

Office of Shared Accountability
APPLIED RESEARCH

MONTGOMERY COUNTY PUBLIC SCHOOLS, ROCKVILLE, MARYLAND

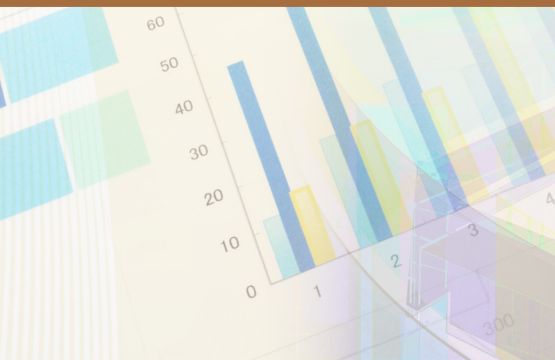
Linking PARCC and MAP Assessments for Students in Montgomery County Public Schools

June 2016

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Published for the Office of Shared Accountability Applied Research Team
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1064.16 • 5/16

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Executive Summary

The Office of Shared Accountability (OSA) in Montgomery County Public Schools (MCPS) conducted a linking study to examine the relationship of the Measures of Academic Progress (MAP) assessment with the Common Core Consortia Partnership for Assessment of Readiness for College and Careers (PARCC) assessment in the 2014–2015 school year. This is the first study to address how existing assessments administered in MCPS can serve as indicators of college and career readiness as measured by PARCC.

The study served two major purposes: 1) to predict college and career readiness on summative PARCC based on fall MAP; and 2) to compare spring MAP and summative PARCC scores. The study results can provide information on how to use MAP data to adjust instruction and to provide additional supports for students at risk of not attaining college and career readiness scores on PARCC. The results can also provide actionable knowledge to stakeholders that will help improve the MCPS accountability system.

This study addressed the following research questions for Grades 3–8 in reading and mathematics. Analyses by grade, content area, and student group were conducted when applicable.

- 1) How did fall/spring MAP RIT scores correlate to summative PARCC scale scores?
- 2) What were thresholds on fall MAP RIT scores that were associated with 65% and 75% probability (likelihood) of meeting the college and career readiness benchmark on PARCC (performance level 4 or higher)? How accurately did fall MAP RIT scores predict college and career readiness on PARCC?
- 3) How did spring MAP RIT scores correspond to PARCC scale scores?

Methodology

A single-group linking method was used to address the research questions, using data from students in Grades 3–8 who took both MAP and PARCC assessments during the 2014–2015 school year. The study samples were created based on MAP test administrations (fall and spring) and content area (reading and mathematics). Students in Grades 6–8 who took PARCC Algebra 1 or Algebra 2 instead of grade-level PARCC assessments were excluded from mathematics samples of relevant grade levels due to a lack of comparable assessments for MAP. This study examined predictive and concordant relationships between MAP and PARCC through the following statistical procedures: Pearson correlation analysis, logistic regression analysis, and equipercentile linking method. More detailed descriptions of these statistical approaches are provided in the Methodology section of the report. It should be noted that most students in the study samples took grade-level PARCC tests, but a few students took PARCC assessments below their grade levels. Therefore, the analysis was based on tests, not the grade students enrolled.

Summary of Findings

Q1. Correlation between MAP and PARCC

A strong positive correlation between MAP and PARCC assessments was found providing predictive validity evidence between fall MAP RIT scores and PARCC scale scores. In fact, all the correlation coefficients were greater than 0.80 in both reading and mathematics across grade levels (see Table 7 of the report). The correlation between spring MAP RIT scores and PARCC scale scores was even stronger compared to that for the fall MAP and PARCC. The strong positive correlation between the spring MAP and PARCC provided concurrent validity evidence.

Q2. Prediction of College/Career Readiness on PARCC based on Fall MAP

MAP RIT cut scores were identified to predict college and career readiness on PARCC with high probability of 65% and 75% (see Tables 8 and 9 of the report). Probability should not be confused with national percentile ranks. In the context of this study, probability indicated how likely (65% or 75% probability) a student would meet the PARCC benchmark, while national percentile rank can be interpreted as the percentage of students in a norm group whose scores fall below a given student's score. As shown in Table 8 of the report, a fall MAP-R RIT score of 205 in Grade 3 is associated with 75% probability of meeting the PARCC college and career readiness benchmark in English language arts/literature (ELA).

To determine whether observed cut scores were precise, prediction accuracy was also examined by student group in this study. Accurate estimation means a student's predicted performance matched his/her actual performance on PARCC. The accurate prediction does not include students who scored below the fall MAP RIT cut score but actually met the PARCC benchmark (underestimation). For example, with 205 as the fall MAP-R RIT cut score at 75% probability, student performance was accurately predicted for over 80% of Grade 3 students on PARCC ELA (see Table 10 of the report). In Grade 3, the prediction accuracy related to MAP-R RIT cut scores was 80.3% for all students, 74.8% for White, 75.9% for Asian, 83.9% for Black or African American, and 86.7% for Hispanic/Latino students (see Table B1 in Appendix B). The prediction accuracy appeared to be higher for Black or African American and Hispanic/Latino students than for their peers of other races, while all service groups showed a high rate of accurate estimation ranging from 87.6% to 91.9% in Grade 3. The same pattern existed for all other grades across content areas. As shown in Tables 10 and 11 of the report, the prediction accuracy of MAP RIT thresholds was higher for PARCC mathematics (MATH) (84–92%) than for PARCC ELA (77–81%) across grade levels.

Q3. Comparison between Spring MAP and PARCC

One way to compare two tests is through establishing concordance tables, such as the concordance tables for ACT and SAT. In this study, the concordance tables allow users to convert any scores on the spring MAP to their corresponding scores on PARCC in 2014–2015. A scale score of 750 is the benchmark for meeting college and career readiness on PARCC for both reading and mathematics in Grades 3 through 8. Spring MAP RIT scores that corresponded to the college and

career readiness benchmark score (750) on PARCC by grade level and content area are provided in Table 12 of the report. The complete concordance tables can be found in Appendix C.

As displayed in Table 12, spring MAP-R RIT score of 207 corresponded to scale score of 750 on PARCC for Grade 3. In other words, a Grade 3 student who scored 207 on spring MAP-R had a score of 750 on PARCC ELA, and met the Grade 3 college and career readiness benchmark. The concordance tables can also help improve MCPS accountability system when students have scores only on one assessment (MAP or PARCC).

Linking PARCC and MAP Assessments for Students in Montgomery County Public Schools

Helen Y. Wang, Ph.D., Huafang Zhao, Ph.D., and Kecia L. Addison, Ph.D.

Introduction

With the recent shift in assessments in the state of Maryland to the Common Core Consortia Partnership for Assessment of Readiness for College and Careers (PARCC) assessments, Montgomery County Public Schools (MCPS) has been focusing on the implications of PARCC assessment on student performance. In MCPS, full implementation of PARCC across all grade levels occurred during the 2014–2015 school year. It is imperative to understand how existing measures employed in MCPS can serve as indicators of performance on PARCC, the new state accountability assessment. For several years, MCPS has administered Measures of Academic Progress (MAP) assessments developed by the Northwest Evaluation Association (NWEA) in Grades 3 through 8. MAP serves many purposes, from informing instruction of teachers to identifying students for intervention to projecting proficiency on state accountability assessments (NWEA, 2015a). School administrators and staff in MCPS have used MAP data to monitor student academic performance and growth toward meeting or exceeding benchmarks on state accountability assessments and adjust instructional practices accordingly. Findings from this study may provide information for helping at-risk students obtain college and career readiness.

Purpose of the Study

This study was designed to determine evidence of the predictive and concurrent validity of two assessments through linking fall and spring MAP data with the summative PARCC data in 2014–2015 school year. Predictive validity exists when a measure (i.e., fall MAP) can be used to predict scores on another measure (i.e., PARCC) (Messick, 1993). In the context of this study, predictive validity results were used to understand how likely students would succeed on PARCC. Concurrent validity exists when a measure (i.e., spring MAP) shows scores that are closely related to scores on another measure (i.e., PARCC) administered during the same time period (Messick, 1993). Both predictive validity and concurrent validity were measured as correlations between PARCC and MAP. Overall, this study was designed to serve the following purposes:

- 1) Find the predictive and concurrent validity evidence through examining the correlation of MAP RIT scores and PARCC scale scores.
- 2) Identify thresholds on fall MAP RIT scores that predicted 65% and 75% probabilities for meeting the college and career readiness benchmark on PARCC.
- 3) Develop concordance tables to show how spring MAP RIT scores were related to PARCC scale scores.

Literature Review

Linking Study

The research-based linking method has been used to examine the relationship between two different assessments that correlate to each other. The linking method can be used to identify threshold scores on one test corresponding to the benchmark on another test. The single-group design is commonly used for linking studies that requires a sample of students who took both assessments. This design can control for differential proficiency of examinees (Dorans et al., 2010). A type of linking method is equipercentile linking, a statistical procedure that bridges the scores from one test to another through the corresponding percentile ranks on the two tests (Holland & Dorans, 2006). The first step in equipercentile linking is to compute the percentile ranks for the score distributions on each of the two tests and then to pair the scores from the two tests based on the corresponding percentile ranks of the examinees.

For example, research conducted for the College Board (Dorans, 1999) used a single-group equipercentile method to establish concordance tables for the college admission tests SAT and ACT through identifying their scores that had the same percentile ranks. The linking method was relevant because the SAT and ACT were highly correlated (with a correlation coefficient greater than 0.80), although they are different in test-specific constructs.

