Linking MAP Growth and Growth Measure Scaled Scores

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Psychometrics and Analytics

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1. Introduction

1.1. Purpose of the Study

NWEA® is committed to providing partners with effective tools to help make inferences about student learning from MAP® Growth™ test scores. For partners transitioning from using Houghton Mifflin Harcourt (HMH) Growth Measure (GM) to MAP Growth assessments, the concordance tables provided in this report (Table 3.4 and Table 3.5) could assist them in connecting the Rasch Unit (RIT) scores from MAP Growth with scaled scores from the GM. Therefore, partners can continue to gain valuable insights into student performance and progress by comparing against their historical data while also benefiting from additional support through improved educational technology tools and resources based on RIT scores.

This document presents results from a linking study conducted by NWEA to statistically connect RIT scores from select MAP Growth assessments with scores from concurrent GM assessments for mathematics in grades K–8 and English language arts (ELA)/reading in grades 2–11. Specifically, this report presents the following results:

1. Study sample demographics
2. Descriptive statistics of test scores
3. Concordance between RIT scores and GM scaled scores
4. Classification agreement statistics
5. Guidelines for using the study results

1.2. Assessment Overview

The GM computerized adaptive tests for ELA and mathematics are standards-based interim assessment tools developed for kindergarten through grade 11. Specifically, the general mathematics assessments cover kindergarten through grade 8. ELA assessments cover grades 2 through 11. The GM tests are typically administered three times per year (e.g., fall, winter, and spring). In the student report, the scores reported include the scaled score, which is specific to each test grade and subject, and other scores (e.g., performance level, grade level equivalent [GLE]) that can be derived from the scaled score. A grade-level scale has a range of G01 to G99, where “G” represents the test grade administered.

MAP Growth tests are adaptive interim assessments aligned to state-specific content standards and are administered in the fall, winter, and spring for reading and general mathematics[1] in grades K through 12. Scores are reported on the RIT vertical scale with a potential range between 100 and 350. NWEA conducts norming studies of student and school performance on MAP Growth assessments to aid in the interpretation of scores. Growth norms provide expected score gains for a test from term to term, such as from fall to spring. The most recent norms study was conducted in 2020 (Thum & Kuhfeld, 2020).

[1] Both the MAP Growth and GM assessments offer course-specific mathematics tests (e.g., Algebra 1, Algebra 2, Geometry) designed for high school students. However, this study concentrates on general mathematics.

2. Methods

2.1. Data Collection and Processing

This linking study is based on data from the Spring 2023, Fall 2023, and Winter 2024 administrations of the MAP Growth and Growth Measure (GM) assessments, respectively. Each student's GM record was matched to the MAP Growth score based on the common student identifier within a term, subject, and grade. Only students who took both the MAP Growth and GM assessments were included in the study sample.

After the merged data was created, the following filtering criteria were used to clean up the data:

1. The HMH_SEASON should be consistent with the SCHOOL-YEAR.
2. The HMH_SEASON should be consistent with the NWEA_TERM_SEASON.
3. The TEST_GRADE should be the same as HMHGRADE and NWEA GRADE.
4. There are no missing GM scaled scores.
5. There are no missing RIT scores.
6. Student IDs need to be unique by term, subject, and grade.

The remaining data was further scrutinized by checking a scatter plot between MAP Growth RIT scores and GM scaled scores within a subject and grade. Noticeable outliers were found, especially at the lower end of the two scales. To mitigate the possible negative impact of these outliers on the linking study results, the robust Z (Huynh & Meyer, 2010) was calculated for each score pair using the equation below; any absolute value of robust Z that was equal to or greater than 1.96 was removed from the study sample.

$$Robust\ Z = \frac{(RIT - Scaled\ Score_{GM}) - median(RIT - Scaled\ Score_{GM})}{0.74 * IQR(RIT - Scaled\ Score_{GM})}$$

IQR is the inter-quartile range of the difference between RIT and GM scaled scores ($Scaled\ Score_{GM}$).

2.2. Descriptive Statistics

Descriptive statistics are provided to summarize the test scores for both the MAP Growth and GM tests, including the test score mean, standard deviation (SD), minimum, and maximum. The mean presents the average test scores across all students in the study sample, and the SD indicates the variability of test scores, revealing how students' scores are distributed around the average score, or mean. Correlation coefficients between the MAP Growth RIT scores and GM scaled scores are also provided to answer the question "How well do the test scores from MAP Growth (that reference the RIT scale) correlate to the scores obtained from the GM test (that references some other scale) in the same subject and grade?" The correlations were calculated as follows:

$$r = \frac{\sum (x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\sum (x_i - \overline{x})^2 \sum (y_i - \overline{y})^2}}$$

where r is the correlation coefficient, x_i and y_i are the values of the *x* and *y* variables (e.g., RIT and GM scaled scores) in a sample, and $\bar{x}$ and $\bar{y}$ are the mean of the values of the *x* and *y* variables.

2.3. Concordance Between MAP Growth and GM Scaled Scores

The equipercentile linking method was used to identify the GM scaled scores that correspond to the MAP Growth RIT scores. The equipercentile linking procedure matches scores on the two scales that have the same percentile rank (i.e., the proportion of tests at or below each score). For example, let x represent a score on Test X (e.g., MAP Growth). Its equipercentile equivalent score on Test Y (e.g., GM), $e_y(x)$, can be obtained through a cumulative-distribution-based linking function defined as:

$$e_y(x) = G^{-1}[P(x)]$$

where $e_y(x)$ is the equipercentile equivalent of score x on MAP Growth on the scale of GM, $P(x)$ is the percentile rank of a given score on MAP Growth, and G^{-1} is the inverse of the percentile rank function for GM that indicates the score on GM corresponding to a given percentile. Polynomial loglinear pre-smoothing was applied to reduce irregularities of the score distributions and equipercentile linking curve.

