Math for America and the Math Science Teaching Corps

We American mathematicians have known for years how poorly our high school students rank on international mathematics assessments such as the TIMSS (Third International Mathematics and Science Study) and PISA (Programme for International Student Assemssment). Now a November 2005 study by the American Institute of Research shows that not just our high school students are behind the international curve; there is "a consistent picture of overall mediocrity" across all grade levels. There are as many theories of how to fix this problem as there are explanations for its existence. None of these solutions, however, is as elegant and simple as properly rewarding mathematics and science teachers for the very valuable role they play in our economy.

Math for America (MfA) does just that. MfA was founded in 2004 by a group of mathematicians and investment professionals headed by Jim Simons; since then it has run two pilot programs to improve mathematics teaching in New York City. MfA's Newton Fellowship Program offers US$90,000 in stipends, in addition to regular salary while teaching, to mathematically capable people as an incentive for their choosing math teaching over other jobs. Fellows receive full tuition scholarship to a master's program in mathematics education, as well as mentoring and professional development opportunities. MfA's Newton Master Teacher Program complements the Newton Fellowship Program by rewarding excellent math teachers already in the field with US$50,000 supplementary stipends.

The success of MfA's pilot programs in New York City has generated a national initiative. On February 7, 2006, bills based on the Newton Program model were introduced in Congress. The Math Science Teaching Corps (MSTC, pronounced "mystic") Act of 2006 is bipartisan, championed in the Senate by Chuck Schumer (D-NY) and in the House by Jim Saxton (R-NJ). The MSTC bill creates a federal fellowship program to recruit, train, and retain outstanding mathematics and science teachers. This program will both recruit new teachers and reward current high-quality teachers, with the goal of eventually involving 20 percent of our nation's secondary public school mathematics and science teachers.

Some details: The Corps recruits both current teachers and prospective teachers. Prospective new teachers in the Corps receive pedagogical training in exchange for a four-year commitment to teach. Those without certification receive training and certification in a one-year master's program before going into the classroom. Those with certification enter the classroom right away while pursuing advanced studies on a part-time basis. Retention strategies include district-level mentoring, professional development, and federal financial incentives. Current teachers who join the Corps commit to teaching for five years and to serve as leaders in their school, to mentor new teachers, and to participate in professional development. They also receive federal financial incentives.

Other bills aimed at improving mathematics and science education have also been introduced in Congress. Four aspects of the MSTC bill set it apart from the rest:

1. National Standards: All applicants to the Corps, whether aspiring teachers or already in service, must perform satisfactorily on a National Academy of Sciences-approved standardized test of subject knowledge. This test will include a portion on mathematics even for science teachers. In addition, candidates must demonstrate strong verbal skills as well as other attributes linked to effective teaching.

2. Financial Incentives: During their years in the program, all Corps members receive stipends from the federal government in addition to their regular salaries. New teachers' supplemental stipends will begin at US$11,000 and scale up to US$20,000 during their four-year teaching period, while working teachers' supplemental stipends will be set at US$20,000 a year. Corps members teaching in hard-to-staff schools may receive enhanced stipends.

3. Prestige and Respect: As members of the Corps, participants experience a high level of enthusiasm and solidarity. The highly visible Corps will build prestige and respect for the field of math and science teaching. Corps members participate in mentoring and professional development programs.

4. Renewable Fellowships: Corps membership is renewable. In the steady state, the top 20 percent of all public secondary school math and science teachers should be Corps members, just as the research activities of the top scientists in our country are supposed to be supported by the National Science Foundation. Corps members applying for renewal compete on an equal footing with all new applicants.

Information about how to help MfA support the MSTC is available on the advocacy pages of our website `http://mathforamerica.org`.

Additional information, including supporting material on some claims, can be found at "Reassessing U.S. International Mathematics Performance: New Findings from the 2003 TIMSS and PISA", American Institutes for Research, November 2005: `http://www.air.org/news/documents/TIMSS_PISA%20math%20study.pdf`; "Trends in International Mathematics and Science Study (TIMSS)", National Center for Education Statistics (NCES), 2005: `http://nces.ed.gov/timss/Results03.asp`; "Learning for Tomorrow's World—First Results from PISA 2003", Organization for Economic Co-operation and Development (OECD), 2004: `http://www.pisa.oecd.org` (click on "What Pisa Produces" and then on "2003").