Linking MAP Data with State-level Accountability Assessments

NWEA has connected MAP data with different state-level accountability assessments across the nation to estimate how MAP RIT scores correspond to “proficiency” and other performance levels on summative state accountability assessments (NWEA, 2016). These studies provide schools and districts with tools to predict students’ reading and mathematics achievement on their state accountability assessments (NWEA, 2015a). NWEA (2015b) conducted a linking study to examine how MAP RIT scores were related to the college and career readiness benchmark measured by the Smarter Balanced Assessment Consortium (Smarter Balanced) and PARCC. Preliminary MAP RIT cut scores for the Smarter Balanced benchmark were established. Limited by the field test sample of Smarter Balanced in spring 2014, the NWEA analyses focused on the percentages of students expected to perform within each of the Smarter Balanced performance levels. The approach is a type of linking method that can provide estimates of cut scores for predicting success on a different test.

Recently, NWEA (2016) completed a linking study to connect MAP with PARCC. Data that corresponded to the college and career readiness benchmark on PARCC (performance level 4 or higher) by content area (reading and mathematics) in Grades 3 through 8 were generated for several states in the PARCC consortia. The study also provided a series of tables that predicted the probability of meeting or exceeding the PARCC benchmark using MAP scores taken during the same school year.

Linking PARCC Data with College Admission Tests

NWEA also established thresholds of MAP RIT scores with college and career readiness benchmarks of other assessments, including ACT (NWEA, 2012, 2015c). The Maryland Assessment Research Center (MARC, 2016) recently conducted a research study to examine the relationship between PARCC test scores and SAT or ACT scores with samples of students in the state who took both PARCC and one of the college admission tests. Although PARCC and the college admission tests do not measure exactly the same content in a similar subject area, the correlational analyses and regression analyses showed that there was a moderate and significant relationship between PARCC tests and corresponding SAT/ACT subtests. Therefore, the equipercentile linking procedure was performed to establish concordance tables for PARCC and the college admission tests in the same content area, reading or mathematics.

Research Questions

The study addressed each of the following questions by grade (or summative PARCC test) level, by content area (reading and mathematics), and by student subgroup, when applicable.

- 1) How did fall/spring MAP RIT scores correlate to PARCC scale scores?
- 2) What were thresholds on fall MAP RIT scores that were associated with 65% and 75% probability (likelihood) of meeting the college and career readiness benchmark on PARCC (performance level 4 or higher)? How accurately did fall MAP RIT scores predict college and career readiness on PARCC?
- 3) How did spring MAP RIT scores correspond to PARCC scale scores?

Methodology

This study utilized the single-group linking method to examine relationships of fall and spring MAP data with the PARCC data in 2014–2015. The linking method was used to identify threshold RIT scores on fall MAP with high probabilities of meeting the college and career readiness benchmark on PARCC and to generate concordance tables for spring MAP and PARCC. The single-group design required grade-level samples of students who took both MAP (in fall and spring test administrations, respectively) and PARCC assessments. The linkage of MAP and PARCC data was realized through various statistical procedures described in the Analysis section of this report.

Measures

Partnership for Assessment of Readiness for College and Careers (PARCC). With computer and paper versions, PARCC assessment is developed to measure students' achievement relative to meeting college and career readiness in English language arts/literature (ELA) and mathematics (MATH). The assessment is aligned to the Common Core State Standards (CCSS) for Grades 3 through 8 and high school. PARCC ELA focuses on text analysis and effective writing, while PARCC MATH focuses on application of skills and concepts and multistep problem solving.

PARCC assessments were operationalized in Maryland in the 2014–2015 school year. The end-of-year summative PARCC data of Grades 3 through 8 were used for this study.

PARCC test levels 3–8 correspond to Grades 3–8 in English language arts/literature and mathematics, respectively. In this study, grade level and test level were interchangeable. The overall PARCC scale scores range from 650 to 850 for each content area across grade levels. There are five performance levels on PARCC. Performance level 4 or higher is classified as meeting or exceeding expectations and on track for college and career. Performance level 4 corresponds to a score of 750 (PARCC, 2016).

Measures of Academic Progress (MAP). MAP is a computer adaptive assessment administered to students in Grades 3 through 8 in MCPS (NWEA, 2011). MAP-Reading (MAP-R) is designed to measure six reading areas including word recognition, reading comprehension, inferential or interpretive comprehension, evaluative comprehension, literary responses or analysis, and general reading. MAP-Mathematics (MAP-M) is designed to measure five mathematics areas, including number process, statistics/probability, algebra, geometry, and measurement. NWEA uses RIT (Rasch unit) scales, which are vertically equated, to measure student achievement and growth. RIT scores, ranging from 100 to 300 with an equal interval, can be added together to calculate group averages. RIT scores and percentile ranks commonly reported for MAP assessments were used in this study.

Samples

During the 2014–2015 school year, all MCPS students in Grades 3 through 8 took fall and spring MAP-R. All elementary school students and only half of middle school students took fall and spring MAP-M. To examine relationships between MAP and PARCC data, students with fall and spring MAP RIT scores and summative PARCC scale scores in 2014–2015 school year were included in the samples. Many students in Grades 6 through 8 took PARCC Algebra 1 or Algebra 2 instead of the grade-level PARCC assessments, and these students were excluded from the samples.

The study included four linking samples of students in Grades 3 through 8:

- Linking sample 1: Students who took both fall MAP-R and summative PARCC ELA assessments
- Linking sample 2: Students who took both fall MAP-M and summative PARCC MATH assessments
- Linking sample 3: Students who took both spring MAP-R and summative PARCC ELA assessments
- Linking sample 4: Students who took both spring MAP-M and summative PARCC MATH assessments

Linking samples 1 and 2 were used for predictive validity analyses, and samples 3 and 4 were used for concurrent validity analyses. Table 1 shows the numbers of students in the samples in comparison with the total students who took PARCC. There was a substantial gap between the size of mathematics samples and the number of students who took PARCC MATH in Grades 6 through 8. Middle school students took different PARCC MATH assessments depending on the

level of mathematics courses in which they were enrolled in 2014–2015. High-performing students in Grades 6 through 8 participated in PARCC Algebra 1 or Algebra 2 instead of the grade-level PARCC assessments, and they were excluded from the mathematics samples.

Table 1
Linking Sample Size and Total PARCC Examinees in 2014–2015

PARCC test	Linking samples				All PARCC takers in MCPS	
	Linking sample 1 (fall MAP-R & PARCC ELA)	Linking sample 2 (fall MAP-M & PARCC MATH)	Linking sample 3 (spring MAP-R & PARCC ELA)	Linking sample 4 (spring MAP-M & PARCC MATH)	PARCC ELA	PARCC MATH
3	11,363	11,446	11,565	11,665	11,638	11,734
4	11,166	10,686	11,340	11,125	11,377	11,475
5	11,201	11,237	11,372	11,443	11,402	11,472
6	10,755	5,203	10,672	5,834	10,950	11,070
7	10,564	4,408	10,463	4,386	10,785	9,866
8	10,308	5,869	9,999	5,748	10,540	6,236

Notes. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded from the mathematics samples.

Analyses

Pearson correlation analysis was used to address research question one, measuring the strength and direction of the relationship between MAP RIT scores and PARCC scale scores. Correlation coefficients range from -1 to +1 with higher values (those closer to -1 or +1) signifying a stronger correlation. The direction of the relation can be positive (between 0 and 1) or negative (between -1 and 0). A positive correlation means as one score increases, the other score also increases, whereas a negative correlation means as one score increases, the other score decreases. A high positive correlation indicates predictive and concurrent validity evidence. The correlation coefficients between MAP RIT scores and PARCC scale scores were presented for each of the linking samples by test administration and content area for each of the grade levels. Table 2 provides a guide for interpretation of correlation coefficients.

Table 2
Correlation Interpretation Guide

Size of correlation	Coefficient general interpretation
0.8 to 1.0	Very strong relationship
0.6 to 0.8	Strong relationship
0.4 to 0.6	Moderate relationship
0.2 to 0.4	Weak relationship
0.0 to 0.2	Weak or no relationship

Source: Salkind, N. J. (2011). *Statistics for people who think they hate statistics*. 4th ed. Sage: Thousand Oaks, California.

Logistic regression analysis was applied to address research question two. The intent was to estimate how fall MAP RIT scores predict a high probability of meeting the college and career readiness benchmark (performance level 4 or higher) on PARCC established by the Maryland State Department of Education (MSDE). In this study, probability is how likely a student who scores at a given cut score on MAP would meet the PARCC college and career readiness

benchmark. After the fall MAP RIT cut scores associated with high probabilities (65% and 75%) of meeting the PARCC benchmark were determined, the prediction accuracy estimated for the 75% probability was examined by student group. The prediction accuracy was examined in three categories:

- *Accurate estimation*: Students' predicted performance (whether or not meeting the fall MAP RIT threshold) agreed with their actual performance (whether or not meeting the PARCC benchmark for college and career readiness).
- *Underestimation*: Students who scored below the fall MAP RIT threshold actually met or exceeded the PARCC benchmark.
- *Overestimation*: Students who scored at or above the fall MAP RIT threshold actually did not meet the PARCC benchmark.

Equipercntile linking method was used to address research question three. In this method, percentile ranks of students in the linking samples were first computed for spring MAP and PARCC, respectively. Then, concordance tables for the two assessments were generated based on students' percentile ranks on the two assessments. Linear interpolation procedure was used in equipercntile linking when the test scores were discrete, or not continuous. The concordance tables can be used to convert spring MAP RIT scores to PARCC scale scores. Specifically, given any spring MAP RIT score, a corresponding PARCC score can be identified.

Limitations

In MCPS, administration of MAP-M was optional for middle school students in 2014–2015. Therefore, middle school results related to MAP-M were based on half of the students who took MAP-M. In addition, a substantial number of middle school students took PARCC Algebra 1 or Algebra 2 instead of the grade-level PARCC MATH at the end of the school year, and these students were excluded from the linking samples. Exploratory analyses showed that students who took PARCC Algebra 1 or Algebra 2 performed higher than their peers who took the grade-level PARCC MATH on MAP-M. The smaller middle school samples in mathematics may bias the analytical results of this study. As a result, future validation with more complete samples is necessary. The results for the middle school mathematics cannot be generalized to students who took PARCC Algebra 1 and Algebra 2.

