

Predicting Middle School Students' Performance on the Maryland School Assessment in Reading

Thomas C. West, Helen Wang, Ph.D., and Vasuki Rethinam, Ph.D.

Executive Summary

This research brief describes changes made to the middle school Maryland School Assessment (MSA) reading performance prediction models. The models provide estimates for Montgomery County Public Schools (MCPS) MSA monitoring tools (Schatz, Gheen, & Rethinam, 2008). The Grades 6, 7, and 8 MSA reading prediction models were modified to accommodate changes in available data. For clarity purposes and because changes were uniformly implemented across the three models, this brief will focus only on the Grade 6 MSA reading prediction model.

This brief can be used to help school staff better understand the student reports provided in the Data Warehouse based on prediction models. It explains changes in how predictions are calculated between current and prior reports. The predicted scores for middle school MSA will be updated in the MSA monitoring tool for the school year 2012–2013 and will be available for use by schools.

Based on our review of the effectiveness of the new prediction models, our recommendation is for administrators and instructors to continue to use the predicted MSA reading scores as they have in the past. The scores are still intended to be used as one of the tools to gauge students' instructional needs in combination with other student information (e.g., current grades, classroom observations, and interactions with the student) provided with the MSA monitoring tools.

Background

In order to help with efforts to meet Goal 1 of the MCPS strategic plan of ensuring success for every student (MCPS, 2011), the Office of Shared Accountability (OSA) maintains and makes available middle school MSA prediction tools to school administrators, teachers, and subject-area support staff. The prediction tools are designed to help identify students in the beginning of the school year that are at risk of underperforming on the MSA

reading exam and those who might be able to perform better with additional support.

Although MCPS has made progress in increasing students' performance on the MSA reading exams, roughly 10% of MCPS students in Grades 6, 7, and 8 are not considered proficient in reading (MCPS, 2010). To streamline the process to identify students who are at risk of not attaining proficiency on the MSA reading exam, OSA staff have updated the MSA prediction tools to reflect currently available data from both the Maryland State Department of Education (MSDE) and MCPS. Changes to the Grade 6 MSA reading prediction model include the following:

- No longer uses the Reading Level reported on students' prior year report cards
- Only uses the most recent MAP-R score from the previous school year (i.e., the spring score or the winter score when the spring score is not available)
- No longer uses measures to identify students currently enrolled in Reading Support or ESOL courses.

Methodology

The updated Grade 6 MSA reading prediction model was based on data from 9,101 students in MCPS who took the 2011 MSA in reading and had available predictor data. Predictor data included the following:

- Grade 5 MSA reading scale score
- Grade 5 MSA mathematics scale score
- Grade 5 spring MAP-R scale score (winter scores were used when spring scores were not available)
- Grade 4 MSA reading scale score (scores were estimated for students with missing data)
- Grade 6 highest English course taken during the school year.

Each of the above variables was included in the prediction model due to their availability and their hypothesized association with reading achievement (Schatz, et al., 2008).

Some students did not have Grade 4 reading scale scores. To estimate Grade 4 reading scale scores for these students, OSA researchers used generalized estimating equations (GEE); a regression-based technique that accounts for variation within and between schools. The estimation equation included the intercept and regression coefficient obtained from procedures used to predict Grade 4 MSA reading scale scores with Grade 5 MSA mathematics scale scores. Grade 5 mathematics scale scores were used because they were found to be a stronger predictor of Grade 4 MSA reading scale score than Grade 5 reading scale scores. Grade 4 MSA reading scores were estimated for 714 Grade 6 students.

Once Grade 4 reading scale scores were predicted for students with missing data, a GEE procedure was run using all five predictors listed previously to get the intercept and coefficients for the final prediction model.

As done for the previous prediction models, cut scores for assigning students to predicted performance levels (i.e., basic vs. proficient or above) were chosen based on the resulting model accuracy and prediction errors for all demographic groups. The cut scores selected for predicted scores were set slightly higher than the cut scores for the Grade 6 MSA reading established by MSDE. This was done to underestimate rather than overestimate students' predicted performance levels.

Results

The efforts described above resulted in a Grade 6 MSA reading model that accurately predicted 91.9% of students who performed at the basic level vs. proficient or above and 84.3% of students who performed at the advanced level vs. proficient or below (See Tables 1 and 2). Prediction errors occurred when students' actual performance was below or above their predicted performance level. Table 1 shows the accuracy and error rates by demographic group for predicting two Grade 6 MSA reading performance levels (basic vs. proficient or above), and Table 2 shows the rates for predicting advanced vs. proficient or below in reading.

As shown in Table 1, prediction accuracy was highest among White, Asian, and Two or More Races students and lowest among students receiving special education and English for Speakers of Other Languages (ESOL) services. However, despite the differences in prediction accuracy, all demographic subgroups were more likely to perform better than

predicted when predictions did not fall into the expected range.