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Mathematics in Spain

Having been educated mostly in Spain, it was a nice surprise when I learned that this year's ICM was going to take place in Madrid. I also appreciate the special article that *Notices* dedicated to Spanish mathematics last February. I am less convinced though that mathematics, or any other branch of science for that matter, will ever achieve the level of development in Spain that it enjoys in the United States, France, or any other country that has been or is currently home to the brightest mathematicians in the world. Put simply, Spanish society doesn't encourage excellence at large, let alone in fields, like mathematics, that have so little tradition in Spain. One could argue whether the Muslim mathematicians that lived in what is today's Spain during the Middle Ages were truly Spanish. Not that Spaniards are less scientifically talented than other Western Europeans, but, as John Ball pointed out during the opening ceremony of ICM06, raw mathematical talent, while necessary, is not enough for the development of high calliber mathematics; a socioeconomic infrastructure suppportive with mathematics is just as important. There is an intrinsic incompatibility between the values promoted by Spanish culture and excellence in mathematics or any other scientific endeavor. The evidence of this fact is overwhelming; the coverage by the Spanish media of ICM 2006 is a case in point. The ICM, despite its significance, didn't make it to the front page of any of the large Spanish newspapers. These same media have special weekend supplements where they usually highlight important events that get lost among the week's current affairs. None of them had a special article on Madrid's ICM or mathematics. One wonders whether if Perelman hadn't rejected the Fields Medal, the large, and most influential, Spanish media would have mentioned the ICM at all. Many of my scientifically educated friends, when presented this view, rush to say that lack of economic resources is the issue. I strongly disagree with that view. In economic terms, Spain is no longer a developing country; moreover, as the Forbes billionnaires list shows, there are a few individuals in Spain with the necessary wealth to create Spain's Clay Math Institute or Packard Foundation if they wanted to. I was lucky. Most of the excellent teachers that I had in high school and early years of college were good mathematicians or had an extensive mathematical training. They instilled in me a love for this discipline; but they also wisely told me that if I wanted to make a career in science, Spain was not the right place to be. Other countries, like France or the United States, were better suited for my interests. I eventually followed their advice, finished my higher education in France through an Erasmus grant, and right now I am a Ph.D. student in electrical engineering at Stanford University.

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First, Last, and Other Names

Re Khalid Saifullah's letter in the September *Notices*: China is not the only country where the family name is written first and the given name(s) second (actually, I think that is the logical order, just look at phone and other directories; but I would not want to force it on other countries or on international organizations that try, maybe foolishly, to standardize). So is, for example, Hungary. Still, I don't know of any Hungarian (or, for that matter, Chinese) mathematician who resents having to write their names in different order in (most) countries other than their own.

Middle names are usually not mandatory on forms, at most middle initials, and those may be replaced by NMI for No Middle Initial. But, if one is fortunate enough (as I am) to have more than one given name (s)he may choose the initial of one of her(his) other given names in order to need just one middle initial, rather than three (NMI).

Things get more complicated when one's name consists of only one part. But if, as in the case of Riazuddin and Fayyazuddin, the name has in Arabic two parts, one would think (admittedly, in complete ignorance of the language) that they could also be transliterated into English in two parts. By the way, not only in China, India, and Pakistan, but also in many European countries last names reflect places the family comes from or some ancestor's one-part name. Maybe it is not an East-West issue.

However, not every effort of standardization succeeds, see e.g., the metric system or the UN (UNESCO?) recommended pattern of writing year, month, and day in that order (which happens to be the standard ordering in Hungarian since time immemorial).

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Textbook Auxiliaries

As the author of one of the textbooks discussed in Allyn Jackson's article "Textbook Tempest: Students and Professors Decry Price Surges" (*Notices*, Aug. 2006, pp. 771–4), I'd like to comment on one of the points she made. The PIRG report dismisses the additional items that are included with textbooks (such as CD-ROMs) as "bells and whistles" and says that 65 percent of instructors use these additional materials rarely or never. I don't doubt the accuracy of that figure, but I think it's unfortunate.

It takes me about a year and a half to prepare a new edition and I spend a fair amount of that time on the CD. It's not easy to convey the dynamic nature of calculus in a static object like a book, but change and motion can be illustrated in a natural way on a CD. Whenever I teach calculus, I use the CD extensively in my lectures and it certainly focuses students' attention and enlivens the classroom. And I encourage students to use it on their own.

I therefore suggest that instructors in any mathematics course take a serious look at the CDs and other materials that come with the book. You might be pleasantly surprised by how helpful they are.

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