



## On My Mind

KEITH DEVLIN

# Reduce Skills Teaching in the Mathematics Class

IT IS MY BELIEF THAT WE NEED TO REDUCE significantly the time we spend teaching basic skills in grades 7–12 mathematics classes.

Well, that's probably got your attention. And maybe my desire to do so led me to state my suggestion a little too strongly. Perhaps I should take out that word *significantly*. But such tinkering aside, I am serious.

I came to what to many might seem a startling conclusion not by contemplating an "ideal world" full of bright and eager pupils fired with a passionate thirst for knowledge nor from looking back to my own childhood (when, of course, I was a bright and eager pupil fired with a passionate thirst for knowledge). Rather, I base my suggestion on what actually goes on in the real world we live in, a world where mathematics education not only fails to produce the goods it sets out to (i.e., mathematically literate citizens), it actually has a pronounced negative effect, in that it produces large numbers of people who are at best math averse and at worst math phobic.

In other disciplines, even the most inspired teaching can fail to generate a love for learning, but only in mathematics do we see our efforts leading to such a strongly negative outcome. For many people, mathematics is, or was, simply their worst school experience, and far from preparing the ground for them to acquire specific mathematical skills later in life when they find that they need them—which I think is a very important aspect of school education—we provoke them into developing a mental attitude that makes such later learning extremely difficult.

I don't think this situation occurs because mathematics teachers are inherently worse than any other teach-

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*The views expressed in "On My Mind" do not necessarily reflect the views of the Editorial Panel of Mathematics Teaching in the Middle School or the National Council of Teachers of Mathematics. Readers are encouraged to respond to this editorial by sending double-spaced letters to Mathematics Teaching in the Middle School for possible publication in "Readers Write." Manuscripts of approximately six hundred words are welcomed for review in "On My Mind."*

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ers. Rather, I think certain features of mathematical thinking—and what a human brain must do to engage in such thinking—make the learning of mathematics particularly difficult. (I examine those features at length in a forthcoming book, *The Math Gene: Why Everybody Has It, but Most People Can't Use It*. In brief, the thesis advanced there is that mathematical thought processes are of a kind far removed from the processes that the human brain evolved to perform. Indeed, the features of mental processes that make the human brain such a powerful organ in many walks of life—such as pattern association and “imprecise” case-based reasoning—generally work against mathematical thought, with the result that to do mathematics, we have to teach our brains to stop doing the very things it does so well.)

Explanations aside, however, when our attempts to teach not only fail to achieve our objectives but often produce a diametrically opposite outcome, I think that we should step back and examine where our efforts are supposed to lead.

Whatever else it is, the purpose of mathematics education is surely not the development of extensive mathematical knowledge or skills. Few citizens in modern society need or make real use of any appreciable knowledge of, or skill in, mathematics. What mathematics they need and use they have probably already met by the time they are twelve years old.

On the positive side, one thing that education surely should do is present options and open doors, and we cannot achieve that if we teach our students only what we are sure they will need. In particular, the continuance of modern society requires a steady supply of a relatively small number of individuals having considerable training in mathematics. So that the critical future supply of mathematicians does not dry up, we must ensure that all high school and university students are made aware of the nature and importance of mathematics so that those who find they have an interest in, and aptitude for, the subject can choose to study it in depth.

For me, these two observations have an obvious consequence for mathematics education: For the middle and high school grades, a major goal in the mathematics class should be to create an awareness of the nature of mathematics and the role that it plays in contemporary society. To do so, mathematics should be taught in much the same way as history or geography or English literature—not as a utilitarian toolbox but as a part of human culture. The aim of a mathematics education should be to produce an educated citizen, not a poor imitation of a \$30 calculator.

In my view, an educated citizen should be able to answer the two questions:

- What is mathematics?
- Where and how is mathematics used?

At present, few people can answer either question well.

Existing methods, which focus on trying to get students to “do mathematics,” turn off pupils in droves and produce math anxiety in many, which is counterproductive. Teach mathematics as a part of our culture, and the result will be many more students who are motivated to want to learn mathematics.

I should stress that I am not saying that basic skills are not important. In particular, I would put quantitative literacy on the same footing as ordinary literacy: both are so fundamental in today’s society that they are *everybody’s* responsibility. The development of basic quantitative skills is as much the responsibility of the social studies teacher as the development of language and presentation skills is the responsibility of the mathematics and science teachers. To leave the development of quantitative skills to the mathematics teacher sends quite the wrong message to the student.

In addition to the need for quantitative skills, I think that mathematics is much like music and many other pursuits, in that a certain level of skill acquisition is necessary before there can be any real understanding or appreciation of the subject. So that’s another reason for teaching basic skills.

What I think is wrong with our present approach is the balance: I believe that too much focus is put on the skills and not enough—in fact, hardly any—on the subject matter. That explains why, to most people, mathematics simply *is* “a collection of procedures for solving problems.”

By changing our present education system radically so that for the vast majority of students, the primary goal in the mathematics class is to create an awareness of the what, the how, and the why of mathematics rather than the development of skills that, apart from a tiny minority, none of them will ever make use of, we will achieve two important *mathematical*, as opposed to quantitative literacy, goals:

1. Tomorrow’s citizens will appreciate the pervasive role played by one of the main formers of the culture in which they live their lives. The justification for this goal is that human life is the richer for having greater understanding of the nature of that life. The more ways we have to know our world and ourselves, the richer are our lives.

2. Those individuals who turn out to have an interest in, and a talent for, advanced mathematics will be exposed to the true nature and the full extent of the subject at an early age and as a result will have an opportunity to pursue that interest to the eventual benefit of both themselves and society as a whole.

Of course, if we do this, mathematics will no longer be a “special case.” But is that so bad? ▲