

Math Education: A Challenge And A Joy

Don't worry about your difficulties with math, Albert Einstein is said to have told a schoolgirl who wrote to him to lament her lack of success in the subject - "Mine," he wrote, "are still greater." Like many of Einstein's off-the-cuff remarks, this one contains a profound truth. Math is the sort of subject that increases in complexity the more you understand it; as the diameter of your knowledge grows, so does the circumference of your ignorance. Some educators see this expanding difficulty as a hurdle to overcome, but in fact, it's exactly the quality that causes many young people to fall in love with math. After all, a young football player's love of the game often increases in proportion to the toughness of the competition; and video game fans actively seek out greater difficulty - the only game they won't play is the one that fails to increase in difficulty with each level cleared. The fact is that children love to solve problems; the problem - and opportunity - lies in the fact that schools often fail to tap into this intellectual curiosity, and sometimes even stultify it. Why, then, do so many students experience math as a chore? Cambridge mathematician Timothy Gowers suggests one possible answer in his *Mathematics: A Very Short Introduction*, in answering the question "Why do so many people positively dislike mathematics." He writes: "Probably it is not so much mathematics itself that people find unappealing as the experience of mathematics lessons - because mathematics continually builds on itself, it is important to keep up when learning it." (His comment will ring true to anyone who remembers endless third-grade drills on the multiplication tables.) Standardized instruction and memorization of these details has to move at a certain plodding pace, which leaves some students bored and others, who are slower to grasp a concept, frustrated. "Those who are not ready to make the necessary conceptual leap when they meet one of these [new] ideas will feel insecure about all the mathematics that builds on it," Gowers writes. "Gradually they will get used to only half understanding what their mathematics teachers say, and after a few more missed leaps they will find that even half is an overestimate. Meanwhile, they will see others in their class who are keeping up with no difficulty at all. It is no wonder that mathematics lessons become, for many people, something of an ordeal." But Gowers sees hope for even the most frustrated student, writing, "I am convinced that any child who is given one-to-one tuition in mathematics from an early age by a good and enthusiastic teacher will grow up liking it." Gowers's remark suggests a few possible directions for school districts and state legislatures concerned by recent declines in math scores. Smaller classrooms, more individualized instruction, and greater access to math tutoring and afterschool homework-help programs for poorer children all may help. If students can work at math in the way that they work at other, more pleasurable problem-solving tasks - moving at the pace that's comfortable to them, so that they aren't inhibited by frustration, fear of failure, and invidious comparison to faster-moving classmates - they may find themselves taking satisfaction in their own intellectual attainments, enjoying the intrinsic incentives that make scholarly success its own reward for top students. Gowers's mention of "one-to-one tuition" may also help to explain the explosive growth of math tutoring services over the past decade. Tamar Lewin, in a November 2006 *New York Times* story, writes that in Washington State alone, "residents spent \$149 million on tutoring and other education support services in 2004, more than three times the \$44 million they spent 10 years earlier." In a state where many parents hope to see their children grow up to work for such local giants as Microsoft or Boeing, math instruction is especially important.

About the Author

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