0.01
	10	193	213	No	<0.01	10	201	227	No	<0.01
	15	197	213	No	<0.01	15	205	227	No	<0.01
	20	199	213	No	<0.01	20	208	227	No	<0.01
	25	202	213	No	<0.01	25	210	227	No	<0.01
	30	204	213	No	<0.01	30	213	227	No	<0.01
	35	206	213	No	0.01	35	215	227	No	<0.01
	40	208	213	No	0.06	40	217	227	No	<0.01
	45	210	213	No	0.17	45	219	227	No	<0.01
	50	212	213	No	0.38	50	221	227	No	0.02
	55	214	213	Yes	0.62	55	223	227	No	0.08
	60	216	213	Yes	0.83	60	225	227	No	0.25
	65	217	213	Yes	0.89	65	228	227	Yes	0.63
	70	220	213	Yes	0.99	70	230	227	Yes	0.85
	75	222	213	Yes	>0.99	75	232	227	Yes	0.96
	80	224	213	Yes	>0.99	80	235	227	Yes	>0.99
85	227	213	Yes	>0.99	85	238	227	Yes	>0.99	
90	231	213	Yes	>0.99	90	242	227	Yes	>0.99	
95	236	213	Yes	>0.99	95	248	227	Yes	>0.99	

TABLE 6. (CONTINUED)

Grade	ELA/Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
6	5	192	220	No	<0.01	5	198	230	No	<0.01
	10	197	220	No	<0.01	10	204	230	No	<0.01
	15	201	220	No	<0.01	15	208	230	No	<0.01
	20	203	220	No	<0.01	20	211	230	No	<0.01
	25	206	220	No	<0.01	25	214	230	No	<0.01
	30	208	220	No	<0.01	30	217	230	No	<0.01
	35	210	220	No	<0.01	35	219	230	No	<0.01
	40	212	220	No	0.01	40	221	230	No	<0.01
	45	214	220	No	0.03	45	223	230	No	0.01
	50	216	220	No	0.11	50	225	230	No	0.04
	55	218	220	No	0.27	55	227	230	No	0.15
	60	219	220	No	0.38	60	230	230	Yes	0.50
	65	221	220	Yes	0.62	65	232	230	Yes	0.75
	70	223	220	Yes	0.83	70	234	230	Yes	0.92
	75	226	220	Yes	0.97	75	237	230	Yes	0.99
	80	228	220	Yes	0.99	80	239	230	Yes	>0.99
85	231	220	Yes	>0.99	85	243	230	Yes	>0.99	
90	235	220	Yes	>0.99	90	247	230	Yes	>0.99	
95	240	220	Yes	>0.99	95	253	230	Yes	>0.99	
7	5	193	222	No	<0.01	5	199	236	No	<0.01
	10	199	222	No	<0.01	10	206	236	No	<0.01
	15	202	222	No	<0.01	15	210	236	No	<0.01
	20	205	222	No	<0.01	20	214	236	No	<0.01
	25	208	222	No	<0.01	25	217	236	No	<0.01
	30	210	222	No	<0.01	30	219	236	No	<0.01
	35	212	222	No	<0.01	35	222	236	No	<0.01
	40	214	222	No	0.01	40	224	236	No	<0.01
	45	216	222	No	0.03	45	226	236	No	<0.01
	50	218	222	No	0.11	50	229	236	No	0.01
	55	220	222	No	0.27	55	231	236	No	0.04
	60	222	222	Yes	0.50	60	233	236	No	0.15
	65	224	222	Yes	0.73	65	235	236	No	0.37
	70	226	222	Yes	0.89	70	238	236	Yes	0.75
	75	228	222	Yes	0.97	75	241	236	Yes	0.96
	80	231	222	Yes	>0.99	80	244	236	Yes	>0.99
85	234	222	Yes	>0.99	85	247	236	Yes	>0.99	
90	238	222	Yes	>0.99	90	251	236	Yes	>0.99	
95	243	222	Yes	>0.99	95	258	236	Yes	>0.99	

TABLE 6. (CONTINUED)