The range of the RIT scores, which are derived using the equipercentile method, depends on the observed minimum and maximum score points in the study sample. To simplify the conversion of the RIT scores within the observable range for the target tests in this study to the GM scaled scores for partners, the range of RIT scores spans from 100 to 300. The corresponding GM scaled scores were then calculated using linear interpolation.

2.4. Classification Agreement

To help parents/caregivers and schools interpret scaled scores, five performance levels (PLs) are reported for the GM tests: *Far Below Level*, *Below Level*, *Approaching*, *On Level*, and *Above Level*. These five performance levels align with the grade-level equivalent (GLE) scores, which include *>2 Grade Levels Below*, *2 Grade Levels Below*, *1 Grade Level Below*, *On Grade Level*, and *Above Grade Level*. The linking study results are evaluated by checking how accurately the equivalent GM scaled scores classify students into the five performance levels and GLE categories. The percentages of exact and adjacent match and Cohen's kappa values were calculated to measure the classification agreement. The exact match rate is the simplest measure of agreement. It calculates the proportion of instances where the predicted class exactly matches the true class. The adjacent match rate is a measure of agreement that is often used when there is a natural order to the categories, and there are negligible effects if a prediction is off by one category. For example, for the five performance levels, predicting *Below Level* when the true level is *Far Below Level* (one level below) or *Approaching* (one level above) might not be considered as serious an error as predicting *On Level* (two levels above). The adjacent match rate would consider *Far Below Level* or *Approaching* as an "adjacent match" and not consider it an error. While exact and adjacent match rates are easy to understand, they do not take into account the possibility of agreement occurring by chance. Cohen's kappa is generally a more robust measure than the exact and adjacent agreement rates because it describes the level of agreement beyond chance values. It is calculated as:

$$Kappa = \frac{p_o - p_e}{1 - p_e}$$

where p_o is the exact match rate. p_e is the sum of the products of marginal totals (i.e., the ith row total times the ith column total of the classification contingency table) divided by the square of the total number of ratings. Kappa tends to be lower than percent agreement; however, kappa is interpreted differently than agreement. For example, a kappa value of 0.3 would mean a 30% improvement beyond chance levels.

The linking study results are also evaluated by checking how accurately the equivalent GM scaled scores classify students into two categories: proficient (*On Level* and *Above Level*) or not proficient (*Far Below Level*, *Below Level*, and *Approaching*). Table 2.1 describes the classification accuracy statistics considered in this report (Pommerich et al., 2004).

Table 2.1. Description of Classification Accuracy Summary Statistics

Statistic	Description	Interpretation
Overall Classification Accuracy Rate	(TP + TN) / (total sample size)	Proportion of the study sample whose proficiency classification on the GM test was correctly predicted by MAP Growth cut scores
False Negative (FN) Rate	FN / (FN + TP)	Proportion of not-proficient students identified by MAP Growth in those observed as proficient on the GM test
False Positive (FP) Rate	FP / (FP + TN)	Proportion of proficient students identified by MAP Growth in those observed as not proficient on the GM test
Sensitivity	TP / (TP + FN)	Proportion of proficient students identified by MAP Growth in those observed as such on the GM test
Specificity	TN / (TN + FP)	Proportion of not-proficient students identified by MAP Growth in those observed as such on the GM test
Precision	TP / (TP + FP)	Proportion of observed proficient students on the GM test in those identified as such by the MAP Growth test
Area Under the Curve (AUC)	Area under the receiver operating characteristics (ROC) curve	How well MAP Growth cut scores separate the study sample into proficiency categories that match those from the GM test cut scores. An AUC at or above 0.80 is considered “good” accuracy.

Note. FP = false positives; FN = false negatives; TP = true positives; TN = true negatives.

3. Results

3.1. Study Sample

Only students who took both the MAP Growth and Growth Measure (GM) assessments in Spring 2023, Fall 2023, or Winter 2024 for the target subjects and grades were included in the linking study sample. Data were collected from 43 states, 430 districts, and 1,131 schools in the United States. Table 3.1 presents the number of students by subject and grade and the percentages by U.S. region within each subject and grade. The study sample includes students from all four U.S. regions. Table 3.2 presents the distributions of students by race and gender in the final study sample.

Table 3.1. Percentages of Students by U.S. Region

Grade	N	Northeast	Midwest	South	West
Mathematics					
K	2,548	10.9	33.1	47.3	8.8
1	4,771	10.2	33.7	46.1	9.9
2	5,282	12.6	36.0	42.8	8.6
3	4,975	22.0	28.4	41.6	7.9
4	5,199	20.6	44.4	29.3	5.8
5	5,236	19.1	55.1	23.9	1.9
6	5,351	16.4	33.5	44.5	5.6
7	4,729	13.9	31.6	51.9	2.6
8	4,266	9.0	22.6	65.6	2.7
ELA/Reading					
2	8,521	16.5	34.3	41.9	7.3
3	17,669	15.7	22.6	56.8	4.9
4	19,949	15.8	20.6	56.2	7.4
5	20,028	15.5	26.0	51.0	7.4
6	22,271	10.2	25.8	49.8	14.2
7	18,226	8.1	18.8	60.6	12.5
8	17,039	7.3	21.8	62.3	8.6
9	3,817	6.2	18.7	41.1	34.1
10	2,837	6.3	18.3	43.9	31.5
11	1,728	7.9	4.9	53.1	34.1

