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Straight Up Conversation: Math Scholar Hung-Hsi Wu on the Common Core

By Rick Hess on October 5, 2011 8:01 AM | **1 Comment** | **Recommend**

A few weeks back, **I penned a post** about the lack of response we'd received regarding our in-the-works *Education Next* forum on the Common Core math standards. I heard from a number of individuals who offered to defend the standards. One was Hung-Hsi Wu, professor emeritus in mathematics from UC-Berkeley, who has just penned the **cover story** on this topic for AFT's magazine *American Educator*. Dr. Wu, who started teaching at Berkeley in 1973, has been actively involved in math education for the past two decades, helping write California's 1999 Mathematics Framework and California's Standards Tests. He was also a member of NAEP's Mathematics Steering Committee, 2000-2001, that contributed to the revision of the NAEP Framework.

I appreciated Dr. Wu's offer to share his take and was impressed by his willingness to talk frankly about the Common Core effort, as he sees it. Here's our (e-mail) conversation.

Rick Hess: In layman's terms, what do you see as the big differences between the Common Core math standards and those in most existing state standards?
Hung-Hsi Wu: The Common Core math standards place great emphasis on mathematical integrity, [in other words] the statements of the standards are mathematically correct and the progression from topic to topic is logical. In this regard, it is at least comparable to the best state standards, such as those of California and Massachusetts. However, the Common Core math standards are unique in being sensitive to the multiple defects in the existing de facto national curriculum that is already embedded in existing textbooks (see **my article** for further discussion) and address these defects directly. For example, there is a profound common misunderstanding about something as basic as what it means to solve an equation. ...The Common Core math standards, however, ask that students "understand solving equations as a process of reasoning" and say explicitly what needs to be taught about this process (see Standard A-REI 1 in High School Algebra). As another example, when state standards ask that the concept of congruence be taught in middle school, they do not realize that what students will end up getting is that *congruence means same size and same shape*. As a *mathematical* definition, the latter is completely unacceptable. By contrast, the Common Core standards explain that congruence means what one gets by a sequence of rotations, reflections, and translations (grade 8, Standard 8.G 2). Such sensitivity to the existing defects is absolutely essential to any meaningful improvement in our math education; in this regard, the Common Core standards leave all rivals far behind.

RH: What do you make of the concerns some have raised that the thematic focus of the 9-12 is an awkward fit for the familiar organization of courses like algebra, geometry, and calculus?
HW: One would feel this way only if one is already wedded to the traditional offering of one year each of Algebra I, Geometry, and Algebra II in high school. There are mathematical reasons why this sequence is not an optimal way to organize high school mathematics. For example, mathematics is best taught without being handicapped by such rigidity. On the other hand, those who are bent on following the so-called American Integrated Curriculum also find fault with the high school set-up of the Common Core, but there are also valid reasons to argue that such an integrated curriculum, by not being sufficiently attentive to mathematical integrity, is not an optimal way to organize high school

mathematics either. In any case, the 9-12 standards of the Common Core are what they are because the Common Core made a conscientious decision to stay neutral in this debate by describing only the mathematical content of the various strands in high school and allow[ing] each state to make its own decision. This flexibility makes it possible to formulate a high school program that conforms to neither the traditional nor the integrated format; see **here** for example.

RH: What's your response to the concerns raised by UPenn dean Andy Porter, who has suggested that, in practice, the standards "do not represent a meaningful improvement over existing state standards" and that they have "a greater focus than certain state standards and a lesser focus than others?"
HW: These conclusions are based on data that are demonstrably wrong: for example, the claim that state standards in grades 3-6 spend 14.47% of instruction time on "Advanced algebra" and 0% on "Measurement" (compared with 0% and 17.79% in Common Core standards, respectively)...His claim that Finland puts "far less emphasis on higher order thinking skills, and far more on basic skills" than do the Common Core standards is also not consistent with the data of Finnish students' performance on their own internal exams. It may be more profitable to wait for Porter to clarify his dissatisfaction with the Common Core using valid data before we discuss this issue further. In the meantime, I would like to make a general statement about Porter's methodology. He did not mention having looked at the mathematical quality of the Common Core standard but relied solely on the findings of a content-analysis procedure (the Surveys of Enacted Curriculum) for his conclusion. There is no denying that such a procedure, when used properly in conjunction with other data, could be a valuable research tool. But when it is used all by itself, it is a crude instrument. This explains why, for example, Porter missed the essential mathematical information about the Common Core described in the answers to questions 1 and 2 above.

RH: What do you think of the concerns raised by critics who argue that the math standards have never been benchmarked against international competitors by independent analysts?
HW: Usually such benchmarking is done by asking whether topic X is taught by a certain grade, and whether each grade teaches too many topics. If topic X is fixed, then the usual criterion of excellence seems to be that the earlier X is taught, the better the curriculum. The Common Core math standards do not play this game, but are nevertheless fully consistent with the research findings of the National Mathematics Advisory Panel on curriculum from an international perspective (see Chapter 3 of the *Report of the Tasks Groups*). People who are worried that the Common Core math standards have not been benchmarked against international competitors may be those who have bought into some myths, e.g., all high-achieving nations finish Algebra I in grade 8. A rational discussion of this issue would show that there is no intrinsic merit in finishing Algebra I by grade 8. When it comes to school algebra, it is not how early you teach it but, rather, how *well* you teach it. The standards of those states in the U.S. that mandate the completion of Algebra I in grade 8 manage to do so *only* by stinting on the necessary background material that students need in order to learn linear equations and their graphs. Furthermore, the math standards of both China and Japan postpone the teaching of quadratic equations and functions to grade 9, and these are two of the highest-achieving nations in the world in math education.