Grade	ELA/Reading					Math				
	Start %ile	RIT Spring	Projected Proficiency			Start %ile	RIT Spring	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
8	5	194	225	No	<0.01	5	199	243	No	<0.01
	10	200	225	No	<0.01	10	206	243	No	<0.01
	15	204	225	No	<0.01	15	211	243	No	<0.01
	20	207	225	No	<0.01	20	215	243	No	<0.01
	25	209	225	No	<0.01	25	218	243	No	<0.01
	30	212	225	No	<0.01	30	221	243	No	<0.01
	35	214	225	No	<0.01	35	224	243	No	<0.01
	40	216	225	No	<0.01	40	226	243	No	<0.01
	45	218	225	No	0.01	45	229	243	No	<0.01
	50	220	225	No	0.06	50	231	243	No	<0.01
	55	222	225	No	0.17	55	233	243	No	<0.01
	60	224	225	No	0.38	60	236	243	No	0.01
	65	226	225	Yes	0.62	65	238	243	No	0.04
	70	228	225	Yes	0.83	70	241	243	No	0.25
	75	231	225	Yes	0.97	75	244	243	Yes	0.63
	80	233	225	Yes	0.99	80	247	243	Yes	0.92
	85	236	225	Yes	>0.99	85	251	243	Yes	>0.99
90	240	225	Yes	>0.99	90	255	243	Yes	>0.99	
95	246	225	Yes	>0.99	95	262	243	Yes	>0.99	

Note. %ile=percentile

TABLE 7. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING M-STEP ELA LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING M-STEP TESTS

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
2	5	149	192	No	<0.01	5	160	192	No	<0.01
	10	155	192	No	0.01	10	165	192	No	<0.01
	15	159	192	No	0.01	15	169	192	No	<0.01
	20	162	192	No	0.04	20	172	192	No	<0.01
	25	164	192	No	0.06	25	174	192	No	0.01
	30	167	192	No	0.10	30	176	192	No	0.02
	35	169	192	No	0.15	35	178	192	No	0.05
	40	171	192	No	0.22	40	180	192	No	0.10
	45	173	192	No	0.26	45	182	192	No	0.18
	50	175	192	No	0.35	50	184	192	No	0.29
	55	177	192	No	0.45	55	186	192	No	0.36
	60	179	192	Yes	0.50	60	188	192	Yes	0.50
	65	181	192	Yes	0.60	65	190	192	Yes	0.64
	70	183	192	Yes	0.70	70	192	192	Yes	0.77
	75	185	192	Yes	0.74	75	194	192	Yes	0.86
	80	188	192	Yes	0.85	80	197	192	Yes	0.95
	85	191	192	Yes	0.90	85	200	192	Yes	0.99
90	195	192	Yes	0.96	90	203	192	Yes	>0.99	
95	200	192	Yes	0.99	95	209	192	Yes	>0.99	
3	5	162	202	No	<0.01	5	171	202	No	<0.01
	10	168	202	No	<0.01	10	176	202	No	<0.01
	15	172	202	No	0.01	15	180	202	No	<0.01
	20	175	202	No	0.02	20	183	202	No	<0.01
	25	178	202	No	0.05	25	185	202	No	0.01
	30	180	202	No	0.08	30	188	202	No	0.03
	35	182	202	No	0.10	35	190	202	No	0.04
	40	184	202	No	0.16	40	192	202	No	0.09
	45	186	202	No	0.24	45	194	202	No	0.17
	50	188	202	No	0.29	50	196	202	No	0.28
	55	190	202	No	0.39	55	198	202	No	0.42
	60	192	202	Yes	0.50	60	199	202	Yes	0.50
	65	194	202	Yes	0.56	65	201	202	Yes	0.65
	70	197	202	Yes	0.71	70	204	202	Yes	0.83
	75	199	202	Yes	0.80	75	206	202	Yes	0.87
	80	202	202	Yes	0.87	80	208	202	Yes	0.94
	85	205	202	Yes	0.94	85	211	202	Yes	0.98
90	209	202	Yes	0.97	90	215	202	Yes	>0.99	
95	214	202	Yes	0.99	95	221	202	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.
4	5	173	209	No	<0.01	5	179	209	No	<0.01
	10	178	209	No	<0.01	10	184	209	No	<0.01
	15	182	209	No	0.01	15	188	209	No	<0.01
	20	185	209	No	0.02	20	191	209	No	<0.01
	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	0.12	35	198	209	No	0.06
	40	194	209	No	0.15	40	200	209	No	0.12
	45	196	209	No	0.23	45	202	209	No	0.16
	50	198	209	No	0.33	50	204	209	No	0.28
	55	200	209	No	0.38	55	205	209	No	0.35
	60	202	209	Yes	0.50	60	207	209	Yes	0.50
	65	204	209	Yes	0.62	65	209	209	Yes	0.65
	70	206	209	Yes	0.73	70	211	209	Yes	0.78
	75	209	209	Yes	0.82	75	214	209	Yes	0.92
	80	211	209	Yes	0.88	80	216	209	Yes	0.96
	85	214	209	Yes	0.93	85	219	209	Yes	0.98
90	218	209	Yes	0.98	90	223	209	Yes	>0.99	
95	224	209	Yes	>0.99	95	228	209	Yes	>0.99	
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	