Table 3.2. Percentages of Student Demographics

Grade	N	Race (%)								Gender (%)	
		AI/AN	Asian	Black	Hispanic	Multi-ethnic	NH/PI	Not Specified	White	Female	Male
Mathematics											
K	2,548	6.9	1.7	16.1	18.7	3.5	0.1	8.3	44.7	49.4	50.6
1	4,771	6.2	2.3	13.5	14.2	4.0	0.1	10.8	48.9	49.1	50.9
2	5,282	6.2	2.5	13.8	13.7	3.8	0.1	9.7	50.4	48.2	51.8
3	4,975	6.1	3.0	14.7	16.9	3.6	0.2	11.1	44.5	49.2	50.8
4	5,199	5.9	2.4	10.0	13.7	3.7	0.2	10.4	53.8	50.0	50.0
5	5,236	2.1	2.6	12.6	16.1	4.1	0.1	6.6	55.8	49.9	50.1
6	5,351	4.4	1.9	15.2	17.1	4.6	0.2	4.9	51.9	49.0	51.0
7	4,729	0.6	1.5	21.7	22.6	3.6	0.2	3.8	46.0	48.5	51.5
8	4,266	0.4	1.2	21.3	24.0	3.4	0.1	3.9	45.6	50.2	49.8
ELA/Reading											
2	8,521	1.7	4.5	13.3	13.5	4.8	0.1	4.8	57.2	49.8	50.2
3	17,669	1.3	2.8	16.8	15.3	5.3	0.1	2.9	55.5	49.9	50.1
4	19,949	1.4	2.7	16.9	14.9	5.0	0.2	3.5	55.5	49.3	50.7
5	20,028	1.1	2.3	17.4	15.4	4.9	0.2	3.4	55.3	49.0	51.0
6	22,271	0.8	2.9	17.2	24.7	4.9	0.2	2.8	46.4	48.2	51.8
7	18,226	0.5	3.4	21.2	24.0	4.8	0.2	2.2	43.7	47.0	53.0
8	17,039	0.6	3.3	20.9	22.4	4.3	0.1	2.4	46.0	47.4	52.6
9	3,817	0.6	1.7	23.3	30.9	3.4	0.3	3.2	36.5	46.8	53.2
10	2,837	0.7	2.0	25.3	30.4	2.1	0.1	1.8	37.6	48.9	51.1
11	1,728	0.5	0.6	29.3	29.9	1.9	0.1	2.9	34.8	50.1	49.9

Note. AI/AN = American Indian or Alaska Native; NH/PI = Native Hawaiian or other Pacific Islander.

3.2. Descriptive Statistics

Table 3.3 presents descriptive statistics of the GM and MAP Growth test scores, including the correlation coefficients (*r*) between them. The correlations between the scores are 0.76 to 0.87 for mathematics and 0.78 to 0.90 for ELA/reading. These values indicate a high positive correlation among the scores, which is important validity evidence for the claim that MAP Growth scores are good predictors of performance on the GM assessments.

Table 3.3. Descriptive Statistics of Test Scores

Grade	*r*	GM Scaled Score				RIT			
		Mean	SD	Min	Max	Mean	SD	Min	Max
Mathematics									
K	0.83	58.5	20.8	3	99	151.4	13.9	104	195
1	0.87	162.0	20.5	101	199	169.1	14.4	117	213
2	0.86	262.3	19.7	201	299	181.4	14.8	126	229
3	0.87	356.9	20.5	301	399	191.0	14.9	122	244
4	0.85	454.4	22.7	401	499	202.0	14.7	134	272
5	0.83	552.4	23.5	501	599	208.5	14.7	139	264
6	0.79	644.4	23.5	601	699	208.8	15.0	154	261
7	0.79	742.2	24.7	701	799	211.5	16.9	154	266
8	0.76	844.4	23.3	801	897	214.0	16.6	158	276
ELA/Reading									
2	0.89	261.1	18.2	204	299	179.8	17.3	126	231
3	0.90	358.9	20.5	301	399	191.4	17.3	127	240
4	0.89	452.1	24.5	401	499	199.0	17.0	136	257
5	0.86	550.6	24.7	501	599	205.7	16.3	138	267
6	0.85	643.6	25.0	601	699	206.2	16.8	151	260
7	0.83	740.9	24.7	701	799	208.2	17.0	152	259
8	0.82	843.6	24.9	801	899	213.0	16.8	155	261
9	0.78	937.2	23.1	901	999	209.3	17.2	151	258
10	0.81	1039.1	24.0	1001	1099	212.0	18.4	155	263
11	0.83	1144.0	24.6	1102	1199	215.9	18.2	158	273

Note. SD = standard deviation; Min = minimum; Max = maximum.

3.3. Concordance Between MAP Growth and GM Scaled Scores

Table 3.4 and Table 3.5 present the equivalent GM scaled scores for the corresponding MAP Growth RIT scores by subject and grade. For example, a grade 3 student who obtained a MAP Growth mathematics RIT score of 170 is likely to get a score of 324 on the grade 3 GM mathematics test.