Results

Descriptive statistics for each linking sample are presented in Tables 3–6. Among students who took fall MAP and PARCC (linking samples 1 and 2), rates for meeting the college and career readiness benchmark ranged from 41.3% to 51.4% for PARCC ELA (Table 3), and from 18.0% to 43.5% for PARCC MATH (Table 4) across the grade levels. Among students who took spring MAP and PARCC (linking samples 3 and 4), rates for meeting the benchmark ranged from 41.1% to 51.6% for PARCC ELA (Table 5) and from 17.6% to 43.0% for PARCC MATH (Table 6) across the grade levels.

In Tables 3 to 6, mean score, standard deviation (SD), and score range for MAP RIT scores and PARCC scale scores are presented by grade level and test administration. In mathematics, the exclusion of those students who took PARCC Algebra 1 or Algebra 2 may have an effect on the low mean scores of PARCC MATH and MAP-M in Grades 6 through 8 (Tables 3 and 6). Thus, caution should be used when reviewing results for these grade levels.

Table 3
Descriptive Statistics of Linking Sample 1 for Fall MAP-R and PARCC ELA

PARCC ELA	N	PARCC benchmark met	PARCC ELA overall scale score				Fall MAP-R RIT score			
			Mean score	SD	Min. score	Max. score	Mean score	SD	Min. score	Max. score
ELA 3	11,363	41.7%	740.37	42.33	650	850	192.58	17.84	133	242
ELA 4	11,166	47.2%	746.59	34.93	650	850	203.34	16.92	143	249
ELA 5	11,201	48.6%	747.11	33.35	650	849	211.56	16.27	143	262
ELA 6	10,755	41.3%	741.12	30.73	650	850	216.49	15.99	143	269
ELA 7	10,564	49.6%	746.11	37.24	650	850	221.11	15.76	147	263
ELA 8	10,308	51.4%	747.70	38.36	650	850	224.99	15.85	142	272

Notes. Includes students with both fall MAP-R RIT scores and PARCC ELA scale scores. SD indicates standard deviation.

Table 4
Descriptive Statistics of Linking Sample 2 for Fall MAP-M and PARCC MATH

PARCC MATH	N	PARCC benchmark met	PARCC MATH scale score				Fall MAP-M RIT score			
			Mean score	SD	Min. score	Max. score	Mean score	SD	Min. score	Max. score
MATH 3	11,446	43.5%	742.85	35.13	650	850	192.83	13.62	136	257
MATH 4	10,686	38.9%	740.97	32.94	650	850	204.70	14.78	140	281
MATH 5	11,237	37.0%	739.27	32.63	650	850	217.58	17.28	143	302
MATH 6	5,203	33.7%	735.94	29.86	650	829	219.53	17.42	140	279
MATH 7	4,408	18.0%	726.26	26.43	650	850	221.76	17.03	146	285
MATH 8	5,869	36.7%	734.76	45.13	650	850	231.52	21.94	152	314

Notes. Includes students with both fall MAP-M RIT scores and PARCC MATH scale scores. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded. SD indicates standard deviation.

Table 5
Descriptive Statistics of Linking Sample 3 for Spring MAP-R and PARCC ELA

PARCC ELA	N	PARCC benchmark met	PARCC ELA scale score				Spring MAP-R RIT score			
			Mean score	SD	Min. score	Max. score	Mean score	SD	Min. score	Max. score
ELA 3	11,565	41.3%	739.94	42.42	650	850	201.24	17.37	141	249
ELA 4	11,340	46.9%	746.28	35.08	650	850	210.00	16.78	140	255
ELA 5	11,372	48.5%	746.95	33.37	650	849	216.61	16.24	144	263
ELA 6	10,672	41.1%	740.86	30.88	650	850	219.87	16.19	144	265
ELA 7	10,463	49.4%	745.99	37.23	650	850	223.52	16.29	141	271
ELA 8	9,999	51.6%	747.79	38.44	650	850	226.90	16.49	141	274

Notes. Includes students with both spring MAP-R RIT scores and PARCC ELA scale scores. SD indicates standard deviation.

Table 6
Descriptive Statistics of Linking Sample 4 for Spring MAP-M and PARCC MATH

PARCC MATH	N	PARCC benchmark met	PARCC MATH scale score				Spring MAP-M RIT score			
			Mean score	SD	Min. score	Max. score	Mean score	SD	Min. score	Max. score
MATH 3	11,665	43.0%	742.39	35.31	650	850	203.11	14.35	136	265
MATH 4	11,125	38.7%	740.81	32.99	650	850	215.88	17.25	142	285
MATH 5	11,443	36.7%	738.94	32.72	650	850	224.66	18.83	146	304
MATH 6	5,834	32.1%	734.47	30.01	650	829	223.40	18.73	141	288
MATH 7	4,386	17.6%	725.83	26.26	650	828	225.00	18.52	149	315
MATH 8	5,748	37.1%	735.45	45.04	650	850	234.61	23.30	143	324

Notes. Includes students with both spring MAP-M RIT scores and PARCC MATH scale scores. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded. SD indicates standard deviation.

Findings of the study are organized in the order of the research questions. As previously indicated, analyses were conducted by grade level, content area, and student group when applicable.

Findings for Research Question One

1) How did fall/spring MAP RIT scores correlate to summative PARCC scale scores?

For reading, correlation coefficients ranged from 0.81 to 0.83 for fall MAP-R and PARCC ELA, and from 0.83 to 0.85 for spring MAP-R and PARCC ELA (Table 7). For mathematics, correlation coefficients ranged from 0.84 to 0.89 for fall MAP-M and PARCC MATH, and from 0.86 to 0.91 for spring MAP-M and PARCC MATH. Findings further revealed that the correlation with the PARCC scale scores was slightly higher for spring than for fall MAP RIT scores across content areas and grade levels. In general, the magnitude of the correlation coefficients observed between MAP tests and PARCC provided predictive and concurrent validity evidence. Although there is a very strong relationship between MAP RIT scores and PARCC scale scores, it is important to remember that correlation does not imply causation.

Table 7
Correlation Between MAP RIT Scores and PARCC Scale Scores by Content Area

PARCC ELA	Correlation with fall MAP-R	Correlation with spring MAP-R	PARCC MATH	Correlation with fall MAP-M	Correlation with spring MAP-M
ELA 3	.828	.839	MATH 3	.866	.894
ELA 4	.831	.846	MATH 4	.873	.908
ELA 5	.831	.851	MATH 5	.872	.901
ELA 6	.831	.848	MATH 6	.885	.902
ELA 7	.831	.838	MATH 7	.840	.859
ELA 8	.814	.826	MATH 8	.887	.899

Notes. Including students with both MAP RIT scores and PARCC scale scores. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded.

Findings indicate that MAP RIT scores highly correlated with PARCC scale scores. All correlation coefficients were greater than 0.80, demonstrating a very strong positive correlation between the two assessments in both reading and mathematics (Table 7). In general, higher scores on MAP tended to be paired with higher scores on PARCC, and lower scores on MAP tended to be paired with lower scores on PARCC.

Findings for Research Question Two

- 2) *What were thresholds on fall MAP RIT scores that were associated with 65% and 75% probability (likelihood) of meeting the college and career readiness benchmark on PARCC (performance level 4 or higher)? How accurately did fall MAP RIT scores predict college and career readiness on PARCC?*

MAP Threshold Cut Scores

Findings indicate that a student who did not meet the threshold cut scores in MAP-R or MAP-M in fall test administration was at a higher risk for not meeting the college and career readiness benchmark on PARCC. It is important to keep in mind that the cut scores were estimated based on group performance. Therefore, the standard error should be taken into account when applying the cut scores to individual students. In other words, an expected score for a particular student can be slightly higher or lower than the cut score due to estimation error.

Threshold cut scores were established for probabilities of 65% and 75%. These are not to be confused with performance at national percentiles. Probabilities indicate the likelihood of meeting a stated cut. As shown in Table 8, Grade 3 students who earned a RIT score of 202 on fall MAP-R had a 65% probability of achieving level 4 or higher on PARCC ELA, which corresponds to a national percentile rank between 80 to 81 (2015 NWEA norms). The national percentile rank indicated that MCPS students who scored 202 in fall performed higher than 80–81% of Grade 3 students in the national norming group who took the same test at the same time. If a Grade 3 student earned a RIT score of 205 on fall MAP-R, s/he then had a 75% probability of performing at level 4 or higher on PARCC ELA, and their corresponding national percentile rank increased to 85 and 86.

Table 8
Fall MAP-R RIT Cut Score Associated With Predicted Probability of Being College and Career Ready (Performance Level 4 or Higher on PARCC ELA)

PARCC ELA	Cut score at 65% probability	National percentile rank	Cut score at 75% probability	National percentile rank
ELA 3	202	80-81	205	85-86
ELA 4	210	77-78	212	81-82
ELA 5	217	77-78	219	81-81
ELA 6	225	82-83	227	86
ELA 7	226	77-78	228	81-82
ELA 8	229	77-78	232	82-83

Notes. Including students with both fall MAP-R RIT scores and PARCC ELA scale scores. National percentile ranks were based on MAP 2015 norms.

The MAP-M RIT cut scores that predicted likelihoods of achieving the college and career readiness benchmark on PARCC MATH are shown in Table 9. A Grade 5 student who scored 227 on fall MAP-M, for example, had a 65% probability of obtaining level 4 or higher on PARCC MATH, and the probability would increase to 75% if the student scored 229 on fall MAP-M. Graphical representation of prediction results are provided in Figures A1 and A2 in Appendix A for reading and mathematics, respectively.

