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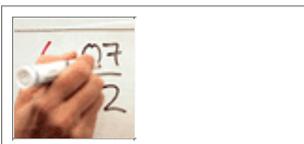
San Francisco Chronicle

## Improving math ed -- Bush right about that But where are the teachers coming from?

Jonathan David Farley

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In his State of the Union address in January, President Bush stressed the importance of improving math education. He proposed to "train 70,000 high school teachers to lead advanced placement courses in math and science, bring 30,000 math and science professionals to teach in classrooms, and give early help to students who struggle with math."



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But where will these teachers come from? And will the training of teachers be sufficient to increase the number of students choosing math and science careers? And why does all this matter?

Because mathematics is the foundation of the natural sciences. It is no coincidence that Isaac Newton, the man who formulated the law of gravitational attraction that revolutionized our understanding of the universe, was also the man who popularized the calculus. And the natural sciences, however pure, are what give us airplanes, cable TV and the Internet.

In the 2003 Program for International Student Assessment, a test that measures math literacy, American 15-year-olds performed worse than their peers in 23 countries, as well as those in Hong Kong. It's not hard to see why. According to the National Council of Teachers of Mathematics, 40 percent of the nation's middle school math teachers do not have the equivalent of an undergraduate minor in math. The average starting salary of a teacher is only \$30,000, whereas the average starting salary for a recent college graduate in computer science or engineering is \$50,000.

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Short of following the British, who have proposed paying experienced math teachers more than \$100,000, with a guaranteed minimum of \$70,000, where will we find a way to attract the thousands of teachers George Bush wants?

New York State initiated an innovative program to bring teachers from Jamaica for two or four years to teach in New York schools. Jamaica, a developing nation where one U.S. dollar equals 65 Jamaican dollars, is nonetheless a stable, English-speaking nation with an unbroken democratic tradition; it stands poised to beat the United States in establishing the world's first Institute for Mathematical Methods in Counterterrorism. When teachers for the New York program were recruited on the campus of the University of the West Indies, recruiters found more experienced math and science teachers than they ever dreamed they would.

But you can have all the teachers in the world and still not inspire kids to learn math. My friend Autumn e-mailed me about her nephew, Joshua: "He's upset because he's asked several of the math teachers why math is important or what are certain formulas used for -- there has to be a use, correct?"

Autumn told her nephew about my work in counterterrorism and for the television crime drama "Numb3rs." Autumn reported, "He's told his math teachers about you as well, and about the show 'Numb3rs.' He's informing them that through something called lattice theory you are managing to fight terrorists -- all with math."

Mathematics is art, and should be appreciated for its beauty, not simply for its utility. But we cannot expect 11 year-olds to cherish totally order-disconnected topological spaces as much as professional mathematicians do.

As I first proposed in January 2005, television shows like "Numb3rs" (or "Medium") -- where the main characters are mathematicians -- could work with the National Council of Teachers of Mathematics to show kids how math is really used; the council and Texas Instruments are now working together to use "Numb3rs" to promote math literacy in schools.

Another way to inspire kids is to relate mathematics to something they see every day. In order to excite students and draw funding to his school, school superintendent Ronald Ross of Roosevelt, N.Y., has begun looking into the idea of creating a curriculum involving math and counterterrorism. What kinds of topics would students learn?

The opening line of the Oscar-winning movie "A Beautiful Mind" is "Mathematicians won the war." During World War II, the mathematics underlying cryptography played an important role in military planning. Winston Churchill admired Alan Turing, the mathematician who had mastered the German codes, recognizing him as the man who had perhaps made the single greatest individual contribution to defeating Hitler.

At Los Alamos, the lab that built the atomic bomb, Cliff Joslyn uses lattice theory to mine data drawn from thousands of reports of terrorist-related activity to discover patterns and relationships that were previously in shadow.

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Lattice theoretical methods developed at MIT tell us the probability that we have disabled a terrorist cell, based on how many men we have taken out and what rank they hold in the organization. Lauren McGough, a Massachusetts high school student, tested the accuracy of this model by getting her classmates to pretend they were terrorists, passing orders down a fictitious chain of command, essentially confirming what the theory predicts.

High school students could learn algebra, trigonometry, calculus and logic while also learning concrete applications involving homeland security. No longer would students yawn and ask, "What is math good for?" Beauty could defeat both terror and boredom.

Whatever you may think of the State of the Union address, when it comes to supporting math education, we should all see pi to pi. President Bush is correct when he says that mathematics education in America must improve if the United States is to stay economically competitive, but the stakes are much higher than that. During the Cold War, the United States would not have tolerated a military gap between itself and its adversaries. Yet today, with 61 percent of all U.S. doctorates in math going to foreigners (15 percent to Chinese), we readily accept a "math gap."

Dollar for dollar, the best defense against our adversaries' weapons of mass destruction may be our allies in the Americas, armed with weapons of math instruction.

Improving math education is not merely a smart idea. It is a matter of national security. Algebra is one revolutionary Islamic concept we cannot afford to neglect or ignore.

*Jonathan David Farley is a mathematician and science fellow at Stanford University's Center for International Security and Cooperation. Contact us at [insight@sfgate.com](mailto:insight@sfgate.com).*

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