RH: What do you say to teachers concerned that moving objectives, units, and skills across grade levels may not seem like a big deal in theory, but that it will pose big headaches for today's teachers?
HW: I presume the "moving objectives and skills across grades" refers to, for example, spreading the teaching of fraction addition over three grades: grades 3 to 5. Contrary to what the question implies, this *is* a big deal because it is part of Common Core math standards' design to optimize mathematics

learning by giving students enough time, whenever feasible, to absorb the material as well as time for teachers to teach the material. For children, the addition of fractions is so conceptually complicated that they need the time to internalize the whole process. This particular treatment of fraction addition is one of the outstanding features of the Common Core standards. A forthcoming document from CCSSO, "Progressions on Fractions," will elaborate on this process; in the meantime, teachers can look at a somewhat discursive discussion **here**. Ultimately, what is at issue is that all teachers owe it to every child to give [him or her] the best chance to learn. If the student takes more than one grade to do it, then that is what it takes. If it takes the Common Core standards to wake us up to our basic obligation to children, then we should applaud these standards.

RH: Okay, softball. What would you argue are a couple of really good things about the Common Core math standards that people generally do not yet know?
HW: The Common Core math standards provide guidance to the teaching [of] fractions in a way that is pedagogically sensible and mathematically correct. Since the fear of fractions has almost become a national pastime, these standards---if properly implemented--- will bring relief to many parents and students. The same can be said about these standards on negative numbers. In addition, the teaching of geometry in middle and high schools is so defective at present that it cries out for a new approach; essentially nothing can make things worse in most cases. The Common Core math standards outline a new approach that makes mathematical sense and, for the first time, provide a seamless transition from middle school geometry to algebra and high school geometry. So finally, there is at least some hope of changing the culture of failure in the teaching of school geometry.

RH: What gives you confidence that teacher preparation and professional development are going to rapidly and effectively make the necessary changes? What have you seen on this score that's worrisome or reassuring?
HW: Nothing, and nobody, has ever given me such confidence. But for the record, let me say in no uncertain terms that, the state of school mathematics education being what it is, we need better teacher preparation and improved professional development in order to stay educationally afloat *no matter what the standards may be*. If we cannot get better teacher preparation or improved professional development, then we would be better off with a set of standards that is at least mathematically sound. In the meantime, the Common Core people are striving to provide teachers with as much help as possible. There will be a set of *Progressions documents* that highlight the main ideas of each major strand in the standards. There is also the *Illustrative Mathematics Project* that will provide problems to illustrate the standards. Various individuals are also pitching in to help teachers. My homepage already has a long document explaining how fractions can be taught according to the Common Core standards; by the end of the year, I will have some documents on the teaching of geometry. So there are resources to make the situation more tolerable. What I find most worrisome is the fact that many educators and administrators believe that the status quo (of doing nothing) is plenty good enough. It is not. We need effective professional development, period.

RH: How aware is the professional mathematics community of the Common Core effort? As a policy observer, it seems like there's been relatively little activity on behalf of the standards by math professors or interested professionals. Is that fair? If so, why is that?
HW: What I have observed among most mathematicians in major research universities is a longstanding apathy towards all things related to schools in general, and the reason for that is complex but partly understandable. So long as school math education continues to be long on politics but short on intellectual substance, the apathy will remain. It has to be said, too, that the reward system in a

research university does not favor work done about school mathematics; the reason in this case is perhaps self-explanatory. Nevertheless, there are very knowledgeable mathematicians like Richard Askey and Roger Howe who are making an effort to improve math education, and there are responsible organizations such as the American Mathematical Society that are trying to make the math community aware that, for a change, the extraordinary quality of the Common Core Standards merits extraordinary action. So we should not lose hope yet.

RH: What's your take on the state of the Common Core math assessments? How concerned are you about potential problems, delays, or fears that they'll give insufficient attention to "hard" math skills?
HW: I am not as well-informed about the math assessment efforts as I should be, but in general terms, I want to make sure that students will not be in any way over-assessed, and that the mathematical quality of the test items be above reproach (which has not always been the case; see Chapter 8 of the National Mathematics Advisory Panel *Report of the Tasks Groups*). Students should be assessed, but there is such a thing as too much of a good thing. On the other hand, I do not believe that a good mathematics education should pursue "hard" skills per se. But by maintaining the high mathematical quality of test items, one will automatically give proper attention to such "hard" math skills. In order to maintain such high mathematical quality, however, very competent mathematicians will have to be involved in the assessment process every step of the way.

RH: Last question: Big picture, what does "success" for the Common Core math standards look like in 2015? If things go well, how different will teacher preparation, math instruction, and assessment look?
HW: Nobody can pass judgment on the success or failure within a year of the kind of profound change promulgated by the Common Core math Standards unless the standards are an immediate disaster (which I hope they are not). I think a more reasonable date to make such a judgment is 2017. If things go well, teacher preparation will begin to concentrate on the most urgent need of the moment: better content knowledge. Math instruction in classrooms will be long on reasoning and short on giving out orders, and textbooks will at least be free of ghastly errors. Assessment will pay equal attention to one-step questions as well as those that require multi-step reasoning. For anyone who is aware of what mathematics education is like at present, such seemingly modest goals, if achieved, would already be cause for celebration.

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