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Irrational Numbers

Reform math draws criticism in schools and creates an opening for business

By: Karen Epper Hoffman

Jeannie Ianelli works with children in one of Kumon's Math and Reading Centers. Kumon is an after-school program designed to help children master the basics of math and reading so they eventually study above their grade level.

Washington has built a long and illustrious track record as a place where businesses that required employees with math smarts could find a home. Microsoft, Boeing, Amazon.com, and more recently, a host of biotechnology concerns, software companies and Internet ventures all chose to set up headquarters in the Evergreen State for more than just the temperate climate and the good coffee.

But many fear the state's youth will not be in a position to fill the growing demand for talented programmers, engineers and medical personnel because they lack the basic math skills required for those professions. Teachers and parents say that even talented students are graduating from high school unable to do long division, let alone algebra and calculus.

A growing number of corporate leaders are voicing concerns that a reputation for poor math education will cause problems beyond detracting from the region's ability to produce workers for its high-tech sector. "We believe this issue is very important to the state and the future of the state's competitiveness," says Brad Smith, senior vice president and general counsel for Microsoft Corp.

Smith says that if Washington schools develop a poor reputation, it will become more difficult for local companies to recruit people from out of state. "If Washington state doesn't quickly develop a higher-caliber math experience, it will make it harder for Microsoft and other technology companies to recruit people to this area," he says. "When we're trying to persuade talented people to move here ... it's very important to [let them] send their kids to great schools."

"This is a very high priority, given the economic backbone of the state and the relevance to our continued competitiveness," says Marc Frazer, vice president of Washington Roundtable, a Seattle-based public policy organization that includes top local executives such as CEOs Scott Carson of Boeing Commercial Airplanes and Kerry Killinger of Washington Mutual Inc.

A focus on curriculum

"It would be bizarre not to move the needle and move it quickly," Frazer says. Businesses are increasingly forced to import talent or outsource jobs because the people entering the workforce here are falling short in their math abilities, according to Frazer. "When students here don't have a chance at many of the best jobs," he says, "that's dubious for the marketplace."

"The curriculum issue is very important," says Microsoft's Smith. He adds that a lack of consistency in math education across school districts as well as in math teacher training also contributes to the problem.

The problem has grown acute. So many students failed the math portion of their Washington Assessment of Student Learning exam that Gov. Chris Gregoire decided to delay implementation of the WASL requirement for graduation. In early May, Gregoire signed a law that extended to 2013 from 2008 the date by which students must meet math (and science) standards for high school graduation that were set by the WASL.

"We must improve math and science teaching and learning, but we cannot penalize students when the system has failed them," Gov. Gregoire said in a statement at the time of the law's passage.

While some blame the standardized tests as a poor measure, many critics place the blame for falling math results squarely on "reform math" curricula, a relatively new approach to teaching math that focuses on learning math through investigation and discovery, rather than practicing basic skills. Reform math has been embraced by an increasing number of public schools over the past decade in several states including Washington. Seattle schools recently adopted the Connected Math program, which takes this approach.

David Klein, professor of mathematics at California State University, Northridge, says he began noticing many years ago that his calculus students were weak in algebra. "They understood the concepts, but couldn't do the basic skills," says Klein. Since then, Klein has added his name to a growing list of academics and educators that have been fighting

the reform math movement. California was among the first to reject reform math when it changed state standards in 1997. Washington may belatedly follow.

Reform math began to develop a following in Washington in 1989, when the National Council of Teachers of Mathematics published a new set of standards that sought to expand math literacy by making it more interesting to more students and focusing on students' ability to reason logically. New textbooks were designed with this approach in mind, but after more than a decade of seeing reform math at work, critics now point out many reform math textbooks read like English or social studies books, while math lessons focus too much on collaboration and communication and not enough on actual arithmetic and problem solving.

Legislators in Olympia – even those that initially supported and have long stood behind the reform math curriculum – are beginning to admit that a change may be necessary. At an October 2006 meeting in Renton organized by the State Board of Education, a number of state lawmakers called for the reform math system to be scrapped and replaced (in the short term) with an intensive program of remediation and basic skills development.

