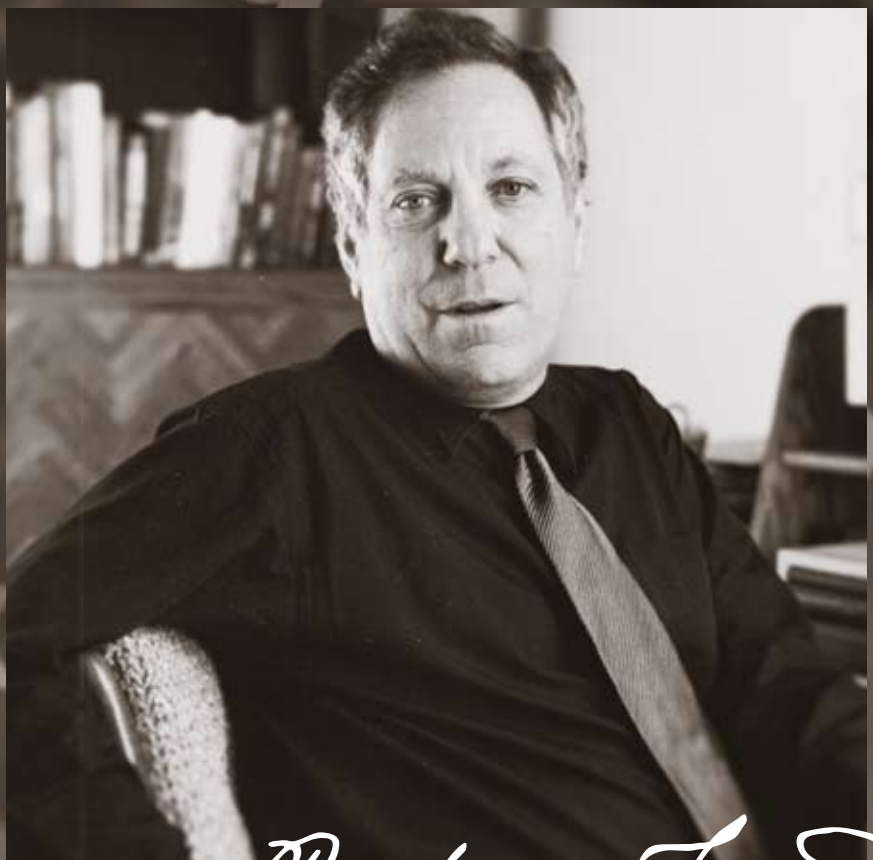

Repairing a Broken Foundation:

Solutions to Help Middle School Students Who Struggle with Math

By Leslie J. Thompson

Noted researcher Dr. Russell Gersten talks about the best practices for middle school math intervention and the goals of the newly formed National Math Advisory Panel.

For the past several years, American educators and politicians have focused intensely on the literacy crisis in the United States. New state and federal regulations established strict assessment standards and fostered improved accountability from the classroom to the district central office. Now, federal officials and leading researchers are turning the spotlight on math achievement and confronting the reality that nationwide, millions of older students are on a downward trajectory.

In the 2003 Trends in International Mathematics and Science Study (TIMSS), eighth-grade students in the United States ranked 15 among 40 nations in a comparison of mathematical understanding and achievement based on international standards. American middle-schoolers came in behind students from Belgium, Estonia, Hungary, Malaysia, and other nations far smaller in size and economic power than the U.S. But, as with reading, although the problem is easy to quantify, identifying the reasons students fall behind is more challenging.

Dr. Russell Gersten, executive director of the non-profit Instructional Research Group in Long Beach, CA, and professor emeritus in the College of Education at the University of Oregon, believes much of the shift can be attributed to the change in math instruction since the release in 1989 of the National Council of Teachers of Mathematics (NCTM) curriculum and evaluation standards.

"Now there are so-called reform programs," he says. "Math is taught differently than it was—perhaps better in some ways, and not as good in others. You get a lot of theories

> "The hope is that this research will help change the trajectory for struggling math students in the near term, and provide guidance to make a long-term impact for future generations."

and arguments about that, but it really is a serious problem."

This May, Dr. Gersten was among a group of 17 education experts and six ex-officio members named to a new National Mathematics Advisory Panel (NMP), the goal of which is to improve math achievement for middle school students nationwide. Modeled after the National Reading Panel and established by executive order of President George W. Bush, the NMP will examine and summarize the scientific evidence related to the teaching and learning of mathematics, with a specific focus on preparation for and success in learning algebra.