Table 3.4. Concordance Between MAP Growth and GM Scaled Scores—Mathematics

RIT Score	Equivalent GM Scaled Scores by Grade: Mathematics								
	K	1	2	3	4	5	6	7	8
100	1	101	201	301	401	501	601	701	801
101	2	101	201	301	401	501	601	701	801
102	3	101	201	301	401	501	601	701	801
103	3	101	201	301	401	501	601	701	801
104	3	101	201	301	401	501	601	701	801
105	3	101	201	301	401	501	601	701	801
106	3	101	201	301	401	501	601	701	801
107	3	101	201	301	401	501	601	701	801
108	3	101	201	301	401	501	601	701	801
109	3	101	201	301	401	501	601	701	801
110	3	101	201	301	401	501	601	701	801
111	3	101	201	301	401	501	601	701	801
112	3	101	201	301	401	501	601	701	801
113	4	101	201	301	401	501	601	701	801
114	4	101	201	301	401	501	601	701	801
115	4	101	201	301	401	501	601	701	801
116	4	101	201	301	401	501	601	701	801
117	5	101	201	301	401	501	601	701	801
118	5	101	201	301	401	501	601	701	801
119	6	101	201	301	401	501	601	701	801
120	6	101	201	301	401	501	601	701	801
121	7	101	201	301	401	501	601	701	801
122	8	101	201	301	401	501	601	701	801
123	9	102	201	301	401	501	601	701	801
124	10	102	201	301	401	501	601	701	801
125	11	102	201	301	401	501	601	701	801
126	13	102	201	301	401	501	601	701	801
127	14	103	201	301	401	501	601	701	801
128	16	103	201	301	401	501	601	701	801
129	18	104	202	301	401	501	601	701	801
130	20	104	202	301	401	501	601	701	801
131	23	105	202	301	401	501	601	701	801
132	25	106	203	301	401	501	601	701	801
133	27	106	203	301	401	501	601	701	801
134	30	107	204	301	401	501	601	701	801
135	32	108	204	301	401	501	601	701	801
136	34	109	205	301	401	501	601	701	801
137	36	110	205	301	401	501	601	701	801
138	38	111	206	301	401	501	601	701	801
139	40	113	207	302	401	501	601	701	801
140	42	114	208	302	401	501	601	701	801
141	44	116	208	302	401	501	601	701	801

RIT Score	Equivalent GM Scaled Scores by Grade: Mathematics								
	K	1	2	3	4	5	6	7	8
142	46	118	209	302	401	501	601	701	801
143	48	119	210	302	401	501	601	701	801
144	50	121	211	302	401	501	601	701	801
145	51	123	212	302	401	501	601	701	801
146	53	125	213	303	401	501	601	701	801
147	55	127	214	303	401	501	601	701	801
148	56	129	216	303	401	501	601	701	801
149	58	131	217	303	401	501	601	701	801
150	59	133	218	304	401	501	601	701	801
151	61	135	219	304	401	501	601	701	801
152	62	136	221	305	401	501	601	701	801
153	63	138	222	305	401	501	601	701	801
154	65	140	224	305	401	501	601	701	801
155	66	142	225	306	401	501	601	701	801
156	67	144	226	307	401	501	601	701	801
157	69	145	228	307	401	501	601	701	801
158	70	147	229	308	402	501	601	701	801
159	71	149	231	309	402	501	601	701	801
160	72	150	232	310	402	501	601	701	801
161	74	152	234	311	402	501	601	701	801
162	75	153	235	312	402	501	601	701	801
163	76	155	237	313	403	501	601	701	801
164	77	156	238	315	403	501	601	701	801
165	78	158	240	316	403	501	601	701	801
166	80	159	241	318	404	501	601	701	801
167	81	161	243	319	404	501	601	701	801
168	82	162	244	321	405	502	601	701	801
169	83	164	246	323	405	502	601	701	801
170	84	165	247	324	406	502	601	701	801
171	85	166	249	326	406	502	601	701	801
172	86	168	250	328	407	502	602	701	801
173	87	169	251	330	408	503	602	701	801
174	88	170	253	331	409	503	602	701	801
175	89	172	254	333	410	504	602	701	801
176	90	173	256	335	411	504	603	701	801
177	91	174	257	337	412	505	603	702	802
178	92	176	258	338	413	505	603	702	802
179	93	177	260	340	415	506	604	702	802
180	93	178	261	342	416	507	604	702	802
181	94	179	263	343	418	507	605	703	803
182	95	181	264	345	420	508	606	703	803
183	96	182	265	347	421	509	606	703	803
184	96	183	267	348	423	510	607	704	804

RIT Score	Equivalent GM Scaled Scores by Grade: Mathematics								
	K	1	2	3	4	5	6	7	8
185	97	184	268	350	425	512	608	704	804
186	97	185	269	351	427	513	609	705	805
187	98	186	271	353	428	514	610	705	805
188	98	187	272	354	430	516	611	706	806
189	98	189	273	355	432	517	612	707	807
190	99	190	275	357	434	519	613	708	808
191	99	191	276	358	436	521	614	709	808
192	99	192	277	360	438	522	616	710	809
193	99	192	278	361	440	524	617	711	811
194	99	193	280	362	442	526	619	712	812
195	99	194	281	364	443	528	620	714	813
196	99	195	282	365	445	530	622	715	814
197	99	196	283	366	447	532	623	717	816
198	99	196	285	368	449	534	625	718	818
199	99	197	286	369	450	536	626	720	819
200	99	197	287	370	452	538	628	722	821
201	99	198	288	371	454	540	630	723	823
202	99	198	289	373	456	542	632	725	824
203	99	198	290	374	457	543	633	727	826
204	99	199	291	375	459	545	635	729	828
205	99	199	292	376	461	547	637	731	830
206	99	199	293	378	462	549	639	733	832
207	99	199	294	379	464	551	640	735	834
208	99	199	295	380	465	553	642	737	836
209	99	199	295	381	467	554	644	739	837
210	99	199	296	382	468	556	646	741	839
211	99	199	297	383	470	558	648	743	841
212	99	199	297	385	471	560	649	744	843
213	99	199	298	386	473	561	651	746	844
214	99	199	298	387	474	563	653	748	846
215	99	199	298	388	476	565	655	750	848
216	99	199	299	389	477	566	656	751	849
217	99	199	299	390	478	568	658	753	851
218	99	199	299	391	480	569	660	755	852
219	99	199	299	392	481	571	662	756	854
220	99	199	299	393	482	573	663	758	855
221	99	199	299	394	484	574	665	759	857
222	99	199	299	395	485	576	667	761	858
223	99	199	299	395	486	577	668	762	859
224	99	199	299	396	487	578	670	764	861
225	99	199	299	397	489	580	672	765	862
226	99	199	299	397	490	581	673	766	863
227	99	199	299	398	491	583	675	767	865

