CARNEGIE LEARNING

MATHia® Performance & End-Of-Year Test Scores: A School District in Ohio (2021-2022)

Executive Summary

- MATHia is a computerized, adaptive learning tool for grade 6-12 mathematics. It is a key component of Carnegie Learning's blended, core curricula, Middle School Math Solution and High School Math Solution. Years of research on the rich data generated by learners using MATHia have led to the Adaptive Personalized Learning Score (APLSE), a progress monitoring metric that is strongly correlated with performance on end-of-year assessments and interim assessments, year-over-year and across the country. These correlations suggest that the APLSE score is a high-quality predictor of end-of-year and interim assessment scores and that MATHia is an assessment of mathematics performance in its own right.
- An Ohio school district provided data for 4,047 students from the 2021-2022 Winter and Spring NWEA MAP Growth assessments. MAP Growth scale scores correlated strongly with MATHia achievement, as gauged by the APLSE score (r = 0.39 to 0.63) depending on grade and test. Every 10-point increase in APLSE points was associated with a 1.3- to 2.5-point increase on the MAP Growth scale. Similar results have been obtained across various states and districts for middle school and Algebra standardized tests.

Background

MATHia is Carnegie Learning's intelligent tutoring system for grades 6-12 mathematics. It offers guided instruction, tailored mastery exercises, and easy-to-understand reports for educators. Within MATHia, students progress through a series of multi-step math problems, organized into workspaces, which cover a complete course. MATHia collects extensive metrics on student effort and performance. As an adaptive instructional system, MATHia continually assesses student knowledge of fine-grained skills. MATHia's continuous assessment not only guides learning but can give us a comprehensive view of student math knowledge, which can be used to predict student performance on state end-of-year math assessments. Carnegie Learning reports the Adaptive Personalized Learning Score (APLSE), a composite score for progress monitoring that combines measures of the amount of time and number of problems required by students to complete and master MATHia workspaces, their skill mastery, and the number of errors students make and the help they request in MATHia workspaces. The score builds in comparisons of these measures with historical data. To obtain maximum benefit from the Middle School Math Solution and High School Math Solution, Carnegie Learning holds that students need to spend time working in MATHia, complete between 80-100 workspaces in an academic year, and eventually perform well on the embedded mathematics questions. Additionally, the APLSE score has been shown to predict scores on well-known interim assessments as well as end-of-year performance on state tests (Fancsali et al., 2018; Joshi et al., 2014; Ritter et al., 2013; Zheng et al., 2019)

The partner school district is a high-achieving district in Ohio. Approximately 69 percent of the population is White, 5 percent Black or African-American, 5 percent Hispanic or Latino, 17 percent Asian, 3 percent Multi-Racial, and 1 percent of any other race. Approximately, 5.9 percent of families live below the poverty level (National Center for Education Statistics, 2023)

Data & Analysis

Carnegie Learning partnered with an Ohio school district to analyze associations between students' usage of and performance in MATHia and the MAP Growth interim assessments for grades 6, 7, and 8 during the 2021-2022 school year. The school district provided Carnegie Learning with data for 4,047 students who used MATHia and completed at least one MAP Growth interim assessment. Analyses included correlations between MATHia achievement (measured using total

APLSE points earned) and the MAP Growth interim assessment scale scores and linear regressions predicting these scale scores from APLSE points earned.

Results

APLSE scores were prorated to reflect the amount of time passed from the beginning of the school year to the date of any particular MAP Growth testing occasion. Analyses indicated statistically significant correlations between APLSE scores and Winter and Spring MAP Growth scale scores (r = 0.27 to 0.63), depending on grade and term (see Figure 1). Correlations were larger for grades 6 and 7 and for Winter and Spring terms. In the regression analyses, every 10-point increase in APLSE scores was associated with a MAP Growth scale score increase of 1.3 to 2.5 points on the MAP Growth scale.

Discussion

The correlations and regression results suggest that the APLSE score is a high-quality predictor of interim and end-of-grade test scores and that MATHia can function as an embedded, formative assessment. These correlations and regression results are consistent with numerous peer-reviewed findings associating usage and performance in MATHia with various standardized test score results across grade levels and states (see, e.g., Ritter et al., 2013; Fancsali et al. 2016, Zheng et al., 2019). The results are consistent with the interpretation that students who put their time in MATHia, do their MATHia assignments, and perform well on the MATHia questions will perform better on their MAP Growth and their end-of-year state tests. Experimental findings from large-scale randomized controlled trials also demonstrate the effectiveness of Carnegie Learning's curricula on instruction and student learning (Pane et al., 2014).

Carnegie Learning welcomes the opportunity to partner with your school to learn more about what's working in your classrooms! Contact your Carnegie Learning representative to learn more.

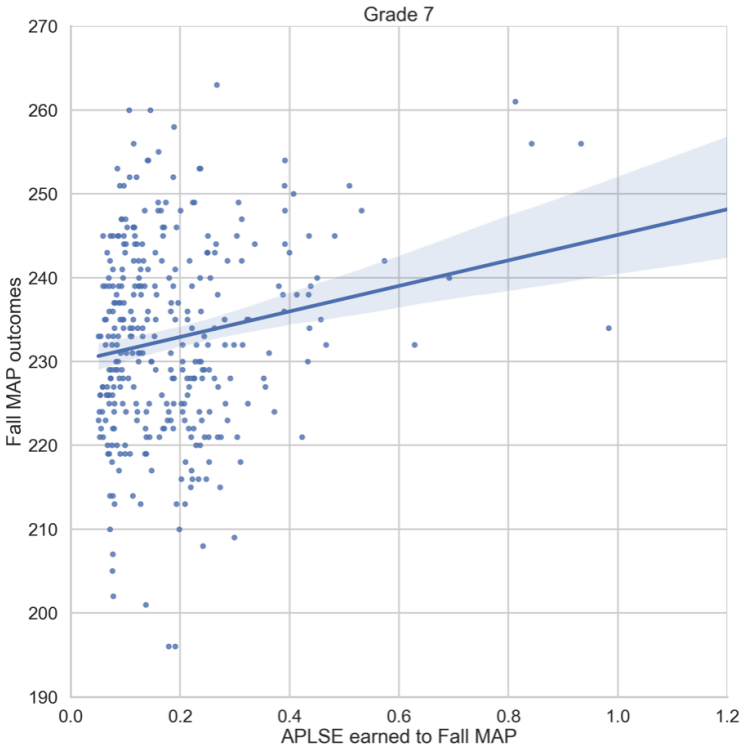

Figure 1. Scatterplot depicting relationship between APLSE points earned and Fall 2021-2022 MAP Growth Grade 7 scale scores. Students who earned more APLSE points received higher scores on MAP Growth interim assessments.

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