

December 13, 2004

PAGE ONE

New Equation
**As Math Skills Slip,
 U.S. Schools Seek
 Answers From Asia**

**Singapore's High Test Scores
 Win Over Some Educators;
 Another Fleeting Craze?**

Teachers Go Back to Class

By **CRIS PRYSTAY**
 Staff Reporter of THE WALL STREET JOURNAL
 December 13, 2004; Page A1

TOWNSEND, Mass. -- About five years ago, a statewide test in Massachusetts revealed that students' math skills deteriorated sharply as they went from fourth to sixth grade. Alarmed, the Massachusetts education commissioner suggested an unconventional fix: importing the math curriculum used in Singapore.

Students in Singapore routinely score among the highest in international math tests. The hope was that American kids taught the Singaporean way would improve their math scores.



David Driscoll

The approach has been adopted in about 200 schools nationwide, from rural Oklahoma to the inner cities of New Jersey. Early indications suggest that many U.S. students taught with textbooks imported from Singapore do perform better in math. Some children who once found the subject frustrating say they now like it.

Faced with a worrying decline in math proficiency among U.S. kids, a growing number of educators are seeking inspiration from Asian curricula. American children are falling behind their Asian peers in science and math, a shift that could push still more white-collar jobs offshore as the next generation graduates.

"Our kids just don't seem as numerate as they should be, and we decided we needed to try whatever we can to fix that," says David Driscoll, Massachusetts' education commissioner and a former math teacher himself, who had the idea of using Singapore text books in local schools.

Critics assert that math teaching has been dumbed down in the U.S. over the past two decades. They say

DOW JONES REPRINTS

 This copy is for your personal, non-commercial use only. To order presentation-ready copies for distribution to your colleagues, clients or customers, use the Order Reprints tool at the bottom of any article or visit: www.djreprints.com.

- [See a sample reprint in PDF format.](#)
- [Order a reprint of this article now.](#)

that too much emphasis is placed on making the subject accessible and fun and not enough on vital, if repetitive, drills such as multiplication tables. Another big criticism: U.S. math curricula tend to cover plenty of subject areas but not in sufficient depth.

Singapore and other southeast Asian countries take a different tack. Singapore's curriculum was developed over the past few decades by math experts hired by the Ministry of Education, who continually interviewed math teachers to find out what works and where kids need help. The elementary textbooks cover only one-third of the topics typically found in U.S. textbooks, but the material is taught far more thoroughly. While rote learning plays a part, kids in Singapore also learn to use visual tools to understand abstract concepts.

Singapore math texts, for example, ask kids to draw bars and other diagrams to visualize problems -- a technique called "bar modeling." When this strategy is applied consistently over a number of years, children tend to be better able to break down complex problems and do rapid calculations in their head.

SCHOOL DAYS



• [Science Journal: The Best Ways to Make Schoolchildren Learn? We Just Don't Know](#) ¹
12/10/04

• [Economic Time Bomb: U.S. Teens Are Among the Worst at Math](#) ²
12/07/04

• [Page One: As Test Scores Fall, Japanese Schools Get Harsh Lesson](#) ³
11/03/04

Not everyone believes that importing textbooks from Singapore would solve America's math problem. Some states say the approach doesn't meet their standards. American math curriculum varies from state to state, so there is a potential gap between standards set on the material students need to know and what they have covered using the Singapore books. The National Council of Teachers of Mathematics in the U.S. suggests that it might not be possible to copy what Singapore's done simply by importing its books. The success of its math program may have roots in Singapore's highly disciplined culture, where the entire community -- particularly parents -- expects kids to buckle down

and work hard, argues the NCTM.

There's little doubt, though, that math teaching in America needs to be overhauled. Tomorrow, Boston College will release a four-year global study that is expected to show the math gap with Asia remains. The college's last study, the 1999 Trends in International Mathematics and Science Study (TIMSS), ranked eighth-graders in Singapore the best in math, while U.S. kids came in 19th, just behind Latvia. American kids also fall further behind the longer they're in school; as fourth-graders, American kids ranked 7th on the 1995 study.

