The California War over Math Instruction

by Joseph G. Rosenstein

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The "old math" was good enough for me. I enjoyed solving equations and puzzles, and never even thought of asking what it was all good for. I saw the patterns and the beauty in mathematics, and eventually became a professor of mathematics.

But the old math wasn't good enough for most of my contemporaries. They learned just enough mathematics to pass their courses and to turn in an acceptable performance on the SAT, if they were college bound. However, they never understood what mathematics was all about, and they were never able to make use of mathematics beyond simple arithmetic. The result was a small percentage of students who were mathematically proficient, barely enough to satisfy our society's need for scientists, mathematicians, and engineers.

Times have changed. The jobs of the future, indeed the jobs of today, require that many more of our students have skills which are even more sophisticated than what was needed a generation ago. The operator of an office copying machine, for example, needs to understand and use a coordinate system in order to instruct the copier to duplicate a portion of a page. Our students will be required to deal with on-the-job problems using a tool-box containing more skills than ever before. And, in our electronic age, they will be competing for jobs with workers sitting at computers all over the world.

So the battle over mathematics education that is taking place in California, as reported on in the front-page article in Thursday's New York Times, is a significant one. However, the arguments against the new methods assume, incorrectly, that they are replacing methods that have worked in the past.

I got involved in elementary and secondary education fifteen years ago when I was director of undergraduate programs in mathematics at Rutgers University (New Brunswick). At that time, we instituted a placement test for all incoming first-year students and learned that there were an astounding number who were unprepared for calculus and even precalculus, even though all had met Rutgers' entrance requirements (then three years of college preparatory mathematics). Every college and university has conducted an extensive remedial program in mathematics for the last twenty years; this in itself should be sufficient evidence that the current approach to mathematics education simply hasn't worked. Students' deficiencies predate the current debate about mathematics education -- they have, unfortunately, been with us for a long time. The question is how those deficiencies can be avoided -- and that is what the reform movement attempts to address.

So what is the current debate about? It is not about "basic skills". Everyone agrees that all students need basic skills. If in their zeal to implement the mathematics standards of the National Council of Teachers of Mathematics, the California system went too far, then that

needs to be corrected. Students need to know the basic multiplication facts and be able to used them quickly and accurately; for example, they should be able to estimate that the cost of mailing 320 pieces of mail at 78 cents is about 300x80 cents or $240. All students need basic skills. And all students need to go beyond basic skills.

Expertise in long division is no longer a marketable commodity. I doubt that one percent of the readers of this article have done a long division problem (with a two- or three-digit divisor) without a calculator even once in the last year. What students need to learn today is how to formulate problems mathematically and then use whatever skills and tools are appropriate, including calculators, to solve those problems. They need to understand long division, but they do not need to practice it endlessly, as students did the past.

The current debate is not about "solving equations" versus "writing how they feel about mathematics" -- a hypothetical contrast mentioned in the New York Times article. Everyone agrees that all students need to be able to solve equations. But they also need to learn that mathematics is valuable, that mathematical problem-solving will make a difference in both their professional lives, which will likely involve many different kinds of jobs, and in their personal lives, where they will also need to make many decisions about communal matters. As with reading, where we want to go beyond literacy and encourage our children to become life-long readers, we want our children to become life-long users of mathematics. For that, they need to value and appreciate mathematics.

The current debate is really about the impact of the democratization of mathematics education on the mathematically talented student. As we pay more attention to the mathematical expectations of *all* students, are we going to ignore the needs of our most able students? Many of the parents who have criticized the new reforms in mathematics education, such as the California computer cohort, are concerned that the result will be lowered expectations for their own children. Many of the mathematicians who have joined in the criticism are concerned that the focus on a mathematically literate public may result in a diminished pool of scientists and engineers.

These concerns are indeed legitimate. But they can be addressed within the context of the proposed reforms. It is truly unfortunate that in the "war over mathematics instruction" in California, both sides seem to be unaware that their concerns are not incompatible, and seem to be unwilling to seek solutions which address both sets of concerns. It will indeed be unfortunate if, as happened in the phonics vs. whole-language controversy about the teaching of reading, California ends up swinging from one camp to the other, without recognizing the value in both approaches, and without incorporating both into its educational practices.

New Jersey's mathematics standards, adopted by the New Jersey State Board of Education in May 1996, notes in Standard 4.16 that students should "be challenged to maximize their mathematical achievements at all grade levels". The New Jersey Mathematics Curriculum Framework, which advises teachers and schools on the implementation of the standards, addresses the twin goals of equity and excellence as follows: "We have to make sure that the

raised expectations for all students do not result in lowered expectations for our high achieving students. A core curriculum [based on the standards] does not exclude a program which challenges students beyond the expectations in the standards. Indeed, New Jersey's mathematics standards calls for all schools to provide opportunities for their students to learn more mathematics than is contained in the core curriculum." Perhaps Californians can adopt a more balanced approach rather than continue their ultimately fruitless "war over mathematics instruction."

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