Table 9
Fall MAP-M RIT Cut Score Associated With Predicted Probability of Being College and Career Ready (Performance Level 4 or Higher on PARCC MATH)

PARCC MATH	Cut score at 65% probability	National percentile rank	Cut score at 75% probability	National percentile rank
MATH 3	198	71-73	200	76-77
MATH 4	212	76-77	213	78-79
MATH 5	227	85-86	229	88-89
MATH 6	231	80-81	233	84
MATH 7	241	86-87	243	89-89
MATH 8	243	82-83	244	84

Notes. Including students with both fall MAP-M RIT scores and PARCC MATH scale scores. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded. National percentile ranks were based on MAP 2015 norms.

The information regarding the thresholds on fall MAP RIT scores associated with the likelihood of performing at level 4 or higher on PARCC may help teachers interpret MAP RIT scores and use the data to guide instruction. Teachers may need to provide additional supports to students who do not meet the threshold cut scores. With the difficulty-adaptive nature of MAP assessments, if students did not make their best efforts, their MAP RIT scores may not accurately reflect their academic abilities.

Prediction Accuracy

It is important to examine prediction accuracy for established cut scores. For this study, prediction accuracy was computed at 75% probability of meeting or exceeding the college and career readiness benchmark on PARCC. The prediction could fall into one of three categories: accurate estimation, underestimation, and overestimation. Accurate estimation means the predicted and actual performance match, including percentage accurately predicted to be college/career ready and percentage predicted not to be ready.

Across grade levels, accurate estimation rates for fall MAP-R cut scores were between 77.4% for Grade 8 and 80.5% for Grade 4 (Table 10). Among Grade 3 students whose performance was accurately estimated, 24.7% of them who scored at or above the fall MAP-R cut score of 205 actually met the PARCC benchmark; 55.6% of the students who scored below the score of 205 in fall did not meet the PARCC benchmark (total accuracy=80.3%) (Table 10). The Grade 3 underestimation rate was 17.1%, which refers to the percentage of students who scored below 205 on fall MAP-R but met the PARCC benchmark. The overestimation rate was 3%, referring to the percentage of Grade 3 students who scored at 205 or higher but did not meet the PARCC benchmark.

Table 10
Prediction Accuracy for Fall MAP-R RIT Cut Score Predicting 75% Probability of Being College and Career Ready (Performance Level 4 or Higher on PARCC ELA)

PARCC ELA	% Accurate estimation	% accurately predicted to be ready	% accurately predicted not to be ready	% Underestimation	% Overestimation
ELA 3	80.3	24.7	55.6	17.1	2.6
ELA 4	80.5	30.8	49.8	16.4	3.1
ELA 5	80.2	32.1	48.1	16.5	3.2
ELA 6	79.9	24.0	55.9	17.3	2.8
ELA 7	80.0	33.2	46.8	16.4	3.7
ELA 8	77.4	31.9	45.5	19.5	3.1

Notes. Including students with both fall MAP-R RIT scores and PARCC ELA scales scores. Accurate estimation means a student met or did not meet the college and career readiness benchmark of performance level 4 on PARCC ELA as predicted by fall MAP-R. Underestimation means a student college and career ready on PARCC ELA while scoring below the fall MAP-R RIT cut score. Overestimation means a student failed to meet the college and career readiness benchmark on PARCC ELA while scoring at or above the fall MAP-R RIT cut score.

With MAP-M RIT cut scores that predicted whether or not a student met the PARCC college and career readiness benchmark, the accurate estimation ranged from 84.0% for Grade 3 to 91.6% for Grade 8 (Table 11). The prediction accuracy of MAP-M cut scores increased with grade level.

Table 11
Prediction Accuracy for Fall MAP-M RIT Cut Score Predicting 75% Probability of Being College and Career Ready (Performance Level 4 or Higher on PARCC MATH)

PARCC MATH	% Accurate estimation	% Readiness accurately predicted	% Non-readiness accurately predicted	% Underestimation	% Overestimation
MATH 3	84.0	29.9	54.1	13.6	2.4
MATH 4	84.6	25.6	58.9	13.2	2.2
MATH 5	84.6	23.5	61.1	13.5	1.9
MATH 6	86.5	22.0	64.5	11.7	1.8
MATH 7	89.4	8.1	81.3	10.0	0.7
MATH 8	91.6	29.7	61.9	7.0	1.4

Notes. Including students with both fall MAP-M RIT scores and PARCC MATH scale scores. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded. Accurate estimation means a student met or did not meet the college and career readiness benchmark of performance level 4 on PARCC MATH as predicted by fall MAP-M. Underestimation means a student college and career ready on PARCC MATH while scoring below the fall MAP-M RIT cut score. Overestimation means a student failed to meet the college and career readiness benchmark on PARCC MATH while scoring at or above the fall MAP-M RIT cut score.

In addition, rates of underestimation ranged from 16.4% to 19.5% for fall MAP-R and the PARCC ELA (Table 10), and from 7.0% to 13.6% for fall MAP-M and the PARCC MATH (Table 11). Rates of overestimation ranged from 2.6% to 3.7% for fall MAP-R and the PARCC ELA (Table 10), and from 0.7% to 2.4% for fall MAP-M and mathematics (Table 11). Among students whose performance was inaccurately estimated, they were more likely to be underestimated than overestimated, indicating the cut score at 75% probability reasonably rigorous. In other words, the fall MAP RIT cut scores were set high enough to have a relatively low rate of overestimation of college and career readiness on PARCC.

Prediction accuracy by student group is provided in Appendix B. Taking Grade 3 fall MAP-R as an example, its accurate estimation was 80.3% for all students, 74.8% for White, 75.3% for students identified as Two or More Races, 75.9% for Asian, 83.9% for Black or African American, and 86.7% for Hispanic/Latino students (see Table B1). The prediction accuracy appeared to be higher for Black or African American and Hispanic/Latino students than for their peers of other races, while all service groups showed a high rate of accurate estimation ranging from 87.6% to 91.9% in Grade 3. The prediction accuracy of fall MAP-R for Grades 4 through 8 mirrored the pattern for Grade 3.

For Grade 3 MAP-M, accurate estimation was 84.0% for all students, 80.3% for White, 83.0% for students identified as Two or More Races, 83.1% for Asian, 85.6% for Black or African American, and 87.5% for Hispanic/Latino students (see Table B2). The prediction accuracy for MAP-M also appeared to be slightly higher for Black or African American and Hispanic/Latino students than for their peer counterparts, while all service groups showed a high rate of accurate estimation as well, ranging from 88.0% to 92.3% in Grade 3. The prediction accuracy of fall MAP-M for Grades 4 through 8 mirrored the pattern for Grade 3.

Threshold cut scores associated with 65% and 75% probabilities of meeting performance level 3 on PARCC and their prediction accuracy were also computed by content area and grade level (See Tables B3 to B6 in Appendix B).

Findings for Research Question Three

3) *How did spring MAP RIT scores correspond to PARCC overall scale scores?*

Estimated MAP RIT scores associated with the college and career readiness benchmark score on PARCC (750) for both content areas and across grade levels are presented in Table 12. The concordance tables can be used to convert spring MAP RIT scores to PARCC scores. A RIT score of 207 on the spring MAP-R corresponded to the PARCC benchmark score of 750 for Grade 3, 213 for Grade 4, 219 for Grade 5, 225 for Grade 6, 226 for Grade 7, and 228 for Grade 8. In mathematics, the spring MAP-M score corresponding to the PARCC benchmark score of 750 was 206 for Grade 3, 221 for Grade 4, 231 for Grade 5, 233 for Grade 6, and 242 for Grades 7 and 8.

Table 12
Concordance Table for Spring MAP RIT Scores Corresponding to the College and Career Readiness Benchmark Score (750) on PARCC Assessment by Content Area

PARCC ELA	Spring MAP-R corresponding score	PARCC Readiness benchmark score	PARCC MATH	Spring MAP-M corresponding score	PARCC Readiness benchmark score
ELA 3	207	750	MATH 3	206	750
ELA 4	213	750	MATH 4	221	750
ELA 5	219	750	MATH 5	231	750
ELA 6	225	750	MATH 6	233	750
ELA 7	226	750	MATH 7	242	750
ELA 8	228	750	MATH 8	242	750

Notes. Including students who took both spring MAP and grade-level PARCC assessments.

Complete concordance tables for MAP and PARCC are presented in Appendix C. In Tables C1 and C2, given an observed MAP RIT score in reading or mathematics, one can find the corresponding scale score on PARCC. Taking Grade 3 reading as an example, a student who scored 215 on MAP-R in spring would have a score of 776 on PARCC ELA, and a student who scored 234 on MAP-R would have a score of 843 on PARCC ELA. For each grade level and content area, MAP scores corresponding to the PARCC scores related to performance level 4 (750) and level 3 (725) were highlighted in yellow and blue, respectively (see Tables C1 and C2).

Because MAP RIT scores are vertically equated, the MAP RIT scores corresponding to 750 on PARCC can serve as the expected performance on MAP for meeting the college and career readiness benchmark. Put differently, if a student at any grade level scored at or above the spring MAP scores corresponding to 750 on PARCC, s/he met the PARCC benchmark in 2014–2015.

Conclusions

The results of the study have demonstrated strong predictive and concurrent validity evidence for MAP and the summative PARCC assessments for both reading and mathematics across grade

levels, which supports the continuous use of MAP assessments in MCPS for predicting PARCC success. For instance, given the strong predictive validity evidence for fall MAP and PARCC, fall MAP-R can be used to predict how well a student will do on PARCC ELA. The threshold cut scores used to predict the high probabilities (i.e., 65% and 75%) of meeting the college and career readiness benchmark on PARCC were determined in both reading and mathematics across grade levels. High prediction accuracy was observed across grade levels, content areas, and student groups. Meanwhile, based on the strong concurrent validity evidence for spring MAP and PARCC, concordance tables were established to enable MCPS educators to convert MAP RIT scores to PARCC scale scores.

