An email received from Dr. James Milgram – Stanford University Professor of Mathematics – Lead on Math Validation Committee for Common Core

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Karen,

For the most part, my previous note to you was too optimistic. I thought I saw definite improvements over Common Core, but on looking more closely, I'm afraid that these "improvements" were just better typesetting. They were not improvements in the actual standards.

I'm afraid that the Tennessee math standards are just a clone of the Common Core Standards, but, in many ways, as bad as Common Core is, the corresponding Tennessee standards are worse.

Perhaps the most discouraging of the early grade Common Core Standards is 1.OA.6 and its virtually identical standards in second and third grade, 2.NBT.5, 2.NBT.7, and 3.NBT.2:1.OA.6.

Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten
(e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship
between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8= 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).

2.NBT.5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

2.NBT.7. Add and subtract within 1000, 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.

Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens

and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

3.NBT.2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

The first of these 1.OA.6 is particularly terrible. In fact, it is the source of about half of the terrible example problems (and their "answers")out there that have been the fodder used by Colbert, Stewart and many Other commentators when illustrating the folly of Common Core.

Now compare with the extremely similar Tennessee standards:

1.OA.C.5 Add and subtract within 20 using strategies such as counting on, counting back, making 10, using fact families and related known facts, and composing/ decomposing numbers with an emphasis on making ten (e.g., 13 - 4 = 13 - 3 - 1 = 10 - 1 = 9 or adding 6 + 7 by creating the known equivalent 6 + 4 + 3 = 10 + 3 = 13).

1.OA.C.6 Fluently add and subtract within 20 using mental strategies. By the end of 1st grade, know from memory all sums up to 10.

2.NBT.B.5 Fluently add and subtract within 100 using properties of operations, strategies based on place value, and/or the relationship between addition and subtraction.

2.NBT.B.6 Add up to four two-digit numbers using properties of operations and strategies based on place value.

2.NBT.B.7 Add and subtract within 1000 using concrete models, drawings, strategies based on place value, properties of operations, and/or the relationship between addition and subtraction to explain the reasoning used.

3.NBT.A.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

But it is worth noting that from a purely mathematical viewpoint, these Tennessee standards are even worse than

the corresponding Core Standards.

Note the MISSING PHRASE in 1.OA.C.5 and 1.OA.C.6 when compared with 1.NO.6: using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4);

The Tennessee standard comes directly from the education school theories about how to handle addition and subtraction that have never worked at all well, Where as the phrase above comes directly from the methods used in the high achieving countries where subtraction is introduced at the SAME TIME as addition. Indeed it is simply the "algebraic form of addition." C is A - B if the sum B + C = A (or the difference A-B is the solution of the algebraic equation B + X = A). And it is exactly at this point that the methods in the high achieving countries begin to show their dramatically better outcomes for students when compared to what happens in this country.

So, not only are the Tennessee Standards almost a direct clone of the Common Core Standards, they are a clone that were written by people with a significantly weaker understanding of mathematics than the authors of Common Core.

Reinforcing this observation is the fact that two of the three lead authors of the Common Core Math Standards were actual mathematicians, and I would be willing to bet that not one person on the Tennessee writing committee was an actual mathematician whose Ph.D was in pure or applied mathematics.

The above standards that are compared and commented on are but one example of the similarity of the two sets of standards and, I'm afraid, that if I had to choose one of these two terrible sets of standards to guide instruction for the students in Tennessee, it would not be the final Tennessee standards, but, as bad as they are, the Common Core Standards.

I hope these comments will be sufficient for you because I am really not interested in doing a more detailed evaluation. Once I saw what was actually happening, I then looked at a number of other sequences of related standards, and saw the same kinds of issues and problems. As

above, where the Tennessee standards in the same areas deviated from the corresponding Common Core Standards, it was because the authors of the Tennessee Standards simply didn't know enough math or enough about how this math is actually handled in the high achieving countries to understand that their replacement was pure ed school dogma and the result would be even poorer outcomes for Tennessee's students.

However, I have attached a letter I wrote some time back talking about the genesis of the Common Core Standards and a number of the issues with them that, if you don't already have it, may be helpful. It is attached as a PDF file.

I hope the comments above and those in the attached letter will be helpful to you. But if you have questions or want clarifications please feel free to ask.

Yours,
Jim Milgram

A Discussion of the Issues With the Common Core Mathematics Standards

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Eighteen years ago we were 5 years in on using the old CA math standards that had been approved in 1992. The lead author of those standards was a guy by the name of Phil Daro. The most important thing about those standards – they weren't mathematics standards at all – they were all about motivations and what it is mathematicians do but Phil Daro has no background in math and hasn't a clue about what mathematicians actually do.

