Some Problems with Mathematics Core Standards

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Intro: I am an internationally known research mathematician at Stanford University. As a research mathematician, I have a large number of honors. For example, I am one of the very small number of 20th century mathematicians whose collected works are slated for publication by a major publisher. I've also had many International honors such as the Gauss professorship in Germany, and even recently, I gave lecture series in Japan, China and Canada on my recent work in Robotics and Bioinformatics. In 2009 I was appointed to the Common Core Validation Committee.[1] I was the only actual mathematician and, indeed, the only member with a Ph.D in a content area and not in education on Validation, so I took in on myself to try to get the best possible document in mathematics. However, in the end, I could not sign off on a statement to the effect that CCMS was benchmarked at the level of the top international standards. Today, I'd like to describe my reasons, and to try to help you understand why I think adopting CC is a very bad idea.

Diane Ravitch: The famous education historian, Diane Ravitch, noted in her book "Left Back." that every 20 years or so, the ed schools notice that our K-12 outcomes are not improving in math – in fact they seem to be getting worse.

They then say "We can fix the problems." And they present to us exactly the same programs and curricula that they presented 20 years earlier. *They tell the small group that remembers 20 years back, that we had improperly implemented their programs then, so the failure was not the fault of the schools of education. "This time we need to spend more money and everything will be fine."*

So welcome to California in 1993. We are hearing exactly the same rhetoric now as we heard then and we are being presented with the same curricula and programs as then. Indeed, the chief difference between then and now is that this time they are presenting them to the entire country. The terrible math textbooks that we got rid of in CA with such difficulty are now back.

The foundation for this advance is the Common Core Math Standards (CCMS) a political document that was written in such a manner that it could be interpreted in many different ways. The point was to get buy-in from as many states and education establishments as possible.

CCMS claims that its intent is to correct the problems with U.S. K-12 mathematics and, if followed faithfully, will make all high school graduates workforce and college ready. It is said that CCMS will also strengthen the Science, Technology, Engineering,

[1] The committee was charged with overseeing the development of the Common Core Standards, and, if necessary, revising parts we deemed unsatisfactory.

Math (STEM) pipeline, and rescue our economy by dramatically increasing the number of students majoring in STEM areas at university.

In order to do this it is claimed that CCMS will correct our "Mile wide and inch deep" K-12 math curriculum, making our instruction much more like the focused teaching in the high achieving countries. There will be far fewer standards, and they will focus on key topics, exactly as is done in the high achieving countries.

Indeed, grade by grade, CCMS does have fewer standards, but to do this they produce things like the following monstrosity, a first grade addition and subtraction standard.

1.NBT.4. *Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.*

This is a glom of separate standards. In the high achieving countries only a small amount of the material above is covered in first grade or even first and second grade together, and yet this material is the main focus of instruction most of these years. Moreover, some of the standard is probably absurd to ask of first or second graders, for example *relate the strategy to a written method and explain the reasoning used.*

Note. Also, the number of choices given, *using concrete models or drawing and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction* is clearly overwhelming for students of this age.

It seems that the reason for this omnibus glom was to include the many different approaches to addition an subtraction that are advocated in the interested states and associations such as the National Council of Teachers of Mathematics (NCTM). As a result, CCMS has often preserved the mile wide structure of our standards, just using fewer (often incomprehensible) paragraphs to do it.[2]

Another major issue is that the standards develop very slowly. Indeed, by the end of sixth grade CCMS is more than one year behind international expectations, and by the end of eighth grade, more than 2 years behind. For example, internationally, one expects fourth graders to be quite fluent with ratios, rates and motion at constant speed types of questions.

I would grade the standards as follows. K - 5 considerably above average for our

[2] See http://educationrealist.wordpress.com/2013/11/09/core-meltdown-coming/ for further examples and a very detailed discussion of this issue. She starts her remarks by observing that "Here's the only important thing you need to know about Common Core standards: they're ridiculously, impossibly difficult," where the difficulties are usually with parsing and teaching standards like 1.NBT.4 above.

states, not nearly as good as the best, CA, MA, IN, MN, WA, but better than 90%. 6- 7 about average, 8 mostly just spinning wheels, HS a serious, serious, problem.

Indeed, in March, 2010, one of the two lead authors of CCMS, Jason Zimba, testified as follows: “We have agreement to the extent that its a fuzzy definition, that the minimally college-ready student is a student who passed Algebra II.”

This is an extraordinarily weak standard. Only about 1 in three students whose highest math course in HS was Algebra II will obtain a four year college degree in any subject, and there is only a 1 in 50 chance that a STEM intending student with this background will ever get a four year degree in any STEM area.[3]

> **Remark** Of course, even Algebra II is a considerable improvement on the original draft where the definition of college-ready student is a student who passed Algebra I. *U.S. govt. provided data shows that with this standard only 7% of students will ever obtain a 4 year college degree.*

Zimba clarified the (Algebra II) definition later in his testimony by stating that CCMS is not for STEM, and and he expanded on it by saying (and I quote)

> *“Not only not for STEM, it’s also not for selective colleges. For example, for UC Berkeley, whether you are going to be an engineer or not, you’d better have pre-calculus to get into UC Berkeley.”*

Thus we are talking about preparing kids for “success” at community colleges and perhaps non-selective colleges like University of Phoenix. In particular, it entirely abandons the top 30% of a typical high school class.[4]

Here is the reason I say 30%.

> In California we have two university systems the University of California system and the California State University system. The UC system guarantees admission to about the top 10% of a CA HS graduating class, while the CSU system guarantees admission to about the top 30%. In the case of the UC system, currently a student who has not gone further than the CCMS expectations will not be eligible for admission, and in the CSU system, they may be eligible, but the expectation is that they would have to start with trigonometry and pre-calculus, which, as I’ve mentioned, severely curtails

[3] See C. Adelman’s book *The Toolbox Revisited*, U.S. Dept. of Education, 2006, pps. 31, 32 and *Web Tables – STEM in Postsecondary Education: Entrance, Attrition, and Coursetaking Among 2003-04 Beginning Postsecondary Students*, U.S. Department of Education, Oct. 2012, NCES 2013-152, p.23, for details

[4] In this context it is worth noting that Education Realist, in her 11/9/2013 blog, after pointing out the “difficulty” of the standards, adds the following remark: “I’m going to make assertions that, I believe, would be supported by any high school math teacher who works with students outside the top 30%, give or take.”

the liklihood that they will ever major in a STEM area, or, indeed, even graduate.

If time remains read this paragraph – otherwise skip to last. We can assume that our education schools are well aware of all this. Consequently, it should be no surprise that a key requirement for states to apply for RttT money was to include signed agreements with the heads of all public colleges and universities or systems stating that students with the CCMS background (passing the SBAC or PARCC Algebra II exam in mathematics and a similar ELA requirement) would be eligible for credit bearing introductory math courses in any public college or university. This severely treatens the international dominance of our university system by forcing public colleges and universities to make most of their non-credit bearing remedial courses into courses that can be taken for credit, which has a dramatic effect on the expected subject knowledge of their math and ELA majors.

So I would judge that, in spite of the quality of CCSSI in the early grades the overall effect of these new standards is extremely risky not only for students, but, indeed, for our very economic well being.