Working from a False Premise

"Many students are very confused about topics involving fractions and decimals—the whole topic of rational numbers. That is critical for understanding algebra, which is even more abstract," says Dr. Gersten. "What the mathematicians like [professors Hung-Hsi] Wu or James Milgram or Roger Howe say is that many of the math textbooks give mathematic definitions and explanations that are not accurate mathematically. That creates problems for children."

A classic example, notes Dr. Gersten, is for a textbook to state that a fraction is part of a whole, which is not true. Because a fraction can actually be more than one (such as the number 7/4) it cannot be defined as part of a whole. This type of inaccuracy in math instruction in the early grades is part of the reason students have difficulty grasping fundamental concepts, a problem that escalates and builds when children enter middle school, Dr. Gersten says. Consequently, it is imperative that teachers ensure students in sixth, seventh and eighth grade fully understand rational numbers and are proficient in fundamental algorithms, such as long division and complex multiplication.

Filling in the Gaps

In some cases, teachers may need to back-track and repeat material on critical topics if students are falling short. In other instances, students may need more formalized intervention to fill in gaps in their skill set.

Research shows that "explicit instruction involving both teacher modeling and kids going through the steps in the models—in small groups or with the whole class or individually—seems to lead consistently to higher gains for kids that are struggling," says Dr. Gersten.

Other strategies proven to enhance gains for struggling students include having students explain out loud each step that is needed to solve a math problem, as well as using graphic representations, such as number lines, manipulatives and diagrams, to help them think through the process. Students' use of computers for activities, games and practice in mathematics also resulted in small effects in three studies.

Unfortunately, there still is a dearth of scientific research evaluating the effectiveness of various curricula and instructional approaches. Although,

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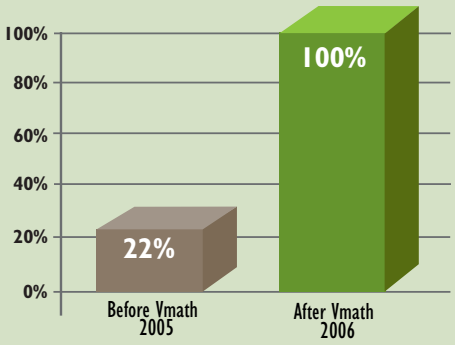
Suburban Texas District Sees TAKS Scores Soar

After an intensive 13-week session of Vmath®, Voyager's new math intervention program, an unprecedented number of fourth- and fifth-grade students at Olympia Elementary in Universal City, TX, passed the math section of the 2006 Texas Assessment of Knowledge and Skills (TAKS). Seventy-three percent of fourth-graders enrolled in Vmath passed the TAKS in 2006, compared to the previous year, when none of the students met the standard on the assessment. In addition, 100 percent of fifth-graders enrolled in Vmath passed the TAKS this year, compared to only 22 percent of the at-risk fifth-grade students in 2005.

"Vmath is so easy to implement. I love the pre- and post-tests because they enable me to see what the child knows or doesn't know, so I can zero in on weak areas," says Bernice Friesenhahn, compensatory education teacher at Olympia Elementary, part of the Judson Independent School District. "I look forward to next year when I'll have the program the whole year instead of just one semester."

Olympia Elementary: Percent of At-Risk 5th Grade Vmath Students Passing TAKS



Dr. Gersten notes that the tide has begun to turn, as several important studies are currently underway.

Keeping Kids on Track

Equally as important as explicit instruction is the use of progress monitoring to gauge whether students are mastering critical math skills and pinpoint areas that may be challenging. Effective progress monitoring can raise student scores the equivalent of 15 percentile points, says Dr. Gersten, particularly if teachers use the information to make effective instructional decisions to meet the needs of individual students.

This September, the National Council of Teachers of Mathematics (NCTM) will release a new set of Curriculum Focal Points, a short list of math skills, by grade, that every elementary and middle school student needs to master. The Focal Points will reflect what the latest research indicates are the essential building blocks for math success, and Dr. Gersten encourages teachers to look to these guidelines to inform their instruction.

Meanwhile, the NMP continues its research on improving outcomes for secondary students who struggle with math, with plans to release its first report in January. The panel's focus includes defining the basic learning processes for mathematics, identifying the content students need to know to succeed, developing effective instructional strategies, and fostering professional development for teachers. The hope, says Dr. Gersten, is that this research will help change the trajectory for struggling math students in the near term, and provide guidance to state legislators and district leaders to make a long-term impact for future generations.