THE UNITED STATES owes a great debt to the makers of Sputnik 1. The Soviet Union's 1957 launch of the world's first earth-orbiting man-made satellite challenged our national self-image of leadership in mathematics and science. Within a year, Congress passed the National Defense Education Act, and by the time Apollo 11 landed the first humans on the moon in July 1969, American mathematics, science, and technology were the envy of the world.

Our nation's leadership in mathematics and science is once again at risk, and a new congressional act of similar scope is needed. According to the recent National Mathematics Advisory Panel report, "American students have not been succeeding in the mathematical part of their education at anything like a level expected of an international leader."

Changing this will take teachers with a dedication to math and science - and the knowledge to match. But the data suggest that we are in a feedback loop, with today's ill-prepared students becoming tomorrow's teachers. This week's announcement that nearly three-quarters of aspiring elementary school teachers failed the math section of the state's licensing exam is the latest example.

Last June, the National Council of Teacher Quality, a nonpartisan research and advocacy group, reported that the average 2007 mathematics SAT score of high-school seniors planning to major in education in college was 32 points below the national average for all college-bound students. And colleges themselves are too often not helping. The council surveyed 77 education schools, and it rated 37 of them as "fail on all measures" in preparing elementary teachers to teach math. The situation in science is no better - a 2007 report of the National Academies described the scientific knowledge of K-8 teachers as "limited" and "often quite thin."

Since teacher knowledge significantly affects student learning, this should give us pause.

The nation is not producing enough well-qualified teachers of math and science. And too many of the ones it does produce are leaving the classroom after a few years. We cannot continue to lead in math and science without substantial and immediate changes nationwide.

To break the feedback loop, we need a new Mathematics and Science Education Act. Its principal points should include:

- Financial incentives to attract mathematically and scientifically able students to become teachers. It should provide low-interest college loans for top math and science students who want to become teachers, with debt forgiveness for those who remain teachers for a certain period of time.

- A focus at colleges and universities on developing math and science content knowledge along with teaching skills. We must ensure that new teachers know these subjects thoroughly - the why, not just the what. This will require new classes, taught by mathematicians and scientists, who must take greater responsibility for preparing the next generation of teachers.

- Professional expectations and opportunities for teachers. We need to reenvision teaching as a profession with a ladder of steps, progressing from novice to expert. Teachers should be subject to rigorous licensing
requirements and periodic recertification. They should also be offered opportunities for substantial professional development leading to additional intellectual engagement with their subject areas. In particular, teachers in mathematics and science must be offered a regular sabbatical so that they can stay up to date and add to their knowledge with college or graduate-level disciplinary courses. And we must pay for those courses.

- Increased salaries for mathematics and science teachers. The law of supply and demand cannot be avoided. We need this expertise, and we should be willing to pay for it.

The implementation of such an Act will require a good deal of effort and is likely to trigger some controversy. But its long-term impact and benefits would far outweigh any growing pains.

Sputnik included a radio beacon audible every 96 minutes. It became a clarion call to change. If only we could hear it now.

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