

Philadelphia Inquirer

December 9, 2008

Singapore math makes a difference

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With a click of a stopwatch, 24 sixth graders were off - racing down a worksheet, figuring out as many basic subtraction problems as they could in 60 seconds.

When the "sprint" ended, teacher Bill Davidson called out the answers in rapid-fire bursts: "6.1, 4.3, 2.2. . . ."
" Students put checks next to the problems they had solved correctly, nodding intently.

The drill "makes us faster. We learn more. We're smarter," said Zi Liang, 13, a student in Davidson's class at the Folk Arts-Cultural Treasures Charter School (FACTS) in Chinatown.

The problems were simple, but the program is a departure - teaching fewer basics in a deeper way, to give children a thorough understanding of essential math ideas.

Educators know the curriculum, which also stresses using visual tools to understand abstract concepts, as "Singapore math."

FACTS is one of a small but growing number of schools around the country that uses the curriculum modeled on math teaching in Singapore, which consistently ranks first in international math comparisons.

The next ranking is due out today. Experts warn not to expect much movement by U.S. students in the 2007 Trends in International Math and Science Study (TIMSS), released every four years. In 2003, the U.S. placed 15th - lowest of all industrialized countries - in math, ranking below Latvia and Hungary.

The poor showing by Americans is no surprise to math educators. William Schmidt, a Michigan State math professor who is on staff at the U.S. TIMSS National Research Center, said the problem is that U.S. students are taught arithmetic repeatedly, but ineffectively.

"The rest of the world is doing algebra and geometry in eighth grade, and we're doing basic arithmetic," Schmidt said.

American math is also taught out of sequence; students learn topics key to algebra and geometry before they grasp fractions and ratios, Schmidt said.

This year, the National Mathematics Advisory Panel concluded that "the delivery system in mathematics education . . . is broken and must be fixed." Its recommendations include paring down the curricula and strengthening it in ways that mirror what happens in the southeast Asian nation.

But Singapore math is not a cure-all.

Teachers must have intensive training, and the sequence in which students learn concepts is not necessarily in sync with state exams. And students who start in the later grades often have shakier basic skills.

FACTS, a 400-student school, opened five years ago at 10th and Callowhill Streets in the rehabbed upper floors of a hardware store.

When they selected Singapore math, the founders and principal were not put off by the challenge.

Deborah Wei, who still serves as principal of the K-8 school, liked that the texts were spare, with few bells and whistles, and that students rely not on tricks (carrying the one, or cross-multiplication) but on deep understanding of how to solve problems.

"To this day I can't tell you how to divide a fraction by a fraction," Wei said. "I can do it, but I can't explain it. Our students can do it, and they can explain it."

Just a handful of schools were using Singapore math five years ago. Now, the number exceeds 1,000, experts say. FACTS, the only school in the region using it, routinely hears from others that are interested. A Delaware school will soon adopt it.

California and Oregon allow schools to use the texts, and some Utah legislators are pushing for all schools there to adopt the curriculum.

For FACTS, the proof is in the scores. In 2006, 27 percent of fifth graders passed the state math test; this year, as seventh graders, 67 percent passed.

Max Klink, the school's assessment manager, said that although Singapore math's sequence is not aligned with state tests, the school does make up for gaps - Singapore math does not cover American money, for instance - and teachers fill in with their own lessons.

But overall, FACTS's scores show the strength of the curriculum, Klink said. "They are learning the same concepts, and they're understanding the material better because of the way the math is taught."

Wei said she was pleased not just because students are scoring better, but also because "kids like math."

On a recent morning, Davidson's sixth-grade class warmed up with subtraction sprints, then stood up and practiced "skip counting" - counting by 12s, 7s, and 45s while doing exercises.

The students then moved onto calculating the angles of a triangle. Davidson asked lots of questions, getting students talking; pupils moved back and forth among three slender books, each with multi-step problems and concrete illustrations.

There are no extra pictures, charts, practice problems or stories in Singapore math books, but children are encouraged to use visual representations to understand word problems.

To solve word problems, second graders might fill in charts or draw circles representing numbers. They might count blocks.

Davidson, 31, who has a master's in education from the University of Pennsylvania, wore a backward baseball cap and taught with a sense of urgency.

Davidson loves the curriculum, although he's required to do plenty of advance planning and to write his own sample problems.

"This curriculum demands a lot of the teacher," Davidson said. "If you want to punch in at 8:20 and leave at 3, this will never be taught well."

Some of Davidson's students have taken three years of Singapore math, while others are new to it.

"Learning the balance has been my biggest challenge," he said. "I've got a few kids on a second-grade math level, and they're in sixth grade."

Nadae Epps, 11, came to FACTS this year from public school.

"In my old school, I didn't know any of my times tables," Epps said. "Math here is fun. It's not like we sit there and just do a whole bunch of work with no break. It makes sense."

That delights Yoram Sagher, a math professor at Florida Atlantic University who trains teachers around the country - including FACTS teachers - in Singapore math. "The concepts are not simple, but they are presented in a way which is sensible," Sagher said.

But though Sagher's calendar is full of visits to schools that want to use the materials, Singapore math, whose U.S. texts are distributed by a small Oregon company, may never gain widespread traction in this country, he said.

The big textbook publishing companies have marketing departments, sales forces, and pricy contracts with school districts. The books are written to meet math standards in all 50 states.

"All the other curricula are marketed. There's no central organization pushing Singapore math," Sagher said.

Janine Remillard, a curriculum expert at the University of Pennsylvania's Graduate School of Education, said that while Singapore math may be responsible for the improved test scores at FACTS, other curricula - such as Everyday Math, used in many districts around the country, including Philadelphia - have also shown promise when taught well.

"A curriculum provides a way of representing the mathematics, but it is only one piece of the puzzle," Remillard said. "How the teacher uses that curriculum is really, really critical."

Opinions vary on how to best tackle the international competitiveness problem. The National Council of Teachers of Mathematics hopes to work with states to narrow and focus what they teach. Schmidt advocates a single national math curriculum.

"What Singapore has," he said, "is a coherent, focused, rigorous set of standards, and that's the competition our kids are facing."