More specifically, the study results can provide information to guide instructional practices and to help improve student academic performance toward meeting the college and career readiness benchmark on PARCC. Students who score below the predictive cut score in fall MAP-R and/or MAP-M are at higher risk for not meeting the PARCC benchmark and may need more instructional support. The fall MAP cut scores should be used along with other measures (i.e., course performance, motivation, test skills, etc) in predicting success on PARCC. In addition, the concordance tables may also provide school administrators and teachers with guidance for instructional planning; the earlier a student reaches the spring MAP RIT threshold score during the year (e.g., in fall), the more likely s/he will be college and career ready. The concordance tables allow MCPS to use MAP and PARCC scores interchangeably for its accountability system, if needed.

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Appendix A: Graphical Presentation of College and Career Readiness Prediction

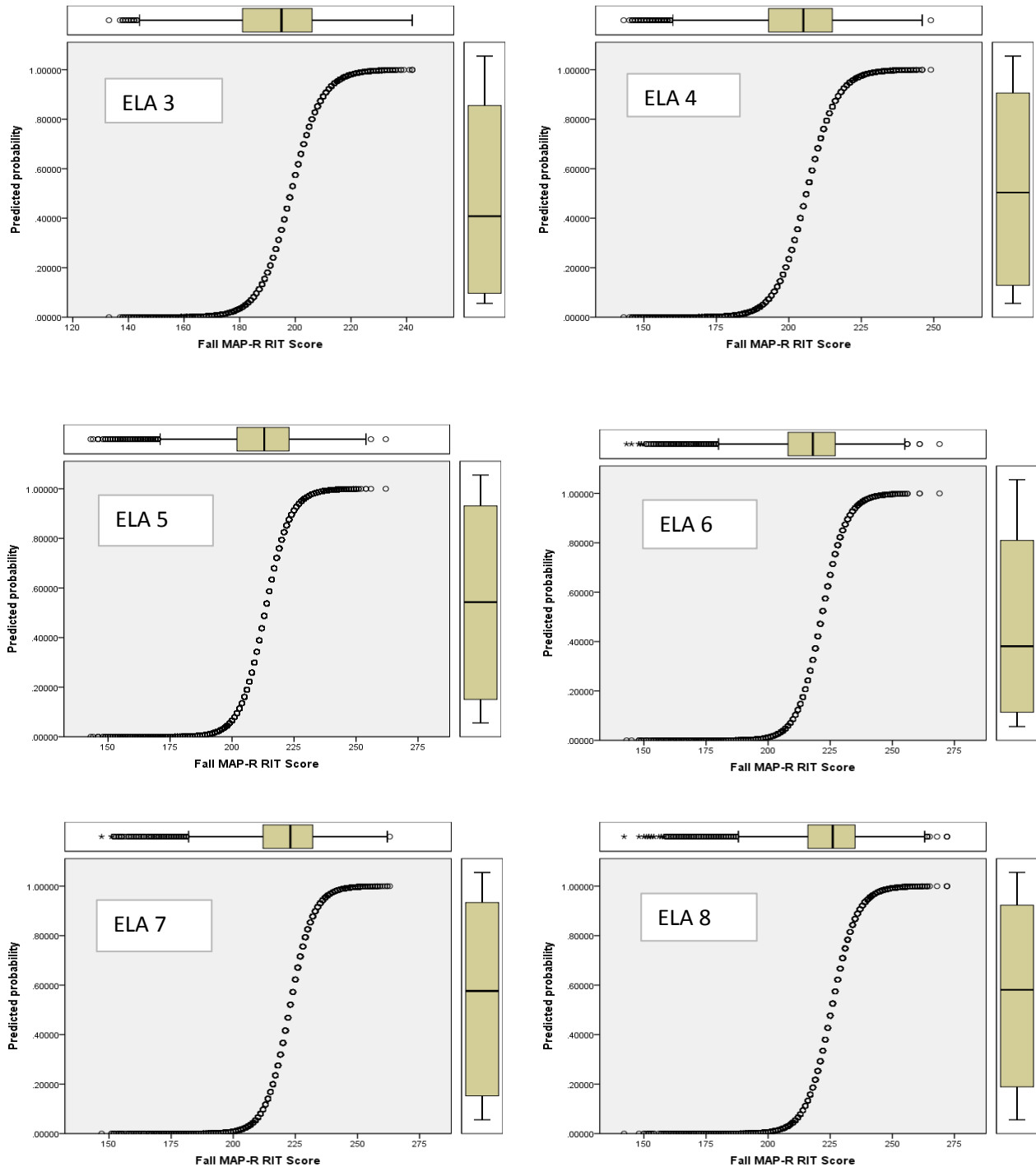


Figure 1. Graphical representation of Fall MAP-R predictions for college and career readiness on PARCC ELA.

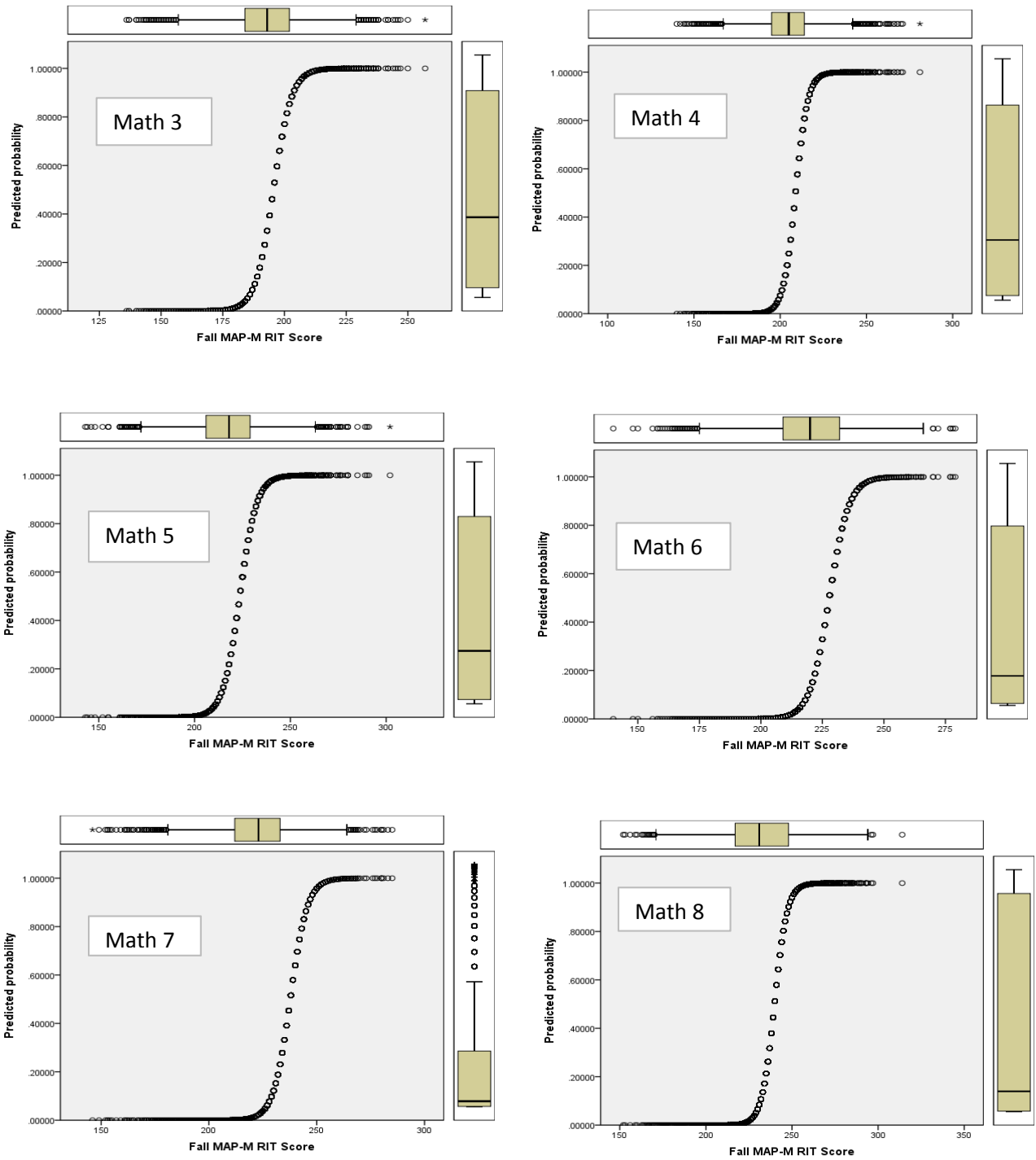


Figure 2. Graphical representation of Fall MAP-M predictions for college and career readiness on PARCC MATH.