That decline has already had an impact on U.S. universities. Among U.S. freshmen who plan to major in science or engineering, one in five requires remedial math courses, according to the National Science Board, which is part of the government-funded National Science Foundation. Enrollment by U.S. citizens or permanent residents in graduate science and engineering programs, meantime, dropped 10% between 1994 and 2001. Enrollment of foreign students grew 35%.

Because of the skills gap, America risks losing even more jobs overseas. "Many have a gnawing sense that our problems may be more than temporary and that the roots of the problem may extend back through our education system," said Federal Reserve Chairman Alan Greenspan at a Boston finance conference in March.

Reforming the U.S. curriculum is difficult. Unlike Singapore and other Asian countries, the U.S. doesn't have a national curriculum. Each state is responsible for setting standards, while each district retains

control over how a subject is taught.

Visual Aid

Singapore books teach kids to draw bar models to visualize a math problem before they start solving it, like this third-grade multistep word problem.

Kelly and Nancy had 450 stamps altogether. Nancy had 50 stamps more than Kelly. How many stamps did Kelly have?



$450 - 50 = 400$
 $400 \div 2 = 200$
 Kelly had **200** stamps

Source: Hougang Primary School

Under the Bush administration's No Child Left Behind policy, funding and jobs depend on how each school rates on standardized state exams. Many district officials are reluctant to try something new for fear of slipping up on those exams.

But a handful are turning to Asia for answers. Georgia plans to adopt Japanese math standards as part of its reform of secondary-school curricula. A teacher-training textbook, based on Singapore's elementary math curriculum and written by a math professor at Michigan State University, is now used at a half-dozen universities in America. Singapore's math textbooks for young kids have the biggest appeal in the U.S. because they're written in English.

In rural Bethel, Okla., school-district superintendent Marty Lewis thought his kids were slipping in math. After his curiosity about Singapore was piqued by the 1999 TIMSS results, he did an Internet search about the Singapore method. That led him to the private Rosenbaum Foundation of Pennsylvania, which funds Singapore math programs in the U.S. and Israel.

The foundation, in turn, put him in touch with Yoram Sagher, a Florida mathematician who trains teachers to teach Singapore math. Mr. Lewis hired Mr. Sagher to give a one-week seminar to all his teachers in July. Bethel kindergartners and first-graders began using the Singaporean books in September.

"I came to a point where I thought: I don't care how crazy people think I am; I'm going to go out and find something that works," says Mr. Lewis.

While Bethel's kids are just getting started, other school districts have adopted the Singapore method wholesale. One is North Middlesex, a farming and commuter district that's an hour's drive from Boston.

North Middlesex's program got rolling soon after the education commissioner, Mr. Driscoll, noticed the decline in math ability among his state's sixth-graders. In 2000, he got a \$50,000 federal grant to test whether a Singapore curriculum would improve math scores for kids in his district.

North Middlesex dispatched three teachers with math degrees to work with a math professor at the Worcester State College in Massachusetts. They came up with a seven-day summer seminar for North Middlesex district teachers, based on textbooks from Singapore.

The Singapore-inspired program was started in grades five through eight, which needed the greatest help. As more teachers volunteered, the program was extended to other grades.



On a recent morning in Ashby, a tiny town in North Middlesex, fifth-grade math teacher Bob Hogan asked for volunteers to work out how many women there are in a hypothetical university class of 250 if there are 50 more men than women.

Mr. Hogan, an energetic 30-year-old teacher, asked for volunteers to tell him how to solve the problem using a bar model. Sarah Carter, a 9-year-old with freckles and bright red hair, leaned forward in her seat, arm in air.

First, she instructed Mr. Hogan to draw two bars of equal length, and label the top one "women" and the bottom one "men." She then he told him to add a small square extension to the "men's" bar, and write "50" inside of it. To the right of both bars, she asked him to write "250," indicating the full value of both, together. Looking at this pictorial, she started to solve the problem without pen or paper: She verbally subtracted 50 from 250, and asked him to write the "200" on the board, to the left of the two empty bars, indicating their combined value. Then, she divided 200 by two, and announced there are 100 women in the class, and 150 men.