Table 1
Number of Students and Percent Predicted Basic vs. Proficient or Above for 2011 Grade 6 MSA Reading, by Demographic Group

Basic vs. Proficient or Above	Total N	Correct Pred. %	Worse than Pred. %	Better than Pred. %
All Students	8,048	91.9	3.6	4.5
Male	3,994	90.5	4.2	5.3
Female	4,054	93.5	2.9	3.7
Asian	1,215	96.7	1.8	1.4
Black or Af.Am.	1,492	84.8	6.5	8.6
Hispanic/Latino	1,789	85.6	6.1	8.3
White	3,149	97.7	1.2	1.1
Two or More Races	388	94.9	2.0	3.2
ESOL	693	77.9	8.8	13.4
FARMS	2,180	82.6	7.7	9.7
Special Education	654	79.6	6.3	14.1

Note. American Indian or Alaskan Native and Native Hawaiian or Other Pacific Islander student results are not reported separately. Black or Af.Am. = Black or African American; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

Table 2
Number of Students and Percent Predicted Advanced vs. Proficient or Below for 2011 Grade 6 MSA Reading, by Demographic Group

Advanced vs. Proficient or Below	Total N	Correct Pred. %	Worse than Pred. %	Better than Pred. %
All Students	7,381	84.3	7.3	8.3
Male	3,719	84.2	7.8	7.9
Female	3,662	84.4	6.8	8.7
Black or Af.Am.	1,473	83.7	6.8	9.5
Asian	1,098	87.4	5.5	7.1
Hispanic/Latino	1,737	83.1	7.5	9.4
White	2,707	84.0	8.4	7.6
Two or More Races	355	86.8	6.1	7.1
ESOL	779	87.5	3.4	9.1
FARMS	2,212	83.8	6.9	9.4
Special Education	702	85.4	4.7	9.9

Note. American Indian or Alaskan Native and Native Hawaiian or Other Pacific Islander student results are not reported separately. Black or Af.Am. = Black or African American; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

Discussion

A reduction in the number of variables included in the Grade 6 MSA reading prediction model compared to models used in previous school years still achieved comparable accuracy rates for all students (91.9% compared to 92.6% for distinguishing between basic vs. proficient or above, and 84.3% compared to 83.9% for distinguishing between advanced vs. proficient or below) (Schatz, et al., 2008). This is an important finding because use of the MSA monitoring tools has continued to increase across MCPS schools.

As with the previous MSA prediction models, staff should interpret the predicted score as a best estimate of the student's performance score. This means the student may actually do better, worse, or the same as their predicted score when they take the MSA. By looking to see which students are at risk of performing worse and which students are predicted to do better, staff can use this information in making decisions about interventions. However, it is important to note that the predicted ranges should not be the only indicator used to make decisions regarding students' instructional needs.

In addition to modifying the Grade 6 MSA reading prediction model, prediction models were revised for Grades 7 and 8. The performance for these models with data from 2010–2011 and the variables used to run the models are provided in Appendix A.

Recommendation

Schools should continue to use the MSA monitoring tools. The MSA monitoring tools not only provide information on students' MSA reading predicted scores, it also provides updated information such as students' current marking period subject grades, ineligibility status, teacher information, etc. The prediction models are merely a prediction of how students may perform. Students' predicted performance can be better interpreted in conjunction with the MSA monitoring tool and teacher observation and interaction with students.

References

- Montgomery County Public Schools. (2010). *Annual Report on Our Call to Action 2010*. Rockville, MD: Author.
- Montgomery County Public Schools. (2011). *Our Call to Action: Pursuit of Excellence 2011–2016*. Rockville, MD: Author.
- Schatz, C. J., Gheen, M. H., & Rethinam, V. (2008). *Using Lagging Indicators to Predict Grade 7 Performance on the Maryland School Assessment in Reading*. Rockville, MD: Montgomery County Public Schools.

Appendix A

Table A1
Number of Students and Percent Predicted Basic vs. Proficient or Above for 2011 Grade 7 MSA Reading, by Demographic Group

Basic vs. Proficient or Above	Total N	Correct Pred. %	Worse than Pred. %	Better than Pred. %
All Students	8,447	93.2	2.9	3.9
Male	4,167	91.6	3.9	4.5
Female	4,280	94.7	1.9	3.3
Asian	1,271	97.2	1.7	1.1
Black or Af.Am.	1,655	88.0	4.8	7.2
Hispanic/Latino	1,818	87.8	4.6	7.5
White	3,273	97.4	1.4	1.1
Two or More Races	415	95.4	1.8	2.8
ESOL	480	82.8	3.8	13.4
FARMS	2,212	85.3	5.6	9.0
Special Education	600	81.7	5.8	12.5