Appendix B: Prediction Accuracy for College and Career Readiness

Table B1

Accuracy for Fall MAP-R Predicting College and Career Readiness (Performance Levels 4 or Higher on PARCC ELA) by Student Subgroup

PARCC ELA	Student group	# Students	Accurate estimation		Readiness accurately estimated		Non-readiness accurately estimated		Under-estimation		Over-estimation	
			<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
ELA 3	All	11363	9125	80.3	2802	24.7	6323	55.6	1939	17.1	299	2.6
	Asian	1595	1210	75.9	663	41.6	547	34.3	341	21.4	44	2.8
	Black/AfAm	2298	1929	83.9	294	12.8	1635	71.1	309	13.4	60	2.6
	Hisp/Latino	3339	2894	86.7	269	8.1	2625	78.6	391	11.7	54	1.6
	White	3476	2601	74.8	1350	38.8	1251	36.0	764	22.0	111	3.2
	Two+ Races	616	464	75.3	221	35.9	243	39.4	126	20.5	26	4.2
	LEP	3291	2896	88.0	176	5.3	2720	82.6	354	10.8	41	1.2
	FARMS	4353	3815	87.6	243	5.6	3572	82.1	468	10.8	70	1.6
	SpEd	1192	1096	91.9	65	5.5	1031	86.5	81	6.8	15	1.3
ELA 4	All	11166	8993	80.5	3436	30.8	5557	49.8	1830	16.4	343	3.1
	Asian	1664	1286	77.3	819	49.2	467	28.1	333	20.0	45	2.7
	Black/AfAm	2308	1931	83.7	391	16.9	1540	66.7	301	13.0	76	3.3
	Hisp/Latino	3065	2612	85.2	308	10.0	2304	75.2	402	13.1	51	1.7
	White	3588	2723	75.9	1680	46.8	1043	29.1	714	19.9	151	4.2
	Two+ Races	514	415	80.7	232	45.1	183	35.6	79	15.4	20	3.9
	LEP	3325	2844	85.5	308	9.3	2536	76.3	419	12.6	62	1.9
	FARMS	4055	3502	86.4	363	9.0	3139	77.4	467	11.5	86	2.1
	SpEd	1179	1083	91.9	87	7.4	996	84.5	68	5.8	28	2.4
ELA 5	All	11201	8988	80.2	3597	32.1	5391	48.1	1849	16.5	364	3.2
	Asian	1675	1295	77.3	815	48.7	480	28.7	339	20.2	41	2.4
	Black/AfAm	2314	1892	81.8	374	16.2	1518	65.6	341	14.7	81	3.5

Continued

Table B1
Accuracy for Fall MAP-R Predicting College and Career Readiness (Performance Levels 4 or Higher on PARCC ELA) by Student Subgroup

PARCC ELA	Student group	# Students	Accurate estimation		Readiness accurately estimated		Non-readiness accurately estimated		Under-estimation		Over-estimation	
			N	%	N	%	N	%	N	%	N	%
		Total										
	Hisp/Latino	2939	2503	85.2	313	10.6	2190	74.5	375	12.8	61	2.1
	White	3710	2848	76.8	1870	50.4	978	26.4	707	19.1	155	4.2
	Two+ Races	543	434	79.9	220	40.5	214	39.4	83	15.3	26	4.8
	LEP	2691	2328	86.5	161	6.0	2167	80.5	320	11.9	43	1.6
	FARMS	3935	3355	85.3	353	9.0	3002	76.3	489	12.4	91	2.3
	SpEd	1164	1079	92.7	62	5.3	1017	87.4	50	4.3	35	3.0
ELA 6	All	10755	8596	79.9	2581	24.0	6015	55.9	1863	17.3	296	2.8
	Asian	1577	1173	74.4	594	37.7	579	36.7	367	23.3	37	2.3
	Black/AfAm	2189	1854	84.7	210	9.6	1644	75.1	285	13.0	50	2.3
	Hisp/Latino	2830	2471	87.3	221	7.8	2250	79.5	310	11.0	49	1.7
	White	3606	2673	74.1	1341	37.2	1332	36.9	796	22.1	137	3.8
	Two+ Races	537	414	77.1	207	38.5	207	38.5	101	18.8	22	4.1
	LEP	1631	1527	93.6	29	1.8	1498	91.8	91	5.6	13	.8
	FARMS	3625	3190	88.0	192	5.3	2998	82.7	382	10.5	53	1.5
	SpEd	1081	1023	94.6	50	4.6	973	90.0	39	3.6	19	1.8
ELA 7	All	10564	8448	80.0	3509	33.2	4939	46.8	1728	16.4	388	3.7
	Asian	1610	1234	76.6	824	51.2	410	25.5	333	20.7	43	2.7
	Black/AfAm	2123	1733	81.6	322	15.2	1411	66.5	311	14.6	79	3.7
	Hisp/Latino	2797	2381	85.1	356	12.7	2025	72.4	346	12.4	70	2.5
	White	3509	2685	76.5	1777	50.6	908	25.9	654	18.6	170	4.8
	Two+ Races	500	400	80.0	226	45.2	174	34.8	76	15.2	24	4.8
	LEP	1489	1376	92.4	60	4.0	1316	88.4	94	6.3	19	1.3
	FARMS	3498	2992	85.5	318	9.1	2674	76.4	422	12.1	84	2.4
	SpEd	1029	964	93.7	60	5.8	904	87.9	35	3.4	30	2.9

Continued

Table B1
Accuracy for Fall MAP-R Predicting College and Career Readiness (Performance Levels 4 or Higher on PARCC ELA) by Student Subgroup

PARCC ELA	Student group	# Students	Accurate estimation		Readiness accurately estimated		Non-readiness accurately estimated		Under-estimation		Over-estimation	
			<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
		Total										
ELA 8	All	10308	7976	77.4	3287	31.9	4689	45.5	2014	19.5	318	3.1
	Asian	1583	1140	72.0	787	49.7	353	22.3	410	25.9	33	2.1
	Black/AfAm	2159	1735	80.4	338	15.7	1397	64.7	352	16.3	72	3.3
	Hisp/Latino	2621	2133	81.4	308	11.8	1825	69.6	434	16.6	54	2.1
	White	3438	2576	74.9	1633	47.5	943	27.4	723	21.0	139	4.0
	Two+ Races	493	384	77.9	218	44.2	166	33.7	92	18.7	17	3.4
	LEP	1215	1129	92.9	36	3.0	1093	90.0	72	5.9	14	1.2
	FARMS	3281	2742	83.6	311	9.5	2431	74.1	469	14.3	70	2.1
	SpEd	1023	952	93.1	53	5.2	899	87.9	40	3.9	31	3.0

Notes. Including students with both fall MAP-R RIT scores and PARCC ELA scale scores in school year 2014–2015. Accurate estimation means a student met or did not meet the college ready benchmark of performance level 4 on PARCC ELA as predicted by fall MAP-R. Underestimation means a student met the benchmark while scoring below the fall MAP-R RIT cut score. Overestimation means a student failed to meet the benchmark while scoring at or above the fall MAP-R RIT cut score.

Table B2
Accuracy for Fall MAP-M Predicting College and Career Readiness (Performance Levels 4 or Higher on PARCC MATH) by Student Subgroup

PARCC MATH	Student group	# Students	Accurate estimation		Readiness accurately estimated		Non-readiness accurately estimated		Under-estimation		Over-estimation	
			<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
		Total										
MATH 3	All	11446	9614	84.0	3422	29.9	6192	54.1	1552	13.6	280	2.4
	Asian	1611	1338	83.1	896	55.6	442	27.4	244	15.1	29	1.8
	Black/AfAm	2318	1984	85.6	332	14.3	1652	71.3	284	12.3	50	2.2
	Hisp/Latino	3378	2955	87.5	346	10.2	2609	77.2	360	10.7	63	1.9
	White	3485	2797	80.3	1591	45.7	1206	34.6	569	16.3	119	3.4
	Two+ Races	616	511	83.0	252	40.9	259	42.0	88	14.3	17	2.8
	LEP	3350	2955	88.2	329	9.8	2626	78.4	350	10.4	45	1.3
	FARMS	4409	3881	88.0	377	8.6	3504	79.5	448	10.2	80	1.8
	SpEd	1226	1131	92.3	104	8.5	1027	83.8	80	6.5	15	1.2
MATH 4	All	10686	9037	84.6	2740	25.6	6297	58.9	1415	13.2	234	2.2
	Asian	1604	1310	81.7	836	52.1	474	29.6	259	16.1	35	2.2
	Black/AfAm	2228	1984	89.0	226	10.1	1758	78.9	200	9.0	44	2.0
	Hisp/Latino	2917	2651	90.9	209	7.2	2442	83.7	234	8.0	32	1.1
	White	3426	2671	78.0	1289	37.6	1382	40.3	651	19.0	104	3.0
	Two+ Races	486	398	81.9	175	36.0	223	45.9	69	14.2	19	3.9
	LEP	3188	2843	89.2	299	9.4	2544	79.8	302	9.5	43	1.3
	FARMS	3867	3539	91.5	221	5.7	3318	85.8	287	7.4	41	1.1
	SpEd	1122	1046	93.2	69	6.1	977	87.1	60	5.3	16	1.4
MATH 5	All	11237	9507	84.6	2639	23.5	6868	61.1	1516	13.5	214	1.9
	Asian	1685	1362	80.8	817	48.5	545	32.3	303	18.0	20	1.2
	Black/AfAm	2328	2071	89.0	190	8.2	1881	80.8	220	9.5	37	1.6
	Hisp/Latino	2950	2684	91.0	197	6.7	2487	84.3	234	7.9	32	1.1
	White	3711	2911	78.4	1257	33.9	1654	44.6	685	18.5	115	3.1
	Two+ Races	543	463	85.3	175	32.2	288	53.0	70	12.9	10	1.8

Continued

Table B2
Accuracy for Fall MAP-M Predicting College and Career Readiness (Performance Levels 4 or Higher on PARCC MATH) by Student Subgroup