RIT Score	Equivalent GM Scaled Scores by Grade: Mathematics								
	K	1	2	3	4	5	6	7	8
228	99	199	299	398	492	584	676	769	866
229	99	199	299	398	493	585	678	770	867
230	99	199	299	399	494	586	679	771	868
231	99	199	299	399	495	588	681	772	870
232	99	199	299	399	495	589	682	774	871
233	99	199	299	399	496	590	684	775	872
234	99	199	299	399	497	591	685	776	873
235	99	199	299	399	497	592	686	777	874
236	99	199	299	399	498	593	688	778	875
237	99	199	299	399	498	594	689	779	876
238	99	199	299	399	498	594	690	780	877
239	99	199	299	399	499	595	691	781	878
240	99	199	299	399	499	596	692	782	879
241	99	199	299	399	499	596	693	783	880
242	99	199	299	399	499	597	694	784	881
243	99	199	299	399	499	597	695	785	882
244	99	199	299	399	499	598	695	786	883
245	99	199	299	399	499	598	696	787	884
246	99	199	299	399	499	598	697	788	885
247	99	199	299	399	499	599	697	788	886
248	99	199	299	399	499	599	697	789	887
249	99	199	299	399	499	599	698	790	888
250	99	199	299	399	499	599	698	791	889
251	99	199	299	399	499	599	698	792	889
252	99	199	299	399	499	599	699	792	890
253	99	199	299	399	499	599	699	793	891
254	99	199	299	399	499	599	699	794	892
255	99	199	299	399	499	599	699	794	892
256	99	199	299	399	499	599	699	795	893
257	99	199	299	399	499	599	699	795	893
258	99	199	299	399	499	599	699	796	894
259	99	199	299	399	499	599	699	797	894
260	99	199	299	399	499	599	699	797	895
261	99	199	299	399	499	599	699	797	895
262	99	199	299	399	499	599	699	798	896
263	99	199	299	399	499	599	699	798	896
264	99	199	299	399	499	599	699	799	896
265	99	199	299	399	499	599	699	799	896
266	99	199	299	399	499	599	699	799	897
267	99	199	299	399	499	599	699	799	897
268	99	199	299	399	499	599	699	799	897
269	99	199	299	399	499	599	699	799	897
270	99	199	299	399	499	599	699	799	897

RIT Score	Equivalent GM Scaled Scores by Grade: Mathematics								
	K	1	2	3	4	5	6	7	8
271	99	199	299	399	499	599	699	799	897
272	99	199	299	399	499	599	699	799	897
273	99	199	299	399	499	599	699	799	897
274	99	199	299	399	499	599	699	799	897
275	99	199	299	399	499	599	699	799	897
276	99	199	299	399	499	599	699	799	897
277	99	199	299	399	499	599	699	799	897
278	99	199	299	399	499	599	699	799	897
279	99	199	299	399	499	599	699	799	897
280	99	199	299	399	499	599	699	799	897
281	99	199	299	399	499	599	699	799	897
282	99	199	299	399	499	599	699	799	897
283	99	199	299	399	499	599	699	799	897
284	99	199	299	399	499	599	699	799	897
285	99	199	299	399	499	599	699	799	897
286	99	199	299	399	499	599	699	799	897
287	99	199	299	399	499	599	699	799	897
288	99	199	299	399	499	599	699	799	897
289	99	199	299	399	499	599	699	799	897
290	99	199	299	399	499	599	699	799	898
291	99	199	299	399	499	599	699	799	898
292	99	199	299	399	499	599	699	799	898
293	99	199	299	399	499	599	699	799	898
294	99	199	299	399	499	599	699	799	898
295	99	199	299	399	499	599	699	799	898
296	99	199	299	399	499	599	699	799	898
297	99	199	299	399	499	599	699	799	898
298	99	199	299	399	499	599	699	799	898
299	99	199	299	399	499	599	699	799	898
300	99	199	299	399	499	599	699	799	899

Table 3.5. Concordance Between MAP Growth and GM Scaled Scores—ELA/Reading

RIT Score	Equivalent GM Scaled Scores by Grade: ELA/Reading									
	2	3	4	5	6	7	8	9	10	11
100	201	301	401	501	601	701	801	901	1001	1101
101	201	301	401	501	601	701	801	901	1001	1101
102	201	301	401	501	601	701	801	901	1001	1101
103	201	301	401	501	601	701	801	901	1001	1101
104	201	301	401	501	601	701	801	901	1001	1101
105	202	301	401	501	601	701	801	901	1001	1101
106	202	301	401	501	601	701	801	901	1001	1101
107	202	301	401	501	601	701	801	901	1001	1101
108	202	301	401	501	601	701	801	901	1001	1101
109	202	301	401	501	601	701	801	901	1001	1101
110	202	301	401	501	601	701	801	901	1001	1101
111	202	301	401	501	601	701	801	901	1001	1101
112	202	301	401	501	601	701	801	901	1001	1101
113	203	301	401	501	601	701	801	901	1001	1101
114	203	301	401	501	601	701	801	901	1001	1101
115	203	301	401	501	601	701	801	901	1001	1101
116	203	301	401	501	601	701	801	901	1001	1101
117	203	301	401	501	601	701	801	901	1001	1101
118	203	301	401	501	601	701	801	901	1001	1101
119	203	301	401	501	601	701	801	901	1001	1101
120	203	301	401	501	601	701	801	901	1001	1101
121	203	301	401	501	601	701	801	901	1001	1101
122	204	301	401	501	601	701	801	901	1001	1101
123	204	301	401	501	601	701	801	901	1001	1101
124	204	301	401	501	601	701	801	901	1001	1101
125	204	301	401	501	601	701	801	901	1001	1101
126	204	301	401	501	601	701	801	901	1001	1101
127	204	301	401	501	601	701	801	901	1001	1101
128	204	301	401	501	601	701	801	901	1001	1101
129	205	301	401	501	601	701	801	901	1001	1102
130	205	301	401	501	601	701	801	901	1001	1102
131	206	301	401	501	601	701	801	901	1001	1102
132	207	301	401	501	601	701	801	901	1001	1102
133	207	301	401	501	601	701	801	901	1001	1102
134	208	301	401	501	601	701	801	901	1001	1102
135	209	302	401	501	601	701	801	901	1001	1102
136	210	302	401	501	601	701	801	901	1001	1102
137	211	302	401	501	601	701	801	901	1001	1102
138	212	302	401	501	601	701	801	901	1001	1102
139	213	303	401	501	601	701	801	901	1001	1102
140	214	303	401	501	601	701	801	901	1001	1102
141	215	303	401	501	601	701	801	901	1001	1102

