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The Middle School Algebra Readiness Initiative

An Evaluation of Teacher Outcomes and Student Mathematics Achievement and Gains

Available data indicate that only 7% to 16% of students met the required 1 hour/week of program use. We had very little other information about implementation fidelity, impairing our ability to interpret the impact upon student outcomes.

Teachers began the initiative slightly above average in terms of their mathematics content and pedagogical knowledge. Posttest results revealed that there was only a marginal and statistically insignificant gain in these areas over the course of the project.

In most cases, students who were in the treatment group underperformed when compared with their grade-level peers who used an alternate curriculum. With few exceptions, the differences were statistically significant.

Evaluation of Middle School Algebra Readiness Initiative in Two WV School Districts Yields Unexpected Results

We conducted an evaluation study of the Middle School Algebra Readiness Initiative (MSARI), a mathematics intervention that was implemented in two West Virginia school districts during the 2011–2012 school year. In participating middle schools, the Carnegie Learning MATHia® software intervention and classroom curriculum were used as a total replacement for the districts' alternative mathematics curriculum for Grades 6, 7, and 8. A cohort of teachers was trained by Carnegie Learning in mathematical content and pedagogy as well as in the proper implementation of the software and classroom curriculum materials.

Method of study. Our evaluation tested five hypotheses. The first investigated the impact of the initiative on teacher-level outcomes, specifically teachers' content and pedagogical knowledge in the areas of patterns, functions, and algebra on the research-validated, *Learning Mathematics for Teaching* (LMT) assessment. The remaining four study hypotheses tested the impact of the initiative on students' mathematical achievement and year-to-year mathematics gains as measured by the Grade 6, 7, or 8 mathematics subtest of the West Virginia Educational Standards Test 2 (WESTEST 2). We used propensity score matching (PSM) to match students in a variety of implementation scenarios to select a comparison group of students. In all cases, we rigorously matched the two groups of students using a variety of covariates. We then examined mean differences in students' standardized test scores and mathematics gains, determining if the treatment or comparison group scores differed by a statistically significant margin. Next, we used linear regression to determine, after controlling for covariates, what level of impact the treatment had on student achievement and gains.

Findings. Our statistical analysis of teacher pretest/posttest differences on the LMT assessment revealed that, for the 20 teachers who completed both a pretest and posttest, there was only a marginal gain, which was not statistically significant. As for student results, in most cases students in the treatment group underperformed on the WESTEST 2, when compared with their grade-level peers who used an alternate curriculum. With a few exceptions, the differences were statistically significant. However, the results of the linear regressions illustrated that, after controlling for important covariates, the negative relationship among treatment and student achievement/gains was relatively small, but still statistically significant.

Limitations of study. Several limitations impair our ability to make conclusions based on these results. Most critically, we had very little information about the degree to which the teachers and students implemented the intervention components with fidelity. We recommend strongly against using our report as an evaluation of MATHia in general. It should be seen as an evaluation of an entire initiative rather than any curriculum or software program alone.

Recommendations. In light of these and other limitations described in this report, we make only two recommendations. First, we suggest future program implementations of this type take substantial measures to collect qualitative implementation data so that the results of quantitative analyses can be more readily interpreted. Second, in districts where similar programs are currently underway or in the planning stages, we recommend continuous monitoring and technical assistance to ensure that the program components are delivered as intended.

For more information, contact the author, Nate Hixson (nhixson@access.k12.wv.us), or download the full report: *Middle School Algebra Readiness Initiative: An Analysis of Teacher Outcomes and Student Mathematics Achievement and Gains* on the Office of Research website (<http://wvde.state.wv.us/research/reports2012.html>).