

Study shows new teaching method improves math skills, closes gender gap in young students

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(Phys.org) —When early elementary math teachers ask students to explain their problem-solving strategies and then tailor instruction to address specific gaps in their understanding, students learn significantly more than those taught using a more traditional approach. This was the conclusion of a yearlong study of nearly 5,000 kindergarten and first-grade students conducted by researchers at Florida State University.

The researchers found that "formative assessment," or the use of ongoing evaluation of student understanding to inform targeted instruction, increased students' mastery of foundational [math concepts](#) that are known to be essential to later achievement in mathematics and science.

Their results corroborated those of two earlier pilot projects indicating that implementation of the Mathematics Formative Assessment System (MFAS) can markedly improve academic performance in mathematics. The findings further suggested that MFAS may help close the gender gap that often develops by third grade.

"The results of the most recent study conducted in schools across Florida are exciting," said Laura Lang, principal investigator who directed development and testing of MFAS. "The randomized [field trial](#) showed that students in K-3 classes where [teachers](#) used MFAS were well ahead of other students taught by teachers using more traditional approaches.

As one of the elementary principals of a participating school put it, MFAS is a real 'game changer' in terms of [student engagement](#) and success in math."

MFAS was created through the efforts of researchers at the Florida Center for Research in Science, Technology, Engineering and Mathematics (FCR–STEM) who received \$2.9 million in competitively awarded grant funds from the Florida Department of Education's Race to the Top program to pursue the project. MFAS is fully aligned with the Common Core State Standards adopted in Florida and many other states.

The randomized field trial was conducted in partnership with 31 schools and 301 teachers in three Florida districts across the state—one urban, one suburban and one rural. Schools were randomly assigned to either the MFAS treatment group or to a group that used a more typical approach to math instruction.

Comparing average annual gains in math on nationally normed tests to the results, learning was accelerated when teachers integrated MFAS in their day-to-day instruction.

"In kindergarten, we can infer that students learned at a rate equivalent to an extra six weeks of instruction," Lang said. "In first grade, the gains were even greater—two months of extra instruction. It was as if we extended the school year without actually adding any more days to it."

In constructing MFAS, Lang and her team drew upon research demonstrating that the learning of mathematics is facilitated when teachers gain deeper insights into what their students already know and are able to do as well as what students do not know and are unable to do. Teachers gather these insights through careful observation and by engaging students in discussions of their mathematical thinking.

"Formative assessment is a process, not a test," Lang said, "and feedback is a key element."

The approach enables teachers to address each child's instructional needs. Teachers can avoid holding back those who are ready to advance, while efficiently helping those who are struggling. This contrasts sharply with current practice in many elementary classrooms.

"Based on our classroom observations over the past four years, teachers typically rely heavily on a math textbook to guide the planning of day-to-day instruction and often provide students feedback only on whether their answers are correct," Lang said. "Teachers integrating formative assessment in instruction not only ask students to do math tasks but also to explain their reasoning and to justify their solutions. As a result, teachers are better equipped to identify misconceptions, determine gaps in understanding and adjust their instruction accordingly."

Students play a key role in the formative assessment process. MFAS actively engages [students](#), encouraging them to monitor and regulate their own learning. Students also evaluate each other's work and provide productive feedback, working as a team.

MFAS also has potential long-term effects on closing the [gender gap](#) in mathematics, Lang said. Studies show that even though both boys and girls enter school with a fundamental number sense, by the third grade boys tend to do better in mathematics.

The results of a pilot study conducted in second- and third-grade classrooms suggest that, in classrooms where MFAS was used, by third grade the girls showed no statistically significant difference in mathematics achievement from boys, according to Mark LaVenia, methodologist on the MFAS team. However, in classrooms with more conventional instruction, girls continued to lag behind boys in math

achievement.

The Mathematics Formative Assessment System is comprehensive. It includes mathematics tasks and rubrics as well as lesson study resource kits, all available at no cost online at www.cpalms.org/Resource/mfas.aspx. Five online introductory modules are also available, four for teachers and one for administrators and math coaches.

Provided by Florida State University

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