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.
6	5	186	220	No	<0.01	5	190	220	No	<0.01
	10	192	220	No	<0.01	10	196	220	No	<0.01
	15	196	220	No	0.01	15	199	220	No	<0.01
	20	198	220	No	0.01	20	202	220	No	<0.01
	25	201	220	No	0.03	25	204	220	No	<0.01
	30	203	220	No	0.06	30	207	220	No	0.02
	35	205	220	No	0.10	35	209	220	No	0.04
	40	207	220	No	0.12	40	211	220	No	0.09
	45	209	220	No	0.19	45	212	220	No	0.12
	50	211	220	No	0.28	50	214	220	No	0.22
	55	213	220	No	0.39	55	216	220	No	0.28
	60	215	220	No	0.44	60	218	220	No	0.42
	65	217	220	Yes	0.56	65	220	220	Yes	0.58
	70	219	220	Yes	0.67	70	222	220	Yes	0.72
	75	221	220	Yes	0.72	75	224	220	Yes	0.83
	80	224	220	Yes	0.84	80	226	220	Yes	0.91
	85	226	220	Yes	0.90	85	229	220	Yes	0.97
90	230	220	Yes	0.96	90	233	220	Yes	>0.99	
95	236	220	Yes	>0.99	95	238	220	Yes	>0.99	
7	5	189	222	No	<0.01	5	192	222	No	<0.01
	10	195	222	No	<0.01	10	198	222	No	<0.01
	15	199	222	No	0.01	15	201	222	No	<0.01
	20	202	222	No	0.01	20	204	222	No	<0.01
	25	204	222	No	0.03	25	207	222	No	0.01
	30	206	222	No	0.05	30	209	222	No	0.02
	35	209	222	No	0.10	35	211	222	No	0.04
	40	211	222	No	0.15	40	213	222	No	0.06
	45	213	222	No	0.23	45	215	222	No	0.12
	50	214	222	No	0.28	50	217	222	No	0.22
	55	216	222	No	0.33	55	219	222	No	0.35
	60	218	222	No	0.44	60	221	222	Yes	0.50
	65	220	222	Yes	0.56	65	223	222	Yes	0.65
	70	222	222	Yes	0.67	70	225	222	Yes	0.78
	75	225	222	Yes	0.77	75	227	222	Yes	0.88
	80	227	222	Yes	0.85	80	230	222	Yes	0.96
	85	230	222	Yes	0.93	85	232	222	Yes	0.97
90	234	222	Yes	0.97	90	236	222	Yes	>0.99	
95	240	222	Yes	>0.99	95	242	222	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.
8	5	191	225	No	<0.01	5	194	225	No	<0.01
	10	197	225	No	<0.01	10	199	225	No	<0.01
	15	201	225	No	0.01	15	203	225	No	<0.01
	20	204	225	No	0.02	20	206	225	No	<0.01
	25	207	225	No	0.04	25	209	225	No	<0.01
	30	209	225	No	0.06	30	211	225	No	0.01
	35	211	225	No	0.10	35	213	225	No	0.02
	40	213	225	No	0.13	40	215	225	No	0.05
	45	215	225	No	0.19	45	217	225	No	0.10
	50	217	225	No	0.26	50	219	225	No	0.18
	55	219	225	No	0.35	55	221	225	No	0.29
	60	221	225	No	0.40	60	223	225	No	0.43
	65	223	225	Yes	0.50	65	225	225	Yes	0.57
	70	225	225	Yes	0.60	70	227	225	Yes	0.71
	75	228	225	Yes	0.69	75	229	225	Yes	0.82
	80	230	225	Yes	0.78	80	232	225	Yes	0.90
	85	234	225	Yes	0.90	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	244	225	Yes	>0.99	