RIT Score	Equivalent GM Scaled Scores by Grade: ELA/Reading									
	2	3	4	5	6	7	8	9	10	11
142	216	303	401	501	601	701	801	901	1001	1102
143	218	304	401	501	601	701	801	901	1001	1102
144	219	304	401	501	601	701	801	901	1001	1102
145	220	305	401	501	601	701	801	901	1001	1102
146	222	305	401	501	601	701	801	901	1001	1102
147	223	306	401	501	601	701	801	901	1001	1102
148	224	306	402	501	601	701	801	901	1001	1102
149	226	307	402	501	601	701	801	901	1001	1102
150	227	307	402	501	601	701	801	901	1001	1102
151	228	308	402	501	601	701	801	901	1001	1102
152	230	309	402	501	601	701	801	901	1001	1102
153	231	310	402	501	601	701	801	901	1001	1102
154	232	311	402	501	601	701	801	901	1001	1102
155	234	312	403	502	601	701	801	901	1001	1102
156	235	313	403	502	601	701	801	901	1001	1102
157	236	314	403	502	601	701	801	901	1001	1102
158	237	315	403	502	601	701	801	901	1001	1102
159	239	316	404	502	601	701	801	901	1001	1102
160	240	317	404	502	601	701	801	901	1001	1102
161	241	319	404	502	601	701	801	901	1001	1102
162	242	320	404	502	601	701	801	901	1001	1102
163	244	321	405	503	602	701	801	901	1001	1102
164	245	323	405	503	602	701	801	901	1001	1102
165	246	324	406	503	602	702	801	901	1001	1102
166	247	326	406	503	602	702	801	901	1002	1102
167	248	327	407	503	602	702	801	901	1002	1102
168	249	329	407	504	603	702	802	902	1002	1103
169	251	330	408	504	603	702	802	902	1002	1103
170	252	332	409	504	603	702	802	902	1002	1103
171	253	333	409	504	603	703	802	902	1002	1103
172	254	335	410	505	604	703	802	902	1003	1103
173	255	336	411	505	604	703	802	903	1003	1103
174	256	338	412	506	604	703	803	903	1003	1104
175	257	339	413	506	605	704	803	903	1003	1104
176	258	340	414	507	605	704	803	904	1004	1104
177	259	342	415	507	605	704	803	904	1004	1104
178	260	343	417	508	606	705	803	904	1004	1105
179	262	345	418	509	606	705	804	905	1005	1105
180	263	346	419	509	607	706	804	905	1005	1105
181	264	347	421	510	608	706	804	906	1005	1106
182	265	349	423	511	608	707	805	906	1006	1106
183	266	350	424	512	609	707	805	907	1006	1106
184	267	351	426	513	610	708	806	907	1007	1107

RIT Score	Equivalent GM Scaled Scores by Grade: ELA/Reading									
	2	3	4	5	6	7	8	9	10	11
185	268	352	428	514	610	709	806	908	1007	1107
186	269	354	429	515	611	709	807	909	1008	1108
187	270	355	431	517	612	710	807	909	1009	1108
188	271	356	433	518	613	711	808	910	1009	1109
189	272	357	435	519	614	712	808	911	1010	1110
190	273	359	437	521	615	713	809	911	1011	1110
191	274	360	438	523	616	714	810	912	1011	1111
192	275	361	440	524	618	715	811	913	1012	1112
193	276	362	442	526	619	716	812	914	1013	1112
194	276	363	444	528	620	717	812	915	1014	1113
195	277	364	446	530	622	718	813	916	1015	1114
196	278	366	447	531	623	719	814	917	1016	1115
197	279	367	449	533	625	720	816	918	1016	1116
198	280	368	451	535	626	722	817	919	1017	1117
199	281	369	453	537	628	723	818	920	1018	1118
200	282	370	454	539	630	724	819	921	1020	1119
201	283	371	456	541	631	726	821	922	1021	1120
202	284	372	458	543	633	727	822	924	1022	1121
203	285	373	459	545	635	729	823	925	1023	1122
204	285	374	461	547	637	730	825	926	1024	1123
205	286	376	462	549	639	732	826	927	1025	1125
206	287	377	464	551	640	733	828	929	1027	1126
207	288	378	465	553	642	735	830	930	1028	1127
208	289	379	467	554	644	737	831	931	1029	1129
209	289	380	468	556	646	738	833	933	1031	1130
210	290	381	470	558	648	740	835	934	1032	1131
211	291	382	471	560	650	742	837	936	1033	1133
212	292	383	473	562	652	744	839	937	1035	1134
213	292	384	474	563	654	746	840	939	1036	1136
214	293	385	476	565	655	748	842	940	1038	1137
215	294	386	477	567	657	749	844	942	1039	1139
216	294	387	478	568	659	751	846	943	1041	1141
217	295	388	480	570	661	753	848	945	1043	1142
218	295	389	481	572	663	755	850	947	1044	1144
219	296	389	482	573	665	757	852	948	1046	1146
220	296	390	484	575	666	759	854	950	1048	1147
221	297	391	485	576	668	761	856	952	1049	1149
222	297	392	486	578	670	763	858	954	1051	1151
223	298	393	487	579	672	765	859	955	1053	1153
224	298	394	488	581	673	767	861	957	1054	1154
225	298	394	489	582	675	769	863	959	1056	1156
226	299	395	491	584	677	771	865	961	1058	1158
227	299	396	492	585	678	772	867	963	1060	1160