PARCC MATH	Student group	# Students	Accurate estimation		Readiness accurately estimated		Non-readiness accurately estimated		Under-estimation		Over-estimation	
			N	%	N	%	N	%	N	%	N	%
		Total										
	LEP	2725	2467	90.5	179	6.6	2288	84.0	237	8.7	21	.8
	FARMS	3950	3584	90.7	221	5.6	3363	85.1	326	8.3	40	1.0
	SpEd	1164	1114	95.7	54	4.6	1060	91.1	39	3.4	11	.9
MATH 6	All	5203	4499	86.5	1144	22.0	3355	64.5	609	11.7	95	1.8
	Asian	734	615	83.8	340	46.3	275	37.5	107	14.6	12	1.6
	Black/AfAm	1072	965	90.0	97	9.0	868	81.0	93	8.7	14	1.3
	Hisp/Latino	1689	1547	91.6	100	5.9	1447	85.7	128	7.6	14	.8
	White	1468	1172	79.8	532	36.2	640	43.6	247	16.8	49	3.3
	Two+ Races	233	194	83.3	71	30.5	123	52.8	33	14.2	6	2.6
	LEP	1000	951	95.1	28	2.8	923	92.3	44	4.4	5	.5
	FARMS	2097	1937	92.4	112	5.3	1825	87.0	140	6.7	20	1.0
	SpEd	600	575	95.8	26	4.3	549	91.5	18	3.0	7	1.2
	MATH 7	All	4408	3940	89.4	355	8.1	3585	81.3	439	10.0	29
Asian		449	370	82.4	106	23.6	264	58.8	72	16.0	7	1.6
Black/AfAm		1024	977	95.4	14	1.4	963	94.0	45	4.4	2	.2
Hisp/Latino		1626	1537	94.5	24	1.5	1513	93.1	87	5.4	2	.1
White		1120	898	80.2	195	17.4	703	62.8	206	18.4	16	1.4
Two+ Races		175	147	84.0	15	8.6	132	75.4	26	14.9	2	1.1
LEP		937	914	97.5	8	.9	906	96.7	22	2.3	1	.1
FARMS		2029	1941	95.7	25	1.2	1916	94.4	84	4.1	4	.2
SpEd		619	604	97.6	6	1.0	598	96.6	14	2.3	1	.2

Continued

Table B2
Accuracy for Fall MAP-M Predicting College and Career Readiness (Performance Levels 4 or Higher on PARCC MATH) by Student Subgroup

PARCC MATH	Student group	# Students	Accurate estimation		Readiness accurately estimated		Non-readiness accurately estimated		Under-estimation		Over-estimation	
			N	%	N	%	N	%	N	%	N	%
		Total										
MATH 8	All	5869	5376	91.6	1745	29.7	3631	61.9	409	7.0	84	1.4
	Asian	860	771	89.7	524	60.9	247	28.7	77	9.0	12	1.4
	Black/AfAm	1343	1249	93.0	150	11.2	1099	81.8	78	5.8	16	1.2
	Hispanic/Latino	1666	1568	94.1	141	8.5	1427	85.7	90	5.4	8	.5
	White	1728	1537	88.9	807	46.7	730	42.2	149	8.6	42	2.4
	Two+ Races	260	240	92.3	121	46.5	119	45.8	15	5.8	5	1.9
	LEP	933	915	98.1	15	1.6	900	96.5	15	1.6	3	.3
	FARMS	2115	1996	94.4	138	6.5	1858	87.8	107	5.1	12	.6
	SpEd	829	806	97.2	27	3.3	779	94.0	17	2.1	6	.7

Notes. Including students with both fall MAP-M RIT scores and PARCC MATH scale scores in school year 2014–2015. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded. Accurate estimation means a student met or did not meet the college readiness benchmark of performance level 4 on PARCC MATH as predicted by fall MAP-M. Underestimation means a student met the benchmark while scoring below the fall MAP-M RIT cut score. Overestimation means a student failed to meet the benchmark while scoring at or above the fall MAP-M RIT cut score.

Table B3
Fall MAP-R RIT Cut Score Associated With Predicted Probability of
Performing at Level 3 or Higher on PARCC ELA

PARCC ELA	Cut score at 65% probability	National percentile rank	Cut score at 75% probability	National percentile rank
ELA 3	191	56-58	194	63-65
ELA 4	196	44-45	199	51-53
ELA 5	204	45-46	207	53-54
ELA 6	212	52-54	214	57-59
ELA 7	216	53-55	218	58-60
ELA 8	219	54-55	222	61-63

Notes. Including students with both fall MAP-R RIT scores and PARCC ELA scale scores. National percentile ranks were based on MAP 2015 norms.

Table B4
Fall MAP-M RIT Cut Score Associated With Predicted Probability of
Performing at Level 3 or Higher on PARCC MATH

PARCC MATH	Cut score at 65% probability	National percentile rank	Cut score at 75% probability	National percentile rank
MATH 3	189	45-47	191	51-53
MATH 4	202	49-51	204	55-57
MATH 5	214	56-58	217	64-66
MATH 6	217	48-49	220	55-57
MATH 7	225	55-56	228	62-63
MATH 8	234	66-67	237	72-73

Notes. Including students with both fall MAP-M RIT scores and PARCC MATH scale scores. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded. National percentile ranks were based on MAP 2015 norms.

Table B5
Prediction Accuracy for Fall MAP-R RIT Cut Score Predicting 75% Probability of
Performing at Level 3 or Higher on PARCC ELA

PARCC ELA	% Accurate estimation	% accurately predicted to be ready	% accurately predicted not to be ready	% Underestimation	% Overestimation
ELA 3	82.6	49.3	33.3	13.8	3.6
ELA 4	85.4	62.0	23.4	10.9	3.7
ELA 5	84.7	62.2	22.5	11.7	3.6
ELA 6	83.7	58.7	25.0	12.5	3.8
ELA 7	84.2	60.0	24.2	12.0	3.9
ELA 8	83.2	60.0	23.2	13.1	3.7

Notes. Including students with both fall MAP-R RIT scores and PARCC ELA scale scores. Accurate estimation means a student met or did not meet performance level 3 on PARCC ELA as predicted by fall MAP-R. Underestimation means a student met performance level 3 on PARCC ELA while scoring below the fall MAP-R RIT cut score. Overestimation means a student failed to meet performance level 3 on PARCC ELA while scoring at or above the fall MAP-R RIT cut score.

Table B6
Prediction Accuracy for Fall MAP-M RIT Cut Score Predicting 75% Probability of
Performing at Level 3 or Higher on PARCC MATH

PARCC MATH	% Accurate estimation	% Readiness accurately predicted	% Non-readiness accurately predicted	% Underestimation	% Overestimation
MATH 3	83.7	54.6	29.0	13.5	2.9
MATH 4	83.3	51.2	32.2	13.8	2.8
MATH 5	83.2	49.8	33.4	14.1	2.8
MATH 6	83.9	48.5	35.4	13.8	2.3
MATH 7	80.3	35.6	44.7	17.1	2.7
MATH 8	86.5	39.4	47.1	11.9	1.5

Notes. Including students with both fall MAP-M RIT scores and PARCC MATH scale scores. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded. Accurate estimation means a student met or did not meet performance level 3 on PARCC MATH as predicted by fall MAP-M. Underestimation means a student met performance level 3 on PARCC MATH while scoring below the fall MAP-M RIT cut score. Overestimation means a student failed to meet performance level 3 on PARCC MATH while scoring at or above the fall MAP-M RIT cut score.

Appendix C: Concordance Tables for Spring MAP and PARCC

Table C1
Concordance Table for Spring MAP-R RIT Scores and PARCC ELA Scale Scores

Spring MAP-R RIT score	PARCC ELA scale score					
	ELA 3	ELA 4	ELA 5	ELA 6	ELA 7	ELA 8
140		650				
141	650	650			650	650
142	650	650			650	650
143	650	650			650	650
144	650	650	650	650	650	650
145	650	650	650	650	650	650
146	650	650	650	650	650	650
147	650	650	650	650	650	650
148	650	650	650	650	650	650
149	650	650	650	650	650	650
150	650	650	650	650	650	650
151	650	650	652	650	650	650
152	650	652	654	650	650	650
153	651	654	655	650	650	650
154	653	656	655	650	650	650
155	655	658	656	650	650	650
156	656	660	656	650	650	650
157	657	663	657	650	650	650
158	658	664	659	651	650	650
159	660	665	659	654	650	650
160	662	667	662	656	650	650
161	664	668	662	657	650	650
162	665	669	663	659	650	650
163	666	670	665	662	651	650
164	668	671	666	663	651	650
165	669	672	666	666	652	650
166	670	673	667	667	653	650
167	671	674	668	667	654	650
168	672	675	669	668	655	650
169	673	677	671	670	656	650
170	675	678	672	670	657	651
171	676	679	673	671	658	653
172	677	680	674	671	659	654
173	679	681	676	672	660	655

Continued

Table C1
Concordance Table for Spring MAP-R RIT Scores and PARCC ELA Scale Scores

Spring MAP-R RIT score	PARCC ELA scale score					
	ELA 3	ELA 4	ELA 5	ELA 6	ELA 7	ELA 8
174	680	682	677	673	661	655
175	682	683	677	674	662	656
176	683	684	679	675	663	657
177	684	685	680	676	664	658
178	685	687	681	676	665	660
179	687	688	682	678	665	662
180	688	689	683	679	666	662
181	689	691	684	679	668	663
182	691	692	685	680	668	664
183	693	694	686	681	669	665
184	695	695	688	682	670	666
185	696	697	689	683	671	666
186	699	698	690	684	672	668
187	701	700	691	685	673	669
188	702	701	692	686	674	669
189	704	702	693	687	676	670
190	707	704	694	688	677	671
191	708	706	695	689	678	672
192	711	707	697	690	679	673
193	713	709	698	691	680	674
194	716	711	700	692	681	675
195	718	712	701	693	682	675
196	721	714	703	694	683	676
197	723	716	704	695	685	678
198	725	718	706	697	686	679
199	729	720	708	698	688	681
200	731	721	710	700	690	682
201	734	724	712	701	691	684
202	736	725	714	703	693	686
203	739	728	716	704	694	689
204	742	730	718	706	696	690
205	745	732	720	708	698	692
206	748	734	722	710	701	694
207	750	736	724	712	703	696
208	754	739	725	714	705	698
209	757	741	729	715	707	700

Continued

Table C1
Concordance Table for Spring MAP-R RIT Scores and PARCC ELA Scale Scores