Note. %ile=percentile

TABLE 8. PROFICIENCY PROJECTION AND PROBABILITY FOR PASSING M-STEP MATH LEVEL 3 (PROFICIENT) WHEN MAP IS TAKEN IN THE FALL OR WINTER PRIOR TO SPRING M-STEP TESTS

Grade	Start %ile	RIT Fall	Projected Proficiency			Start %ile	RIT Winter	Projected Proficiency		
			Cut Score	Level 3	Prob.			Cut Score	Level 3	Prob.
2	5	155	193	No	<0.01	5	165	193	No	<0.01
	10	160	193	No	0.01	10	170	193	No	<0.01
	15	163	193	No	0.03	15	173	193	No	<0.01
	20	166	193	No	0.07	20	175	193	No	0.01
	25	168	193	No	0.10	25	178	193	No	0.03
	30	170	193	No	0.16	30	180	193	No	0.08
	35	172	193	No	0.24	35	181	193	No	0.11
	40	174	193	No	0.33	40	183	193	No	0.21
	45	175	193	No	0.33	45	185	193	No	0.34
	50	177	193	No	0.44	50	186	193	No	0.42
	55	179	193	Yes	0.56	55	188	193	Yes	0.58
	60	180	193	Yes	0.61	60	190	193	Yes	0.73
	65	182	193	Yes	0.72	65	191	193	Yes	0.79
	70	184	193	Yes	0.76	70	193	193	Yes	0.85
	75	186	193	Yes	0.84	75	195	193	Yes	0.92
	80	188	193	Yes	0.90	80	197	193	Yes	0.97
	85	191	193	Yes	0.96	85	200	193	Yes	0.99
90	194	193	Yes	0.98	90	203	193	Yes	>0.99	
95	199	193	Yes	>0.99	95	208	193	Yes	>0.99	
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	