RIT Score	Equivalent GM Scaled Scores by Grade: ELA/Reading									
	2	3	4	5	6	7	8	9	10	11
228	299	396	492	586	680	774	869	965	1062	1161
229	299	397	493	588	682	776	870	967	1063	1163
230	299	397	494	589	683	778	872	969	1065	1165
231	299	398	495	590	685	780	874	971	1067	1167
232	299	398	496	591	686	781	876	973	1069	1168
233	299	398	496	592	687	783	877	975	1071	1170
234	299	399	497	593	689	785	879	977	1072	1172
235	299	399	497	594	690	786	881	978	1074	1174
236	299	399	498	595	691	788	882	980	1076	1175
237	299	399	498	596	692	789	884	982	1078	1177
238	299	399	498	596	693	790	885	984	1079	1178
239	299	399	499	597	694	791	887	985	1081	1180
240	299	399	499	597	695	792	888	987	1082	1182
241	299	399	499	598	696	793	889	988	1084	1183
242	299	399	499	598	696	794	891	990	1086	1185
243	299	399	499	598	697	795	892	991	1087	1186
244	299	399	499	599	697	796	893	992	1088	1187
245	299	399	499	599	698	796	894	993	1090	1189
246	299	399	499	599	698	797	895	994	1091	1190
247	299	399	499	599	698	797	895	995	1092	1191
248	299	399	499	599	699	798	896	996	1093	1192
249	299	399	499	599	699	798	897	996	1094	1193
250	299	399	499	599	699	798	897	997	1095	1194
251	299	399	499	599	699	799	898	998	1095	1195
252	299	399	499	599	699	799	898	998	1096	1195
253	299	399	499	599	699	799	898	998	1097	1196
254	299	399	499	599	699	799	899	999	1097	1197
255	299	399	499	599	699	799	899	999	1098	1197
256	299	399	499	599	699	799	899	999	1098	1197
257	299	399	499	599	699	799	899	999	1098	1198
258	299	399	499	599	699	799	899	999	1099	1198
259	299	399	499	599	699	799	899	999	1099	1198
260	299	399	499	599	699	799	899	999	1099	1199
261	299	399	499	599	699	799	899	999	1099	1199
262	299	399	499	599	699	799	899	999	1099	1199
263	299	399	499	599	699	799	899	999	1099	1199
264	299	399	499	599	699	799	899	999	1099	1199
265	299	399	499	599	699	799	899	999	1099	1199
266	299	399	499	599	699	799	899	999	1099	1199
267	299	399	499	599	699	799	899	999	1099	1199
268	299	399	499	599	699	799	899	999	1099	1199
269	299	399	499	599	699	799	899	999	1099	1199
270	299	399	499	599	699	799	899	999	1099	1199

RIT Score	Equivalent GM Scaled Scores by Grade: ELA/Reading									
	2	3	4	5	6	7	8	9	10	11
271	299	399	499	599	699	799	899	999	1099	1199
272	299	399	499	599	699	799	899	999	1099	1199
273	299	399	499	599	699	799	899	999	1099	1199
274	299	399	499	599	699	799	899	999	1099	1199
275	299	399	499	599	699	799	899	999	1099	1199
276	299	399	499	599	699	799	899	999	1099	1199
277	299	399	499	599	699	799	899	999	1099	1199
278	299	399	499	599	699	799	899	999	1099	1199
279	299	399	499	599	699	799	899	999	1099	1199
280	299	399	499	599	699	799	899	999	1099	1199
281	299	399	499	599	699	799	899	999	1099	1199
282	299	399	499	599	699	799	899	999	1099	1199
283	299	399	499	599	699	799	899	999	1099	1199
284	299	399	499	599	699	799	899	999	1099	1199
285	299	399	499	599	699	799	899	999	1099	1199
286	299	399	499	599	699	799	899	999	1099	1199
287	299	399	499	599	699	799	899	999	1099	1199
288	299	399	499	599	699	799	899	999	1099	1199
289	299	399	499	599	699	799	899	999	1099	1199
290	299	399	499	599	699	799	899	999	1099	1199
291	299	399	499	599	699	799	899	999	1099	1199
292	299	399	499	599	699	799	899	999	1099	1199
293	299	399	499	599	699	799	899	999	1099	1199
294	299	399	499	599	699	799	899	999	1099	1199
295	299	399	499	599	699	799	899	999	1099	1199
296	299	399	499	599	699	799	899	999	1099	1199
297	299	399	499	599	699	799	899	999	1099	1199
298	299	399	499	599	699	799	899	999	1099	1199
299	299	399	499	599	699	799	899	999	1099	1199
300	299	399	499	599	699	799	899	999	1099	1199

3.4. Classification Agreement

Table 3.6 presents the classification agreement rates and kappa values for the five categories of performance and GLE levels. Table 3.7 presents the classification accuracy summary statistics for the two performance categories: proficient and not proficient. These results indicate how well the equivalent GM scaled scores predicted from the MAP Growth RIT scores can classify the performance and GLE levels (as well as the proficiency on the GM tests), providing insight into the predictive validity of MAP Growth. The exact match rates range from 47.3 to 65.5. The adjacent match rates range from 91.3 to 99.9. The Cohen's kappa values range from 0.32 to 0.46. Both the exact match rate and Cohen's kappa values suggest a moderate level of agreement. The high adjacent match rates suggest the classifications are acceptable.

