

Notices

of the American Mathematical Society

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From the Editor

Should children still be forced to learn to read? Most of the information that we obtain from print media can now be communicated using videotapes, audiotapes, recorded messages, computer graphics, etc. With computer scanners and voice synthesizers, even material stored only in printed word form can be communicated orally. Some information, such as instructions for assembling toys and household paraphernalia, might be more effectively conveyed by videos or computer graphics than by printed words.

Despite the legitimacy of the claim that technology does provide alternatives to the printed word, no widespread movement to denigrate the value of literacy has yet emerged. Why then do so many people think that the development of computers and calculators has diminished the importance of mathematics in basic education? In part, this is a consequence of the misconception that identifies mathematics with numerical computations. But that is not the whole story.

The utility of literacy is rarely used as the *sole* justification for teaching children to read. Even if technology were to make reading nonessential, advocates would readily cite the value of exposing children to the beauty of poetry and literature. Nor have I heard anyone suggest that schools develop separate reading classes for girls in which cookbooks and child care manuals are used to motivate them.

Despite the influence of detractors like M. Smith (whose book, *Humble Pi*, is reviewed elsewhere in this issue), it is easy to make a convincing case for the pragmatic importance of providing quality mathematics education for all. However, expecting that children will learn mathematics just because it's useful makes about as much sense as imagining that they will eat vegetables just because vitamins are good for them. Adults and children are more likely to eat vegetables that are prepared in genuinely tasty ways than overcooked mushy peas. Nor is covering them with gooey chocolate sauce likely to provide more than a temptation to lick the sauce off.

Students will be receptive to mathematics only if it is enjoyable as well as relevant. Is this possible? I think so, provided that by "enjoyment" we mean the kind of genuine pleasure that comes from solving challenging puzzles rather than "chocolate syrup" games to promote rote learning of arithmetic.

Suppose that our educational system required all students to learn to tune instruments very precisely but never allowed them to listen to music. Most of them would grow up hating music. Only a talented or lucky few would discover that one could use these same instruments to make beautiful sounds. This group might even become a powerful elite in a "world dominated by [musicians]" and become the subject of a diatribe by M. Smith!

Is it really impossible, as some claim, for the average person to appreciate mathematical beauty? Certainly not everyone—perhaps not even all mathematicians—will appreciate the beauty of the Seiberg-Witten breakthrough in 4-dimensional topology. But most young children *do* enjoy puzzles and games of strategy. What is less widely appreciated is that such nonnumerical games are also mathematics.

True appreciation for, and enjoyment of, mathematics will not come from making it easy—any more than riding up in a cable car can replace the pleasure and achievement of a strenuous hike up a mountain. But good training and guidance are essential if mountaineering is to be truly enjoyable rather than unpleasantly arduous and terrifying. This is why we must strive to ensure that those teachers who guide children into the mathematical world are themselves well-qualified enthusiasts. Only then can we hope that children learn and enjoy the genuine mathematics associated with hard "problem-solving" rather than the rote formula memorization that is so often misrepresented as "mathematics".

Does this mean that we should abandon all efforts to also give students a facility with some of the "basic" formulas and algorithms that most of us learned? No more than suggesting that musicians do not need to practice scales and learn techniques in order to be able to play beautiful music.

But why, you may ask, am I "preaching" to the "converted" readers of the *Notices* when the real challenge is to convince educators and the general public? Because I think that we need to reevaluate the arguments we have been putting forth. It may well be necessary to emphasize eventual applications to secure funding for mathematics research. Applications can also make mathematics more interesting; they can even provide the insight to make it more comprehensible or intuitive. But we do our best work when we find pleasure, as well as purpose, in our activity. We cannot hope that many children will learn mathematics unless we find a way to share our enjoyment and show them its beauty as well as its utility.

Mary Beth Ruskai