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.
4	5	179	214	No	<0.01	5	185	214	No	<0.01
	10	184	214	No	<0.01	10	190	214	No	<0.01
	15	188	214	No	0.01	15	194	214	No	<0.01
	20	190	214	No	0.03	20	197	214	No	0.01
	25	193	214	No	0.08	25	199	214	No	0.02
	30	195	214	No	0.14	30	201	214	No	0.05
	35	197	214	No	0.22	35	203	214	No	0.10
	40	198	214	No	0.27	40	205	214	No	0.20
	45	200	214	No	0.38	45	207	214	No	0.34
	50	202	214	Yes	0.50	50	209	214	Yes	0.50
	55	204	214	Yes	0.62	55	211	214	Yes	0.66
	60	205	214	Yes	0.62	60	212	214	Yes	0.74
	65	207	214	Yes	0.73	65	214	214	Yes	0.86
	70	209	214	Yes	0.83	70	216	214	Yes	0.93
	75	211	214	Yes	0.89	75	218	214	Yes	0.97
	80	214	214	Yes	0.96	80	221	214	Yes	0.99
	85	216	214	Yes	0.98	85	223	214	Yes	>0.99
90	220	214	Yes	>0.99	90	227	214	Yes	>0.99	
95	225	214	Yes	>0.99	95	232	214	Yes	>0.99	
5	5	187	227	No	<0.01	5	192	227	No	<0.01
	10	193	227	No	<0.01	10	198	227	No	<0.01
	15	196	227	No	<0.01	15	201	227	No	<0.01
	20	199	227	No	<0.01	20	204	227	No	<0.01
	25	202	227	No	0.01	25	207	227	No	<0.01
	30	204	227	No	0.03	30	209	227	No	<0.01
	35	206	227	No	0.05	35	211	227	No	0.01
	40	208	227	No	0.09	40	213	227	No	0.02
	45	210	227	No	0.15	45	215	227	No	0.05
	50	211	227	No	0.19	50	217	227	No	0.11
	55	213	227	No	0.28	55	219	227	No	0.20
	60	215	227	No	0.38	60	221	227	No	0.34
	65	217	227	Yes	0.50	65	223	227	Yes	0.50
	70	219	227	Yes	0.62	70	225	227	Yes	0.66
	75	221	227	Yes	0.72	75	228	227	Yes	0.85
	80	224	227	Yes	0.85	80	230	227	Yes	0.93
	85	227	227	Yes	0.93	85	233	227	Yes	0.98
90	230	227	Yes	0.97	90	237	227	Yes	>0.99	
95	236	227	Yes	>0.99	95	242	227	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.
6	5	192	230	No	<0.01	5	196	230	No	<0.01
	10	198	230	No	<0.01	10	202	230	No	<0.01
	15	202	230	No	<0.01	15	205	230	No	<0.01
	20	205	230	No	0.01	20	209	230	No	<0.01
	25	207	230	No	0.01	25	211	230	No	<0.01
	30	209	230	No	0.03	30	214	230	No	<0.01
	35	212	230	No	0.07	35	216	230	No	0.01
	40	214	230	No	0.12	40	218	230	No	0.03
	45	216	230	No	0.19	45	220	230	No	0.07
	50	218	230	No	0.28	50	222	230	No	0.15
	55	220	230	No	0.38	55	224	230	No	0.27
	60	222	230	Yes	0.50	60	226	230	No	0.42
	65	224	230	Yes	0.62	65	228	230	Yes	0.58
	70	226	230	Yes	0.72	70	230	230	Yes	0.73
	75	228	230	Yes	0.81	75	233	230	Yes	0.89
	80	231	230	Yes	0.91	80	236	230	Yes	0.97
	85	234	230	Yes	0.95	85	239	230	Yes	0.99
90	238	230	Yes	0.99	90	243	230	Yes	>0.99	
95	243	230	Yes	>0.99	95	248	230	Yes	>0.99	
7	5	195	236	No	<0.01	5	198	236	No	<0.01
	10	201	236	No	<0.01	10	204	236	No	<0.01
	15	205	236	No	<0.01	15	208	236	No	<0.01
	20	209	236	No	<0.01	20	212	236	No	<0.01
	25	211	236	No	<0.01	25	215	236	No	<0.01
	30	214	236	No	0.01	30	217	236	No	<0.01
	35	216	236	No	0.02	35	220	236	No	<0.01
	40	218	236	No	0.03	40	222	236	No	0.01
	45	221	236	No	0.08	45	224	236	No	0.02
	50	223	236	No	0.14	50	226	236	No	0.05
	55	225	236	No	0.22	55	228	236	No	0.10
	60	227	236	No	0.32	60	230	236	No	0.20
	65	229	236	No	0.44	65	233	236	No	0.42
	70	231	236	Yes	0.56	70	235	236	Yes	0.58
	75	234	236	Yes	0.73	75	238	236	Yes	0.80
	80	237	236	Yes	0.86	80	240	236	Yes	0.90
	85	240	236	Yes	0.94	85	244	236	Yes	0.98
90	244	236	Yes	0.98	90	248	236	Yes	>0.99	
95	250	236	Yes	>0.99	95	254	236	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.
8	5	197	243	No	<0.01	5	199	243	No	<0.01
	10	203	243	No	<0.01	10	206	243	No	<0.01
	15	208	243	No	<0.01	15	210	243	No	<0.01
	20	211	243	No	<0.01	20	214	243	No	<0.01
	25	214	243	No	<0.01	25	217	243	No	<0.01
	30	217	243	No	<0.01	30	220	243	No	<0.01
	35	219	243	No	0.01	35	222	243	No	<0.01
	40	222	243	No	0.02	40	225	243	No	<0.01
	45	224	243	No	0.03	45	227	243	No	<0.01
	50	226	243	No	0.06	50	229	243	No	0.01
	55	229	243	No	0.12	55	231	243	No	0.02
	60	231	243	No	0.18	60	234	243	No	0.08
	65	233	243	No	0.26	65	236	243	No	0.16
	70	236	243	No	0.35	70	239	243	No	0.35
	75	238	243	No	0.45	75	241	243	Yes	0.50
	80	241	243	Yes	0.60	80	245	243	Yes	0.79
	85	245	243	Yes	0.78	85	248	243	Yes	0.92
90	249	243	Yes	0.90	90	253	243	Yes	0.99	
95	256	243	Yes	0.99	95	259	243	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 2 to 8 that correspond to each M-STEP performance level. By using matched score data from a sample of students from Michigan, 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 M-STEP 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 M-STEP 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 116 schools in Michigan, 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 M-STEP performance from other schools in Michigan 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 116 schools in Michigan. The sample contained matched M-STEP ELA and MAP reading scores from 27,869 students in Grades 3 to 8 and matched M-STEP and MAP math scores from 27,952 students in Grades 3 to 8 who completed both M-STEP and MAP in the spring of 2016.