Note. American Indian or Alaskan Native and Native Hawaiian or Other Pacific Islander student results are not reported separately. Black or Af.Am. = Black or African American; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

Table A2
Number of Students and Percent Predicted Advanced vs. Proficient or Below for 2011 Grade 7 MSA Reading, by Demographic Group

Advanced vs. Proficient or Below	Total N	Correct Pred. %	Worse than Pred. %	Better than Pred. %
All Students	7,699	84.9	7.1	8.0
Male	3,856	84.7	7.8	7.4
Female	3,843	85.1	6.3	8.6
Asian	1,141	87.2	6.7	6.1
Black or Af.Am.	1,541	81.9	7.8	10.3
Hispanic/Latino	1,703	82.3	6.6	11.1
White	2,922	87.0	7.2	5.8
Two or More Races	381	87.6	6.2	6.2
ESOL	491	84.7	2.1	13.3
FARMS	2,134	82.3	6.5	11.1
Special Education	675	83.5	4.1	12.4

Note. American Indian or Alaskan Native and Native Hawaiian or Other Pacific Islander student results are not reported separately. Black or Af.Am. = Black or African American; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

Table A3
Number of Students and Percent Predicted Basic vs. Proficient or Above for 2011 Grade 8 MSA Reading, by Demographic Group

Basic vs. Proficient or Above	Total N	Correct Pred. %	Worse than Pred. %	Better than Pred. %
All Students	8,461	92.7	3.1	4.2
Male	4,260	91.8	3.8	4.4
Female	4,201	93.6	2.4	4.0
Asian	1,343	96.8	1.5	1.7
Black or Af.Am.	1,739	88.0	5.2	6.9
Hispanic/Latino	1,814	86.9	5.0	8.1
White	3,197	97.1	1.5	1.4
Two or More Races	358	95.2	2.4	2.4
ESOL	386	78.3	6.3	15.4
FARMS	2,253	85.0	5.9	9.2
Special Education	598	82.5	6.2	11.3

Note. American Indian or Alaskan Native and Native Hawaiian or Other Pacific Islander student results are not reported separately. Black or Af.Am. = Black or African American; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

Table A4
Number of Students and Percent Predicted Advanced vs. Proficient or Below for 2011 Grade 8 MSA Reading, by Demographic Group

Advanced vs. Proficient or Below	Total N	Correct Pred. %	Worse than Pred. %	Better than Pred. %
All Students	7,652	83.8	5.2	11.0
Male	3,868	83.3	6.1	10.6
Female	3,784	84.3	4.3	11.5
Asian	1,201	86.5	5.4	8.1
Black or Af.Am.	1,624	82.1	4.7	13.2
Hispanic/Latino	1,702	81.5	4.2	14.3
White	2,801	85.1	6.1	8.8
Two or More Races	313	83.2	4.8	12.0
ESOL	430	87.2	1.6	11.2
FARMS	2,186	82.4	4.0	13.5
Special Education	591	81.5	3.0	15.4

Note. American Indian or Alaskan Native and Native Hawaiian or Other Pacific Islander student results are not reported separately. Black or Af.Am. = Black or African American; ESOL = English for Speakers of Other Languages; FARMS = Free and Reduced-price Meals System.

Table A5
 Data Used for Predicting Students' Performance on the Maryland School Assessment (MSA)
 in Reading (Grades 6, 7, and 8)

Model	Data Used to Estimate Missing MSA Reading Scale Scores for Two Years Prior	Data Used to Predict MSA Reading Scale Scores
Grade 6	<ul style="list-style-type: none"> • Grade 5 MSA mathematics scale score 	<ul style="list-style-type: none"> • Grade 5 MSA reading scale score • Grade 5 MSA mathematics scale score • Grade 5 spring MAP-R scale score (winter scores were used when spring scores were not available) • Grade 4 MSA reading scale score (scores were estimated for students with missing data) • Grade 6 highest English course taken during the school year
Grade 7	<ul style="list-style-type: none"> • Grade 6 MSA reading scale score • Grade 6 MSA mathematics scale score 	<ul style="list-style-type: none"> • Grade 6 MSA reading scale score • Grade 6 MSA mathematics scale score • Grade 6 spring MAP-R scale score (winter scores were used when spring scores were not available) • Grade 5 MSA reading scale score (scores were estimated for students with missing data) • Grade 7 highest English course taken during the school year
Grade 8	<ul style="list-style-type: none"> • Grade 7 MSA mathematics scale score 	<ul style="list-style-type: none"> • Grade 7 MSA reading scale score • Grade 7 MSA mathematics scale score • Grade 7 spring MAP-R scale score (winter scores were used when spring scores were not available) • Grade 6 MSA reading scale score (scores were estimated for students with missing data) • Grade 8 highest English course taken during the school year