Here's what happened. In 1992, when we started with those standards, CA math outcomes were in the middle of the pack among all the states, which is reasonable since it's by far the largest state by population with about 13% of the United States total population. But, by 1996, four years in, CA had dropped to 49th in the country! Later, in the early 2000s, Daro initially headed up the teams revising the Georgia and New Jersey mathematics standards, and the results were so bad that both sets of standards had to be entirely redone by others.

So there we were with those terrible standards. There was some mathematical content in them but much of it was simply incorrect, and the majority of the discussion was about pedagogy, not content. As a consequence, the programs that were written to align with these standards, programs like Mathland, and TERC's Connected Mathematics series seemed to actually be lowering student outcomes. So the California State Board of Education requested that I, together with three of my colleagues in the Stanford Department of Mathematics create new California mathematics standards – which we did. It took all of 2 weeks and these new standards were adopted by California in 1997-98.

For about the next 10 years they were generally regarded as the best mathematics standards in the country. And California really made progress with the standards, the new aligned curricula, and the newly designed tests and measures of achievement that also aligned with them.

We were definitely recovering from the 1992 disaster and kids were beginning to show real progress – and most, across all ethnicities and SES levels were learning mathematics at a level that was very close to what is expected internationally. It had taken a while to get there but that's what was happening.

After our work on the California mathematics standards, I had been asked to help out writing standards in other states, and by 2004-2005 I think I was pretty much regarded as the country's leading expert on mathematics standards.

Then the Common Core project came along in 2009. At that point I was trying to distance myself from education issues and get back to actually doing mathematics, so I didn't think much about Common Core. Indeed, even though I had been appointed to the reviewing team for the mathematics standards, I was not intending to participate in their development.

However, out of the blue, I received this invitation to be one of the members of the Validation Committee for the new standards. The role of the Validation Committee was described as overseeing the development of the standards, verifying all the research that was supposed to underlie them, and, if necessary, rewriting sections of the document. Basically we were charged with overseeing the entire development of the standards. This was something so important that I did not feel I could turn it down, so I agreed to serve.

Initially, there were about 25 members of Validation. Since I was the only content expert in mathematics in the group, I focused almost exclusively on the mathematics standards, and I believe the entire group acknowledged that I was the logical person to oversee the day to day development of the standards.

As I said above, Phil Daro was responsible for the 1992 CA standards, but, in spite of their terrible quality, he was appointed to be one of the three lead

authors for the Common Core mathematics standards along with two other people, William McCallum and Jason Zimba, who both had Ph.D's in mathematics, but had no experience with K-12 mathematics standards and the pitfalls that had to be avoided. So, to all intents, it appears that Daro was responsible for the level and the philosophy underlying the Common Core document.

Consequently, it should come as no surprise that the Common Core mathematics standards are very low level indeed – at least 2 full years behind international expectations by the eighth grade – and they have the same underlying philosophy and are focused in the same way as the disastrous California 1992 standards. Moreover, the same curricula that we got rid of in 1998-2000 in California are now reappearing claiming to be entirely aligned with Common Core. Consequently, the most likely way the implementation of these standards will play out is exactly the way the 1992 California standards did, something that cannot be regarded as encouraging.

Indeed, when we put together the 97-98 standards we introduced new tests in CA and those tests were in place from 1999 until 2012. This gave us a huge data set of nationally normed outcome data and most of it was in the public domain. Consequently, I was easily able to access it. Some years back I asked myself this question: "How long would it take for a student initially in the Phil Daro 1992 program before its low level and erroneous perspective on mathematics would have produced irreversible damage?" What the data showed was that if a student had been in that program for four or more years – that is to say they had already entered K-12 by 1993 – statistically they never recovered – They were always lagging behind their compatriots who had been in programs aligned with the much more mathematically reasonable program that we had introduced – And they never matched up. Those students who had been in the Daro program for only 1-2 years recovered pretty quickly. Those with three years took longer, but they appeared to reach a high enough level after sufficient time had elapsed.

So you have a situation with the Common Core mathematics standards where you have a limited window and you pretty much know what's going to happen. You know because the guiding ideas behind it are the exact guiding ideas behind the 1992 CA standards.

So I've been there – I've heard all the verbiage. All of the explanations these people have for how wonderful these ideas are and how much they'll help kids. Those were the exact statements I was hearing consistently from 1992-1998 and the same programs that we were using then that had been put in CA are the programs that are now labeled Common Core aligned and are reappearing. Chief among them at the high school level is a program called College Preparatory Mathematics, CPM for short, while TERC's Connected Mathematics Program, CMP, is being widely touted for it's alignment with Common Core for grades K – 8.

