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Common-Core Math Standards Don't Add Up

By Grant Wiggins

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There is little question in my mind that national standards will be a blessing. The crazy quilt of district and state standards will become more rational, student mobility will stop causing needless learning hardships, and the full talents of a nation of innovators will be released to develop a vast array of products and services at a scale that permits even small vendors to compete to widen the field to all educators' benefit.

That said, we are faced with a terrible situation in mathematics. In my view, unlike the English/language arts standards, the **mathematics components** of the Common Core State Standards Initiative are a bitter disappointment. In terms of their limited vision of math education, the pedestrian framework chosen to organize the standards, and the incoherent nature of the standards for mathematical practice in particular, I don't see how these take us forward in any way. They unwittingly reinforce the very errors in math curriculum, instruction, and assessment that produced the current crisis.

Let's start with the vision. The goal of mathematics education is clear enough: We want students to be able to solve nonroutine and worthy mathematical (or math-related) problems, not just handle simple, discrete, and dull exercises; and we want students to learn to like doing math, see value in it, and therefore develop greater persistence and skill in handling mathematical challenges. Yet, there is not one word in the standards document about building curricula backward from rich, nonroutine, interesting, and authentic problems. As Sol Garfunkel and David Mumford recently noted in a widely read *New York Times* **opinion piece**: "This highly abstract curriculum is simply not the best way to prepare a vast majority of high school students for life."

A look at the **National Assessment of Educational Progress**, or NAEP; the **Trends in International Mathematics and Science Study**, or TIMSS; and state test results shows that our students are woefully deficient in solving any problems that require a transfer of learning, as opposed to the plug and chug of simple rules and algorithms. And nothing in the new standards will change this sorry state of affairs.

I am astonished that there is not one mention in the document of the difference between real and pseudo-problems. Have the writers of this document not been in classrooms or looked at mainstream curricular materials? As it stands now, few students encounter real problems, i.e., puzzling and atypical challenges that require clever approaches and solutions—real thought. The

long-standing weaknesses in math curricula and instruction will be abetted, not solved, by these standards.

There are no valid intellectual principles undergirding the document. Many “standards” address picayune topics. Why weren’t the big ideas of mathematics highlighted in the standards themselves, as the draft science standards from the National Research Council do? A few years ago, Randy Charles wrote a detailed set of big ideas in math for the National Council of Supervisors of Mathematics. Why weren’t they or their equivalent highlighted? Why weren’t goals for complex transfers of knowledge emphasized? Why weren’t model problems linked to essential questions referenced?

Yes, the authors identified the practice standards; they are a start, but they are set apart from dozens of pages of content standards, and none of the assessment or instructional examples in the content standards show you how to combine practice and content. (In a just-released **report** by David Conley, the math practice standards were more highly rated by college teachers than the content standards. A common complaint was that “general problem-solving skills are not emphasized enough.”)

Worse, the math practice standards are incoherent and not sufficiently thought through, as one can see from the standards language quoted below:

“Make sense of problems and persevere in solving them. *Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution.”*

The entire narrative underneath this standard involves various heuristic moves, but not a complete set. And as noted, there is no discussion of what a genuine problem is.

“Reason abstractly and quantitatively*. Mathematically proficient students make sense of quantities and their relationships in problem situations.”*

How is this a “practice standard”? This is a truism. This describes what anyone working in mathematics must always be doing: working with abstractions.

"The mathematics components of the Common Core State Standards Initiatives are a bitter disappointment."

“Model with mathematics. *Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.”*

This phrasing begs the key question: How will students learn to model with mathematics if they aren’t provided with ambiguous and confusing situations that demand models and in which different models have pros and cons? The average myopic teacher will simply see this as saying: Please plug in the “right” model. Nothing in the standard prohibits this.

“Use appropriate tools strategically. *Mathematically proficient students consider the available tools when solving a mathematical problem.”*

What does “strategically” mean in this context? Why isn’t it simply “tactical” or “intelligent”? This is a missed opportunity to underscore the importance of confronting students with messy

and non-well-defined problems that require them to make such decisions (especially since students will typically have few tools from which to choose).

"Attend to precision. *Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning."*

This is arguably the most poorly thought-through of all the practice standards. Why does the primary reason for "attend[ing] to precision" focus on communicating to others? Why don't the demands of mathematics require a student to worry about significant figures, margin of error, and precise calculations?

"Look for and make use of structure. *Mathematically proficient students look closely to discern a pattern or structure,"* and

"Look for and express regularity in repeated reasoning. *Mathematically proficient students notice if calculations are repeated, and look both for general methods and shortcuts."*

In the last two standards, we are given two narrowly phrased pieces of advice of completely different scale and scope. And is this all there is to say about how to solve problems? What about something as vital as "Turn unfamiliars into familiars via equivalence"? What about the series of questions that the famed scholar George Pólya taught so many to use for solving all kinds of problems? This is random counsel.

Missing entirely from the practice standards is a discussion of how to pose problems, and, more generally, how to ask powerful questions. This is a telling oversight. Unlike in school, real problems are not served up on a platter, fully formed. The standards-writers overlooked the most basic fact of people with genuine math expertise: They *find* problems!

The English/language arts standards were released with a rich and elegant framework of anchor standards; no such framework exists here. The ELA standards also provided samples of assessment and anchor texts. This is a glaring omission on the part of the math-standards writers. One would think that the authors would have worked overtime to provide educators with samples of model tasks, as well as a long list of do's and don't's about how to address the standards.

Is it too late to change this? I hope not. Solving our problem of poor mathematics education depends upon it.

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