"I don't know where Singapore is," she said, "but I like the way they do math."

Some teachers were initially skeptical. Steve Keating, a veteran math teacher who teaches seventh grade, says he has lived through a host of new math approaches, including the "new math" craze in the 1970s. "My first thought was, here we go again," he says, referring to the Singapore method.

He was especially taken aback by the textbook. By grades seven and eight, kids in the Singapore program are doing high-school-level algebra. "I thought, wow, that's complicated -- even for me," says Mr. Keating. He was eventually won over when he saw how enthusiastic his own students became about math.

The approach expects a lot of its teachers. Singapore's math program doesn't come with guides that walk teachers through every step of the class, and every problem, as many U.S. courses do. Teachers can't flip to the back of the book for answers. During the first year, Mr. Keating spent two hours every night preparing the next day's lesson. On his summer vacation he took math books to the beach. The effort paid off; his students' math scores improved.

Some parents also had doubts. Suzanne Carter recalls that her daughter Sarah, who'd always struggled at math, came home and drew bars and rectangles instead of working on the sums she grew up with.

"I was frustrated. I had no idea what she was doing," says Mrs. Carter, a sign-language instructor.

Her daughter's school, however, doesn't need more convincing. Students at North Middlesex are already doing better on state exams. Eighth-graders, for example, scored 75.4 points on this year's state "math proficiency index," up from 63.2 points in 2000. That jump was twice that of the state average -- which also improved. Other grades improved, but in line with the state average.

Eager for something more conclusive, North Middlesex recently hired Stanford University's Hoover Institution to analyze a slew of state and district exams to see whether a group of 300 students who'd taken one to three years of the Singapore program were better at math than other students. The study, which is continuing, found the Singapore math students had "significantly" better computation skills.

Boston Public Schools tried the Singapore math books in a few classes at one school last year, but decided to drop them. The district had adopted another math program, called the Workshop Model, which promoted group and independent work activities designed to get kids to think about concepts behind math. They didn't want to detract from that by experimenting more broadly with something new, said Ed

Joyce, curriculum director for math for Boston Public Schools.

"I wouldn't say anything bad about Singapore math, but I would say there's a lot of programs that would have the same result," he said.

Another hurdle that could limit the appeal of the Singapore method is the U.S. obsession with standardized testing. Kids taking Singapore math might be better at a core set of subjects such as multiplication, fractions, word problems and algebra, but they may struggle with topics that appear on state tests.

So North Middlesex supplements the Singapore books with a few extra lessons in subjects like probability, which are taught in grades four and five in the U.S. but not until later grades in Singapore.

The Singapore method continues to attract fans. Inspired by North Middlesex, 20 schools in 12 different districts across Massachusetts are now running Singapore pilot programs.

William Carey, principal of Beachmont Elementary school in Revere, a blue-collar suburb of Boston, last year began offering "Singapore math" in grades one through four. He reports some early signs of success. Beachmont's grade four class lagged behind the state average by just 3% on this year's state exam, up from the 8% gap between the state and last year's fourth-grade class.

Beachmont's success, in turn, has inspired others. Across town, teachers at Garfield Elementary began to teach math the Singapore way this year. "When something makes a difference, people notice," says Mr. Carey, the principal at Beachmont. "Word is starting to spread."

Write to Cris Prystay at cris.prystay@wsj.com⁴

URL for this article:

<http://online.wsj.com/article/0,,SB110288916514797758,00.html>

Hyperlinks in this Article:

(1) <http://online.wsj.com/article/0,,SB110263537231796249,00.html>

(2) <http://online.wsj.com/article/0,,SB110236760101392346,00.html>

(3) <http://online.wsj.com/article/0,,SB109943381380162667,00.html>

(4) <mailto:cris.prystay@wsj.com>

Copyright 2004 Dow Jones & Company, Inc. All Rights Reserved

This copy is for your personal, non-commercial use only. Distribution and use of this material are governed by our [Subscriber Agreement](#) and by copyright law. For non-personal use or to order multiple copies, please contact Dow Jones Reprints at 1-800-843-0008 or visit www.djreprints.com.