Connected Math and other reform math programs have been heavily criticized because the program is based on the principle that children will discover mathematic principles on their own. The textbooks do not explain to children how to approach problems. One result is that parents have difficulty helping their children with their homework, and consequently, a growing number of parents are turning to outside tutors to supplement their children's math education. During the decade between 1994 and 2004, when reform math became more prevalent, spending on tutoring and education services in Washington increased to $149 million, up 340 percent, according to the Washington Department of Revenue. And those numbers continue to rise. Tony Beals, director of operations for the Kumon Centers in Bellevue, says that enrollment in his company's tutoring facilities throughout Washington state leapt 22 percent in 2006 alone. Currently, more than 3,800 Washington students are enrolled at Kumon, about two-thirds of them receiving math tutoring.

"[Parents] are concerned that students are not getting basic calculation skills," Beals says. Kumon typically charges between $80 and $110 per subject per month. At Blaine School and TOPS, two K-8 schools in Seattle, parents have hired their own teachers and organized before- and after-school algebra classes to supplement the weak math learned in regular classes.

Many teachers are also concerned about how the new approach is affecting their students' math comprehension. Bob Dean, who teaches Advanced Placement calculus and trigonometry at Evergreen High School in Vancouver, says he's seeing more and more students come to him "not being prepared with the basic [math] skills. I'm talking about the simplest skills you would learn by third grade. ... They're just not taught in the reform programs."

Not Adding Up

It was about 10 years ago that Cheryl Pflug first sensed a problem with her children's school math curriculum. The mother of four was helping out in her son's classroom when she noticed that many of the students were struggling with basic math.

"The students were trying to feel their way through it," Pflug says. "It was really sad."

Now a Republican state senator representing Washington's Fifth Legislative District in Seattle's eastside suburbs, Pflug is pushing for major changes in the curriculum to strengthen students' facility with basic math computations like multiplication, long division and fractions.

"It's those basic computational skills that give students confidence," Pflug says. "One major problem with the national movement [to reform math] is that it's focused on advanced reasoning at the expense of a solid foundation." She points out that about two-thirds of the students that start at Bellevue Community College must take some kind of remedial class, usually in math.

In January 2006, a group of concerned Washington parents launched Where's the Math?, a campaign to fight reform math. Bob Brandt, a software engineer and former math teacher in Sammamish, helped found the group after he noticed that a sixth-grade student his high school-age daughter was tutoring could not do long division. The sixth-grader had never been taught how to do it.

Brandt, whose own children received a more classic math education during their elementary years at a private school, believes that by failing to give students a strong foundation in basic arithmetic during their early years, reform math makes it difficult for students to progress to algebra, trigonometry and calculus later on.

Practicing basic arithmetic problems, memorizing multiplication tables, and other basic skills that used to be commonplace have become almost nonexistent in today's math classes because such exercises have become demonized by new-math proponents as "drill and kill," he says. But Brandt parallels learning math to becoming proficient at playing tennis. "A tennis player may understand how they're supposed to hit the ball, learn about better ways to serve . . . But ultimately, they also need to just practice."

Karen Economopoulos, co-director of the Investigation in Numbers curriculum for TERC, the Cambridge, Mass. company that develops reform math curricula used at several schools in Washington state, defends the program, pointing out that U.S. math education had problems long before reform programs were put in place. Economopoulos argues that her math curricula helped fill a "a need for more broad-based education. Most kids weren't getting the skills to participate."

Last fall, Washington Learns unveiled a 60-page report that recommended upgrading and standardizing the K-12 math curriculum. Already, individual Washington school districts – in Tacoma and North Beach, for example – are purchasing Saxon math textbooks,

known for their more traditional approach to math learning, in order to help students bolster their comprehension of basic math skills.

Ultimately, many experts believe schools will settle on some kind of hybrid plan that combines a classic drills-and-skills curriculum and a more investigative reform-style curriculum. "Right now, a lot of critics are moving from one extreme to another," says Kumon's Beals. "I think schools need to adopt more of a balanced approach."

Karen Epper Hoffman is a Poulsbo-based writer