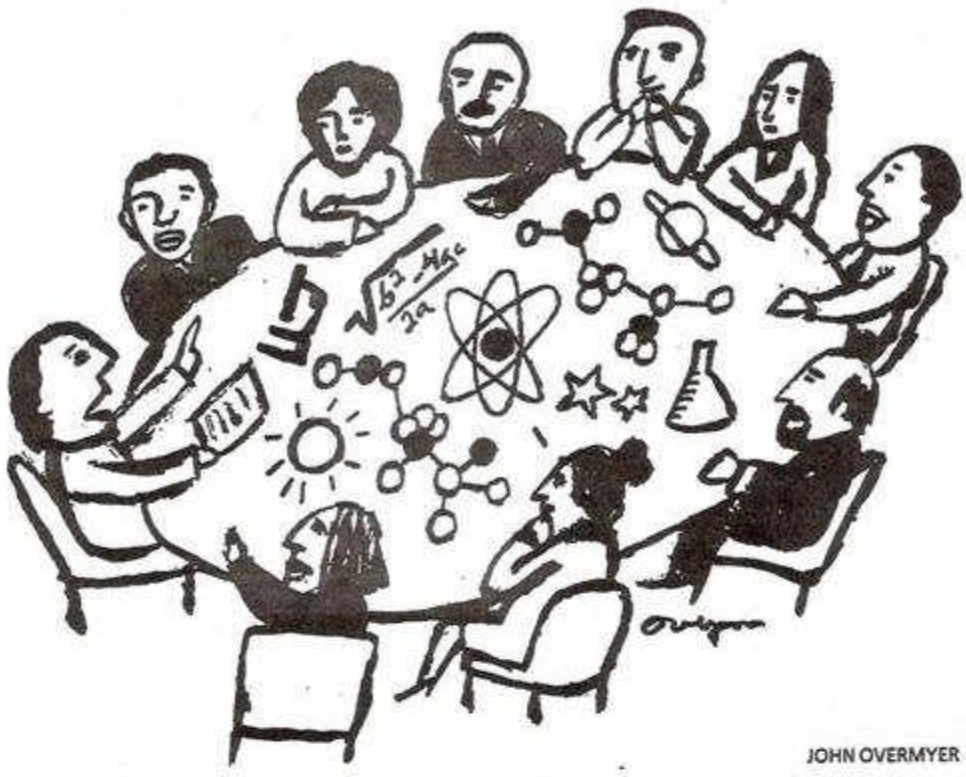
OTHER OPINION



JOHN OVERMYER

Scientific Notation

We Shouldn't Translate Math's Abstractions Into English

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The raging battle for teaching mathematics in the public school system is a familiar one. Any parent who earns a living in a technical field (engineering, science, math) becomes frustrated when dealing with today's public school educators.

The recent front-page story in The Courant about division in the math ranks highlights some of the issues that separate the two sides: the public school educators who must prepare children to be literate citizens with functional math skills, no matter what their career aspirations; and the so-called gurus in our colleges and universities who must turn these students into future researchers and engineers, keeping our nation a technological leader in the world community.

Over the past several years U.S. math students have failed when compared to students in years past, as well as to students worldwide. Recent college freshmen require remedial math to get up to speed with previous generations of students. Why is this so?

Many problems have been alluded to, from simplified curriculums for social agendas that must facilitate all students, especially girls and minorities, to the capability or intellect of the math teachers in the public school system.

However, the single major flaw with math education today is that educators are trying to verbalize all mathematical concepts, which waters down and distorts the basic thought processes required in math. This helps the less skilled math student (fewer abstract concepts — easier curriculum) and actually harms the more skilled math student because added verbiage garbles abstract thought.

Mathematical symbols, spatial perceptions and variable relationships lose continuity and flow when put into words. In essence, verbalizing hampers and perverts underlying principles in mathematics, causing confusion.

Educators prepare curriculums grounded in their own understanding of math, usually based on a verbal or liberal arts background, far from an educational experience founded in rigorous mathematical training. This satisfies the needs of the lowest skilled math students, to the detriment of the most advanced and talented.

Hence the attempt to over-verbalize these concepts has damaged the mathematical experience at both the elementary and secondary levels.

Verbalizing means giving every concept a name and an elaborate definition. In years past the basic relation "x = x" was simply an equality, quite obviously. Now defined as the "Reflexive Axiom of Equality," the definition must be memorized and regurgitated verbatim on a test. Is this math?

This verbalizing hurts the exceptional math students because typically those people who are good in math do not verbalize well. I know; I am one of them. That does not mean we cannot communicate well; it only means we understand and process information or data much differently than a person who has good verbal skills.

In a sense we process data similarly to the way a digital computer processes data: one piece of information at a time — but very, very quickly. A person with good verbal skills sees the forest for the trees; a person with good mathematical skills also sees the forest for the trees, but one tree at a time.

A simple example. Thermodynamics is an engineering course that relates matter and energy. A calculus background is helpful (but not necessary) to understand the basic equations that relate concepts. But for 90 percent of the problems that must be solved, only high school algebra is required. Thus, thermo could be taught in high school with no loss of understanding.

Yet in the most difficult of college studies that attract the best math students, typically mechanical and chemical engineering, thermo is the single most cited course for students dropping out of these programs of study. Why?

Thermodynamics is difficult because of the tremendous amount of nomenclature and new verbiage needed to apply the underlying principles in problem solving. Therefore the verbalized portion of thermo is so difficult to learn, comprehend and apply in such a short amount of time that many good math students fail.

Is this not what we are doing in our public school math curriculums today, verbalizing too many mathematical concepts? Sure, it helps the liberal arts-trained educators who have a poor mathematical understanding. But what about the highly skilled math students who will be our future researchers and scientists? Perceptions in the abstract are difficult, if not impossible, to verbalize.

Learning mathematics involves mastering a language of numbers and symbols. For some, it is very easy; for others, it remains a mystery. Can we accept this fact and stop trying to remove the abstract thought process required for this field of endeavor?

The gurus are right: Teach the best and brightest to use their natural mathematical skills. Until public school educators come to this realization, future generations will suffer the consequences of math illiteracy, hopefully not at the expense of our global superiority in technology.

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