Spring MAP-R RIT score	PARCC ELA scale score					
	ELA 3	ELA 4	ELA 5	ELA 6	ELA 7	ELA 8
210	759	743	731	718	710	703
211	762	746	733	720	712	705
212	766	748	736	722	715	708
213	769	750	738	724	717	710
214	772	753	740	725	719	713
215	776	755	742	728	722	716
216	779	757	744	730	725	718
217	783	760	747	733	728	721
218	786	763	749	735	731	723
219	789	765	750	737	733	725
220	792	767	753	739	736	728
221	795	769	755	741	738	731
222	799	772	758	744	741	733
223	802	775	760	746	743	736
224	805	777	762	748	746	739
225	808	779	764	750	749	741
226	812	781	766	753	750	745
227	815	784	768	755	754	747
228	818	786	770	757	756	750
229	822	789	772	760	759	753
230	826	791	775	762	762	755
231	829	794	777	764	764	758
232	832	797	779	766	767	761
233	837	800	782	769	769	764
234	843	803	785	771	771	766
235	849	806	787	773	774	769
236	849	810	790	775	777	772
237	850	814	793	777	779	774
238	850	817	796	779	782	776
239	850	820	799	781	784	779
240	850	824	801	782	787	781
241	850	828	804	785	790	783
242	850	832	807	786	792	786
243	850	837	810	789	795	788
244	850	843	814	791	798	790

Continued

Table C1
Concordance Table for Spring MAP-R RIT Scores and PARCC ELA Scale Scores

Spring MAP-R RIT score	PARCC ELA scale score					
	ELA 3	ELA 4	ELA 5	ELA 6	ELA 7	ELA 8
245	850	846	816	794	801	793
246	850	848	818	797	803	796
247	850	849	821	800	805	798
248	850	849	824	803	808	801
249	850	850	826	805	812	804
250		850	829	809	814	806
251		850	831	812	816	809
252		850	835	815	819	812
253		850	837	818	821	814
254		850	840	820	824	816
255		850	843	822	827	819
256			844	827	830	821
257			844	831	834	823
258			845	832	835	827
259			846	833	838	829
260			846	835	842	831
261			847	836	845	837
262			848	837	849	839
263			849	842	849	841
264				846	849	846
265				850	849	849
266					850	849
267					850	849
268					850	850
269					850	850
270					850	850
271					850	850
272						850
273						850
274						850

Notes. Data are presented based on students with both spring MAP-R RIT scores and PARCC ELA scale scores. Scores highlighted in yellow are associated with PARCC performance level 4. Scores highlighted in blue are associated with PARCC performance level 3.

Table C2
Concordance Table for Spring MAP-M RIT Scores and PARCC MATH Scale Scores

Spring MAP-M RIT score	PARCC MATH scale score					
	MATH 3	MATH 4	MATH 5	MATH 6	MATH 7	MATH 8
136	650					
137	650					
138	650					
139	650					
140	650					
141	650			650		
142	650	650		650		
143	650	650		650		650
144	650	650		650		650
145	650	650		650		650
146	650	650	650	650		650
147	650	650	650	650		650
148	650	650	650	650		650
149	650	651	650	650	650	650
150	650	652	650	650	650	650
151	650	653	650	650	650	650
152	650	653	650	650	650	650
153	650	654	650	650	650	650
154	650	655	650	650	650	650
155	652	655	650	650	650	650
156	653	655	650	650	650	650
157	654	656	650	650	650	650
158	655	658	650	650	650	650
159	657	660	650	650	650	650
160	659	660	650	650	650	650
161	659	663	650	650	650	650
162	660	664	650	650	650	650
163	660	665	650	651	650	650
164	663	667	650	651	650	650
165	665	668	650	651	650	650
166	666	669	650	651	650	650
167	667	669	650	651	650	650
168	670	670	657	655	650	650
169	671	671	659	656	650	650
170	672	672	664	656	650	650
171	674	672	665	657	650	650

Continued

Table C2
Concordance Table for Spring MAP-M RIT Scores and PARCC MATH Scale Scores

Spring MAP-M RIT score	PARCC MATH scale score					
	MATH 3	MATH 4	MATH 5	MATH 6	MATH 7	MATH 8
172	675	673	666	660	651	650
173	676	674	666	663	653	650
174	679	676	666	665	655	650
175	680	677	667	666	659	650
176	680	678	667	668	660	650
177	683	679	668	669	661	650
178	684	680	670	670	664	650
179	685	681	671	672	664	650
180	687	682	672	673	665	650
181	688	683	673	675	665	650
182	691	684	674	677	667	650
183	692	685	677	677	668	650
184	694	687	678	678	671	650
185	696	688	679	679	672	650
186	698	690	679	680	672	654
187	700	690	683	683	676	654
188	702	692	683	684	676	655
189	705	693	684	684	677	655
190	707	694	684	685	680	656
191	710	696	685	687	680	659
192	711	697	687	688	681	661
193	714	699	688	688	681	663
194	716	700	690	690	685	665
195	719	701	692	692	686	665
196	722	703	692	692	687	668
197	724	704	693	693	688	671
198	725	705	696	695	689	672
199	730	707	696	696	691	674
200	733	709	698	697	692	675
201	735	710	699	698	694	675
202	738	712	700	699	695	677
203	741	714	702	702	695	680
204	744	715	703	703	697	681
205	747	716	705	704	698	682
206	750	718	706	706	699	682
207	753	720	707	707	700	684
208	756	722	709	708	701	686
209	760	724	710	709	702	687

Continued

Table C2
Concordance Table for Spring MAP-M RIT Scores and PARCC MATH Scale Scores

Spring MAP-M RIT score	PARCC MATH scale score					
	MATH 3	MATH 4	MATH 5	MATH 6	MATH 7	MATH 8
210	762	725	712	711	704	688
211	765	728	713	712	705	689
212	768	730	714	714	707	692
213	771	732	716	715	708	693
214	773	734	717	716	709	694
215	776	737	719	717	710	694
216	779	739	720	720	712	697
217	782	742	723	722	713	698
218	784	744	724	723	714	699
219	787	746	725	724	715	701
220	789	749	728	725	718	703
221	791	750	730	729	718	704
222	793	753	732	731	720	706
223	795	756	734	733	721	708
224	798	758	736	735	722	709
225	800	760	737	737	724	711
226	802	762	739	738	725	713
227	804	764	742	740	727	715
228	805	766	744	742	729	716
229	807	768	746	744	730	719
230	808	771	748	745	732	721
231	810	773	750	747	734	723
232	811	775	752	748	736	725
233	813	776	754	750	737	728
234	814	778	756	752	738	730
235	816	780	758	754	739	733
236	817	782	760	756	741	735
237	820	784	762	758	743	737
238	822	786	764	759	744	740
239	823	788	766	760	746	742
240	824	790	768	762	747	744
241	826	792	770	764	749	748
242	831	794	771	766	750	750
243	832	796	774	768	753	753
244	837	799	776	770	754	755
245	838	801	778	771	756	757
246	840	804	780	773	757	759

Continued

Table C2
Concordance Table for Spring MAP-M RIT Scores and PARCC MATH Scale Scores

Spring MAP-M RIT score	PARCC MATH scale score					
	MATH 3	MATH 4	MATH 5	MATH 6	MATH 7	MATH 8
247	840	806	782	775	759	761
248	842	807	784	776	761	763
249	843	809	785	778	763	765
250	844	810	786	779	764	767
251	844	811	788	781	767	770
252	845	813	790	783	768	772
253	848	814	791	784	770	773
254	849	815	792	786	771	775
255	849	818	794	788	773	777
256	849	820	796	790	775	780
257	849	822	797	792	776	782
258	849	824	799	795	777	785
259	850	824	800	797	779	787
260	850	825	802	799	781	789
261	850	826	803	799	782	791
262	850	826	805	802	783	793
263	850	828	806	804	783	794
264	850	828	809	807	784	797
265	850	831	810	808	784	799
266		835	811	808	785	800
267		838	813	809	786	802
268		840	814	810	787	804
269		842	815	811	789	806
270		843	816	813	790	808
271		845	818	814	790	810
272		845	819	817	791	813
273		846	821	817	794	815
274		849	822	817	795	816
275		849	824	818	797	818
276		849	826	818	798	819
277		849	827	821	800	821
278		850	827	822	805	822
279		850	828	822	808	823
280		850	831	822	810	826
281		850	834	822	811	827
282		850	836	823	815	831
283		850	837	823	815	832

Continued

Table C2
Concordance Table for Spring MAP-M RIT Scores and PARCC MATH Scale Scores

Spring MAP-M RIT score	PARCC MATH scale score					
	MATH 3	MATH 4	MATH 5	MATH 6	MATH 7	MATH 8
284		850	838	823	816	834
285		850	838	824	816	838
286			839	825	817	842
287			840	826	817	843
288			843	829	818	848
290			846		821	848
291			846		822	849
292			846		822	849
293			846		823	849
294			847		823	849
295			847		823	849
296			847		823	849
297			848		824	850
298			848		824	850
299			848		824	850
300			849		824	850
301			849		825	850
302			849		825	850
303			850		825	850
304			850		825	850
305					826	850
306					826	850
307					826	850
308					826	850
309					827	850
310					827	850
311					827	850
312					827	850
313					828	850
314					828	850
315					828	850
316						850
317						850
318						850
319						850
320						850

Continued

Table C2

Concordance Table for Spring MAP-M RIT Scores and PARCC MATH Scale Scores

Spring MAP-M RIT score	PARCC MATH scale score					
	MATH 3	MATH 4	MATH 5	MATH 6	MATH 7	MATH 8
321						850
322						850
323						850
324						850

Notes. Data presented are based on students with both spring MAP-M RIT scores and PARCC MATH scale scores. Students taking PARCC Algebra 1 or Algebra 2 in Grades 6 through 8 were excluded. Scores highlighted in yellow are associated with PARCC performance level 4. Scores highlighted in blue are associated with PARCC performance level 3.