

Math success becomes elementary

Education | New programs are teaching algebraic principles to grade-schoolers

By MARIA GLOD

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WASHINGTON — Joanne Tegethoff teaches algebra. Never mind that her students carry Disney princess and Thomas the Tank Engine backpacks and have the alphabet taped on their desks.

The Montgomery County, Md., first-graders one recent afternoon were learning to write "number sentences" to help Lucy Ladybug: "Lucy wakes up and puts five spots on her back," Tegethoff told the class. "Then she gets confused. She wants 10 spots. What's missing?"

Tegethoff used to teach what she called "very boring math," using worksheets of addition and subtraction problems. Now her lessons delve into algebraic thinking. By the third grade, Viers Mill Elementary students in Silver Spring, Md., are solving equations with letter variables.

Long considered a high school staple, introductory algebra is fast becoming a standard course in middle school for college-bound students. That trend is putting new pressure on such schools as Viers Mill to insert the building blocks of algebra into math lessons in the earliest grades. Disappointing U.S. scores on international math tests have added to the urgency of a movement that is rippling into kindergarten. At stake, some politicians say, is the country's ability to produce enough scientists and engineers to compete in the global economy.

But education experts say students aren't the only ones who need more rigorous instruction. Too many elementary school teachers, they say, lack the know-how to teach math effectively.

"You can't teach what you don't know, and your students won't love the subject unless you love the subject," Kenneth Gross, a University of Vermont mathematics and education professor, recently told a group



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Annika Ricci works out a math problem during class at Viers Mill Elementary School in Silver Spring, Md. Grade schools are under pressure to prepare young students for middle school algebra.

Virginia efforts

In Virginia, George Mason University, the University of Virginia, Virginia Tech and three other universities have teamed with local K-12 systems to improve math teaching through a master's degree program in math and educational leadership for elementary and middle school teachers. The program, begun in 2002, has about 60 graduates, who have returned to their schools and become a resource for colleagues.

Virginia Commonwealth University math professor William Haver, who is involved in the partnership, said elementary teachers need to know far more than the standard curriculum. With a depth of knowledge, teachers can help children understand relationships between numbers and solve problems in different ways. Without it, teachers often rely on memorization and aren't well-equipped to help struggling students.

"Elementary math isn't elementary," Haver said. "There are a lot of deep ideas there. Usually, if a child doesn't get the right answer, there's a fair amount of good thinking along the way, but it got astray at some point. If you can pinpoint that problem, you're better off."

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National Science Foundation. "All of mathematics depends on what kids do in the elementary grades. If you don't do it right, you're doing remedial work all the way up to college. Arithmetic, algebra and geometry are intertwined."

Gross and others say many elementary and middle school teachers — generalists relied on to teach reading, science and social studies and even to make sure a child's coat is zipped — are drawn to teaching by a love

home with words than numbers.

"Many of them fear math," said Vickie Inge, math outreach director with the University of Virginia's School of Continuing and Professional Studies. "Many of them had trouble with math themselves."

Educators, mathematicians and business leaders are working to bridge the knowledge gap. At an increasing number of schools, including Viers Mill, teachers work with a coach who helps boost their math knowl-

funded by ExxonMobil, and the National Science Foundation are granting universities and school systems millions of dollars for programs to produce better math and science teachers.

In February, a panel of educators and mathematicians appointed by President Bush is slated to recommend ways schools can produce more algebra-savvy students. The panel will lay out skills students need to have starting in third grade to master algebra down the road. It will also recommend ways to improve teacher preparation.

Test scores released this month reignited concerns about math education in the United States. The Program for International Student Assessment found that 15-year-olds in the United States trailed peers from 23 industrialized countries in math.

What's more, Michigan State University professor William Schmidt found that U.S. teachers scored at the bottom of the pack on an algebra test in a recent study of middle school math teachers from six countries. Teachers in Korea and Taiwan, where students earn high marks on international tests, had the best scores.

"The U.S. performance was weak," Schmidt said. He found that U.S. and Mexican teachers had taken far fewer advanced undergraduate math courses than peers in Taiwan and Korea. He also found math knowledge isn't enough. Teachers also need strong training in instructional techniques.

Gross runs the Vermont Mathematics Initiative, a graduate program that has trained more than 160 elementary teachers in math leadership. He drew an analogy to elementary reading instruction.

"Would you want a teacher who has read 'Dick and Jane'?" he asked. "Or would you want a teacher who has read Shakespeare and the masters and has a fondness for reading?"

Results in Vermont are promising. In schools with the math leaders, students are earning better math test scores than