So it isn't that I am guessing – I'm not guessing – I know what's going to happen and it's just going be an unmitigated disaster – But now it will be across the entire country.

The above was by way of introduction. We need to return to the work of the Validation Committee to see why the well designed plans for truly first rate national math standards fell apart so badly.

The first draft of the Common Core mathematics standards came out in October, 2009, and, aside from all the usual problems one expects in a first draft, they completely stopped with just Algebra I, which was, moreover, moved from the eighth grade to ninth. In the high achieving countries, Algebra I, Geometry, and Algebra II are compulsory and are taught in grades seven through nine. In China, for the last 8 or 10 years, they've even added a course in "algorithms" to that list. This is a quite high level course in computers and computer programming. So this is the normal background of kids in the high achieving countries entering their last two years in high school.

Besides the material above, in about half of the high achieving countries, calculus is required for high school graduation. Moreover, in all the high achieving countries over 90% of the population are high school graduates. These numbers are so large that we have to conclude that virtually all kids are capable of learning mathematics to this level, but here, the initial draft of the Common Core mathematics standards stopped with Algebra I in ninth grade.

Data from the National Center for Education Statistics (NCES), the department in the US Department of Education responsible for education data and statistics, shows that in 1992, a student with just an Algebra I course would have only a 7% chance of ever obtaining a 4 year college degree, and there is no rational way that such a background could possibly be declared *college ready*. But college and career ready was the announced goal of the Common Core Standards! Clearly, there was a huge disconnect here.

Since I was the only content expert on Validation, it seemed entirely reasonable that I would focus on the mathematics standards and try to bring the level of these standards as close as possible to the *actual* expectations in the high achieving countries, and I had long discussions with McCallum and Zimba (but not Daro) about these issues. My impression was that they fully agreed, but it appeared that their hands were tied, and I had to discuss these concerns with the leaders of Achieve.

So I spent most of a day showing these people the relevant standards for countries like China, South Korea, Taiwan, and Singapore as well as the conclusions of the report of the National Mathematics Panel on the essential topics that needed to be present in K-12 algebra, and shortly afterwards it appears that they gave the Common Core writing team permission to include a limited amount of geometry and second year algebra in the document. Based on this, it seemed reasonable to assume that the end result would be a document that would have a (non-compulsory) path to calculus in it, something that would match up adequately with international expectations.

But shortly after that the members of Validation received a note from higher up the ladder stating that we no longer would be permitted to "interfere" in the work of the writing group, nor would we be able to explicitly vet the "validating" research for the individual standards, or revise and rewrite portions of the document. All that was allowed would be for us to sign a letter asserting that the standards were excellent, and benchmarked to the highest international expectations. There were no provisions for those of us who would not sign that letter.

However, I and 4 other members refused to sign the letter. My reasons were simply that I could not sign something asserting facts I knew to be incorrect.

Moreover, during that same time frame both McCallum and Zimba, in public testimony clearly indicated that they also believed the standards were unacceptably low. (To be fair, this occurred while they still believed that they would be allowed to include a pathway to calculus, and both of them mentioned that this pathway was going to fix their issues. But, while this pathway was strongly hinted at in the drafts between January 2010 and May, 2010, it is completely missing in the final document which was released in June, 2010.) After June 2010, McCallum and Zimba tried to suppress their previous remarks, but, none the less, those remarks are in the public record and readily available.

It is also worth noting that even with the added material ending with a weak version of Algebra II, if a student stopped with just the material in the final version of the common core standards, then there would be less than a 40% chance of ever obtaining a college degree in any area, and if a student with only that background wished to major in a STEM area, there would only be a 2.1% chance (1 in 50) of an actual degree in STEM.

But besides this, there has been no analysis of the evidence supporting the standards as written, and, to my knowledge there is an overwhelming amount of evidence that things like the approach to geometry there will simply not work. Indeed, the Common Core approach is almost identical to an approach that was tried in the old USSR, though there it was limited to their strongest students. In spite of this, it was a disaster and was rapidly abandoned. Other areas where there are severe problems are (1) the crucial sixth and seventh grade material on ratios, rates, proportions and percents, where there are outright errors in the standards, besides the fact that this material is placed at least two years behind the grade level expectations in the high achieving countries, and (2) the handling of vectors and matrices in the high schools, where the definition of vectors is entirely incorrect.

Finally, the standards have not been tested. They have simply been decreed to be the gift that will fix all this countries problems in spite of the fact that the two authors that are competent in mathematics have no background with the creation, verification or testing of standards, while the third author has never been successful in creating standards of any quality what-so-ever.