Ditch the Calculators:

Letting children punch numbers into a machine does not add up to learning math
by Diane Hunsaker

I sigh inwardly as I watch yet another student, this one a ninth grader, struggle with an advanced math problem that requires simple multiplication. He mentally grapples with 5 x 6, looks longingly at the off-limits calculator on the corner of my desk and finally guesses the answer: 85. The proliferation of calculators in the classroom amazes me. The students I tutor tell me regularly that their teachers allow unlimited access to this tool. The National Council of Teachers of Mathematics actively encourages its use. Recently I attended a math seminar where the instructor casually stated that teachers, once reluctant to permit calculators in the classroom, had crossed this hurdle. Now "everyone" agrees on their importance, she said. The more I hear from the education establishment about the benefits of these devices in schools, the less surprised I am when middle- and high-school students who have difficulty with arithmetic call for tutoring in algebra and geometry. Having worked six years as an electrical engineer before switching to teaching, I often suggest to my students that they consider technical and scientific careers, but I'm discouraged when I see an increasing number of kids who lack simple math skills.

Educators have many oft-repeated arguments in defense of calculators, but each one ignores the reason that we teach math in the first place. Math trains the mind. By this I mean that students learn to think logically and rationally, to proceed from known information to desired information and to become proficient with both numbers and ideas. These skills are something that math and science teach and are essential for adolescents to become thinking, intelligent members of society.

Some teachers argue that calculators let students concentrate on how to solve problems instead of getting bogged down with tedious computations. Having a calculator doesn't make it any easier for a student to decide how to attack a math problem. Rather, it only encourages him to try every combination of addition, subtraction, multiplication or division without any thought about which would be most appropriate. Some of my elementary-school children look at a word problem and instantly guess that adding is the correct approach. When I suggest that they solve the problem this way without a calculator, they usually pause and think before continuing. A student is much more likely to minimize his work by reflecting on the problem first if he doesn't have a calculator in his hand. Learning constructive methods for approaching confusing problems is essential, not just for math but for life.

A middle-school teacher once said to me, "So what if a student can't do long division? Give him a calculator, and he'll be fine." I doubt it. I don't know when memorization and repetitious problem-solving fell to such a low priority in education circles. How could we possibly communicate with each other, much less create new ideas, without the immense store of information in our brains? Math is as much about knowing why the rules work as knowing what the rules are. A student who cannot do long division obviously does not comprehend the underlying principles. A true understanding of why often makes learning by rote unnecessary, bemuse the student can figure out the rules himself. My students who view the multiplication tables as a list of unrelated numbers have much more difficulty in math than those who know that multiplication is simply repeated addition. Calculators prevent students from seeing this kind of inherent structure and beauty in math.
A student who learns to manipulate numbers mentally can focus on how to attack a problem and then complete the actual computations easily. He will also have a much better idea of what the answer should be, since experience has taught him "number sense," or the relationship between numbers.

A student who has grown up with a calculator will struggle with both strategies and computations. When youngsters used a calculator to solve 9 x 4 in third grade, they're still using one to solve the same problem in high school. By then they are also contending with algebra. Bernuse they never felt comfortable working with numbers as children, they are seriously disadvantaged when they attempt the generalized math of algebra. Permitting extensive use of calculators invites a child's mind to stagnate. If we don't require students to do the simple problems that calculators can do, how can we expect them to solve the more complex problems that calculators cannot do?

Students learn far more when they do the math themselves. I've tutored youngsters on practice SAT exams where they immediately reach for their calculators. If they'd take a few seconds to understand the problem at hand, they most likely would find a simpler solution without using a crutch. I have also watched students erroneously enter a problem like 12 + 32 into their calculators as 112. + 32 and not bat an eye at the obviously incorrect answer. After all, they used a calculator, so it must be right. Educators also rationalize that calculators are so inexpensive and commonplace that students must become competent in using them. New math texts contain whole sections on solving problems with a calculator. Most people, including young children, can learn its basic functions in about five minutes. Calculators do have their place in the world outside school and, to a limited extent, in higher-level math classes, but they are hardly educational tools.

Many teachers as well as students insist, "Why shouldn't we use calculators? They'll always be around, and we'll never do long division in real life." This may be true. It's also true of most math. Not many of us need to figure the circumference of a circle or factor a quadratic equation for any practical reason. But that's not the sole purpose of teaching math. We teach it for thinking and discipline, both of which expand the mind and increase the student's ability to function as a contributing individual in society: the ultimate goals of education.

HUNSAKER is a mathematics tutor and adult-education teacher in Santa Clara, Calif.