Trends

Mathematics

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Change

On my desk I have four kilograms—nine pounds worth—of recommendations for changing mathematics education in the United States. All of these recommendations have been published within the past 15 years, and the number of reports published in the last year exceeds that of any of the previous 14 years. These were just the reports that were easiest to locate—there are probably at least as many that I missed. Although there are some variations, all say pretty much the same thing.

Is this a temporary fad? Will all the reformers soon go away and leave us alone? Can we wait a few more years to see if they really mean it? If we really have to change, how soon must we change, and how should we go about doing it?

Looking back on the history of education in America, we can see that the most fundamental changes have come in response to outside forces. During the first half of the 19th century, the forces of mass immigration and industrial revolution created the need for universal free public elementary education. Similarly, during the first half of the 20th century, labor unions, job shortages, and other factors triggered raising the compulsory attendance age to 16 in most states. Though some philosophers and educators advocated reforms, the outside forces were the true change agents.

It is thus reasonable to ask whether the current batch of recommendations are simply the product of utopians or whether they in fact herald a new wave of outside forces that mandate change.

Consider today's dramatic advances in technology. Major changes in school mathematics instruction are already required just to prepare people to live in the present—to say nothing of the future. In my pocket I have a six-ounce computer that costs $60. It runs on almost no electricity, and it can do things that would have been thought incredible for the multimillion-dollar, house-filling, power-guzzling, overheated vacuum-tube computers of 40 years ago.

Computers and calculators can do virtually all the symbol manipulating required in the first 14 years of school mathematics. That includes such operations as factoring polynomials, multiplying vectors or complex numbers, graphing and solving trigonometric equations, and differentiating or integrating functions algebraically or numerically. The skill to do what a common calculator can do much quicker is of little value today, and will be of even less value tomorrow. Every day that we fail to make major changes in the school mathematics curriculum, we waste precious human resources.

But before we all go out and buy computers and new textbooks, the first step is to develop a large cadre of well-informed people within school systems so that good judgment will precede decision making.

These people should be familiar with the National Council of Teachers of Mathematics' *Standards for Selection and Implementation of Instructional Materials*, *Curriculum and Evaluation Standards for School Mathematics*, and *Professional Standards for Teaching Mathematics*. They should realize—and they should help others realize—that for meaningful change to occur, substantial inservice teacher preparation and support will have to accompany adoption of any new curriculum material. They should also keep in mind that tests, as well as textbooks, drive the *de facto* curriculum.

Textbooks with special sections on technology, communication, problem solving, data analysis, estimation skills, and other recommended topics probably will not satisfy the NCTM standards nor the need for improvement. To be taught effectively, these topics must be integrated throughout the entire program. Thus, new algorithms or procedures (dividing by two-digit numbers, for example) should be taught in a way that will enhance problem solving and communication, that will take into account the availability of calculators and computers, and that will emphasize estimation skills. Tacking exotic new topics onto the end of a traditional curriculum will be ineffective and will consume entirely too much time (or will simply be skipped by some unmotivated teachers).

Substantial amounts of time, money, and willpower are going to be necessary to make any profound change in

A New Design for Mathematics Education

In his new book, *Mathematics Education for a Changing World*, Stephen S. Willoughby argues for a complete overhaul—not just a simple tune-up—of mathematics education. Emphasizing user-friendly mathematics, Willoughby points out that most students have no inclination or ability to use mathematics as an everyday problem-solving tool because it is usually taught as a dreary, abstract exercise with no real-world relevance. He also describes the effect of changes in technology on the goals and means of mathematics education and criticizes outdated curriculums that fail to teach skills appropriate to a technological age.

Willoughby reviews recent recommendations, provides examples, makes suggestions for change, and advises educators on how to foster such change. Available from ASCD in paperback for $11.95. Call ASCD Member Relations at 703-549-9110, ext. 224. Stock #611-90100.

the way mathematics is taught in this country. So far, the many recommendations for improving school mathematics in the United States have probably done more to deplete our forests than to educate our children. There is already a choice of excellent mathematics textbooks available at every level for those who wish to use them. There are many superb educators who are willing and able to help teachers prepare a mathematics curriculum for the 21st century. In addition, good tests—that measure both traditional skills and skills needed in the future—are now becoming available.

The need for change has been demonstrated; what we need now is less talk and more action. The tools with which to make appropriate change are available, but they are not widely used. The world will not stop and wait for education to catch up. We must begin today to change for tomorrow.□

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IN THE APRIL ISSUE . . .

"Strategic Planning"

Educational Leadership explores the benefits of systematic planning processes described by educators who have experimented with them. We think you'll be interested in:

★Ron Brandt's conversation with George Wilkinson of United Way, who recognizes we can't predict the future accurately but advocates anticipating several possible futures in order to make wiser decisions about how our organizations can respond;

★Roger Kaufman's "Pony Express" wisdom applied to strategic planning;

★Lessons learned from local planning efforts, reported by Robert Blum and Anthony Kneidek, Tom Mecca and Charles Adams, Mary Nebgen, and Therese Walter.

Plus, as our Contemporary Issues feature, an important survey of "Global and International Education," with contributions from Kenneth Tye and Willard Kniep, Siegfried Ramler, Meg Little Warren, John LeBaron, and others.

Plus a "Synthesis of Research on Reviews and Tests" by Frank Dempster.

COMING IN MAY: "Restructuring"—a rich harvest of grass roots efforts and the perspectives of Carl Glickman, Ted Sizer, Pat Wasley, Jane David, and others.