To understand the statistical characteristics of the test scores, descriptive statistics are provided in Table A1 below. As Table A1 indicates, the correlation coefficients between MAP reading and M-STEP ELA scores range from 0.80 to 0.82, and the correlation coefficients between MAP and M-STEP math scores range from 0.82 to 0.89. In general, all these correlations indicate a strong relationship between MAP and M-STEP test scores.

TABLE A1. DESCRIPTIVE STATISTICS OF THE SAMPLE DATA

Subject	Grade	N	<i>r</i>	M-STEP				MAP			
				Mean	SD	Min	Max	Mean	SD	Min	Max
ELA/ Reading	3	4824	0.80	1293.30	26.44	1217	1357	196.86	16.40	136	243
	4	4599	0.81	1393.30	27.09	1301	1454	204.03	16.08	142	252
	5	4613	0.82	1496.90	26.25	1416	1560	209.85	16.11	143	254
	6	4732	0.81	1592.80	27.67	1508	1655	214.18	16.38	142	262
	7	4571	0.80	1693.80	27.91	1618	1753	217.29	16.83	148	265
	8	4530	0.80	1796.10	28.39	1721	1857	221.03	16.50	146	266
Math	3	4794	0.82	1292.70	27.39	1217	1361	200.82	14.27	146	274
	4	4579	0.85	1392.10	26.77	1310	1455	209.25	15.57	141	272
	5	4623	0.86	1485.70	26.72	1409	1550	217.72	16.96	137	277
	6	4742	0.89	1584.10	28.65	1518	1650	220.41	18.38	143	286
	7	4608	0.87	1685.80	28.42	1621	1752	226.01	20.64	129	321
	8	4606	0.87	1785.90	27.96	1725	1850	231.22	21.95	139	328

Equipercentile Linking Procedure

The equipercentile procedure (e.g., Kolen & Brennan, 2004) was used to establish the concordance relationship between M-STEP and MAP scores for grades 3 to 8 in ELA/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., M-STEP). 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):

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

where $e_y(x)$ is the equipercentile equivalent of scores on M-STEP 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 M-STEP tests.

To calculate consistency rate of classification, sample students were designated “Below M-STEP cut” or “At or above M-STEP cut” based on their actual M-STEP 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 M-STEP 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 M-STEP 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 M-STEP 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 M-STEP cut scores. Students classified in the *false negative* (FN) category were those predicted to be Not Proficient based on the MAP cut scores but were classified as Proficient based on the M-STEP 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 M-STEP TO MAP CONCORDANCE

		M-STEP Score	
		Below M-STEP cut	At or Above M-STEP cut
MAP Score	Below MAP cut	True Negative	False Negative
	At or Above MAP cut	False Positive	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 M-STEP 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 M-STEP, based on his/her fall or winter MAP score is given in Equation (A2):

$$Pr(\text{Achieving Level 3 in spring} | a \text{ RIT score of } x) = 1 - \Phi\left(\frac{x + g - c}{SD}\right) \quad (A2)$$

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

$$Pr(\text{Achieving Level 3 in spring} | a \text{ RIT score of } s \text{ in spring}) = 1 - \Phi\left(\frac{s - c}{SE}\right) \quad (A3)$$

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

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