The overall classification accuracy rate ranges from 0.83 to 0.86 for mathematics and 0.84 to 0.89 for ELA/reading. These values suggest that the RIT scores are effective at classifying students as proficient or not proficient on the GM assessment.

Table 3.6. Classification Agreement Rates for Five Performance and GLE Levels

Subject	Grade	N	PL/GLE_Exact (%)	PL/GLE_Adjacent (%)	Kappa
Mathematics	K	2548	57.0	96.6	0.42
	1	4771	60.1	98.0	0.46
	2	5282	58.8	98.3	0.44
	3	4975	58.8	98.4	0.45
	4	5199	56.2	96.3	0.43
	5	5236	51.6	95.2	0.38
	6	5351	49.2	93.5	0.35
	7	4729	49.8	91.4	0.35
	8	4266	47.3	91.3	0.32
ELA/Reading	2	8521	65.5	99.9	0.52
	3	17669	63.6	99.5	0.51
	4	19949	58.5	97.3	0.47
	5	20028	54.9	95.9	0.43
	6	22271	55.0	95.6	0.42
	7	18226	54.7	95.4	0.41
	8	17039	52.3	94.3	0.39
	9	3817	53.0	94.9	0.37
	10	2837	54.2	94.1	0.40
	11	1728	53.5	95.2	0.40

Note. PL = performance level; GLE = grade level equivalent.

Table 3.7. Classification Accuracy Results for Proficient and Not Proficient

Grade	N	CA	FP	FN	Sensitivity	Specificity	Precision	AUC
Mathematics								
K	2548	0.84	0.18	0.15	0.85	0.82	0.85	0.84
1	4771	0.83	0.23	0.12	0.88	0.77	0.84	0.83
2	5282	0.83	0.20	0.14	0.86	0.80	0.85	0.83
3	4975	0.83	0.18	0.16	0.84	0.82	0.82	0.83
4	5199	0.84	0.14	0.19	0.81	0.86	0.84	0.84
5	5236	0.83	0.11	0.25	0.75	0.89	0.84	0.82
6	5351	0.85	0.08	0.33	0.67	0.92	0.78	0.79
7	4729	0.86	0.09	0.27	0.73	0.91	0.76	0.82
8	4266	0.83	0.11	0.31	0.69	0.89	0.75	0.79
ELA/Reading								
2	8521	0.87	0.14	0.12	0.88	0.86	0.88	0.87
3	17669	0.86	0.18	0.11	0.89	0.82	0.84	0.86
4	19949	0.85	0.14	0.17	0.83	0.86	0.82	0.85
5	20028	0.84	0.14	0.19	0.81	0.86	0.80	0.83
6	22271	0.86	0.09	0.24	0.76	0.91	0.78	0.83
7	18226	0.88	0.08	0.26	0.74	0.92	0.77	0.83
8	17039	0.86	0.09	0.27	0.73	0.91	0.78	0.82
9	3817	0.89	0.05	0.34	0.66	0.95	0.75	0.80
10	2837	0.89	0.06	0.28	0.72	0.94	0.77	0.83
11	1728	0.87	0.09	0.25	0.75	0.91	0.79	0.83

Note. CA = overall classification accuracy rate; FP = false positive rate; FN = false negative rate; AUC = area under the ROC curve.

3.5. Guidelines for Using the Study Results

The sole purpose of this study is to assist partners transitioning from using GM to MAP Growth assessments by linking the RIT scores from MAP Growth with the scaled scores from GM. This allows partners to continue gaining valuable insights into student performance and progress by comparing against their historical data while also benefiting from additional support through improved educational technology tools and resources based on RIT scores. For example, partners can convert RIT scores to the equivalent GM scaled scores and then derive other scores (such as performance levels and GLE scores) based on the existing rules used for the GM tests. The equivalent GM scaled scores and their corresponding derived scores can be compared against the historical data; however, it is important to understand that the prediction of GM scaled scores from RIT scores is not flawless, given the imperfect correlation between them as well as discrepancies in test design.

Although the correlations between the RIT scores and GM scaled scores for most of the tests are reasonably positive ($r > 0.7$), numerous differences exist between the MAP Growth and GM assessments. Some noticeable differences include: 1) the RIT scores are vertically scaled, whereas the GM scale score metric for each test grade and subject is determined independently of those for other test grades and subjects; 2) the detailed content coverage of the two assessments differs; 3) the proficiency levels are determined using different criteria; 4) the criteria used to make instruction intervention decisions differ. Therefore, it is not recommended

to compare the instructional decisions suggested by RIT scores with those based on the GM scaled scores.

References

Huynh, H., & Meyer, P. (2010). Use of Robust Z in detecting unstable items in item response theory models. *Practical Assessment, Research & Evaluation*, *15*(2), 1–8. https://doi.org/10.7275/ycx6-e864

Kolen, M. J., & Brennan, R. L. (2004). *Test equating, scaling, and linking: Methods and practices* (2nd ed.). Springer. https://doi.org/10.1007/978-1-4939-0317-7

Pommerich, M., Hanson, B., Harris, D., & Sconing, J. (2004). Issues in conducting linkage between distinct tests. *Applied Psychological Measurement*, *28*(4), 247–273. https://doi.org/10.1177/0146621604265033

Thum, Y. M., & Kuhfeld, M. (2020). *NWEA 2020 MAP Growth achievement status and growth norms for students and schools*. NWEA Research Report. NWEA. https://teach.mapnwea.org/impl/normsResearchStudy.pdf