Three Threats to the Success of the Common Core State Standards for Mathematics in the American Classroom

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Abstract

The author discusses three significant threats to the successful implementation of the Common Core for Mathematics: teachers' lack of conceptual understanding of mathematics; teachers' lack of pedagogical knowledge for creating and teaching inquiry-driven lessons, and; lack of class time to incorporate the pedagogical goals of the Common Core.

I'm a supporter of the *Common Core State Standards for Mathematics* (National Governors Association for Best Practices & Council of Chief State School Officers, 2010), or at least what it professes to be. Its emphasis on students engaging in higher levels of thinking and making sense of the mathematics as described in the Eight Mathematical Practices is a significant step in the direction that I would like to see math education move. Of course, all depends upon how the states view this step and we won't know until the states test students; if the tests emphasize little in the way of creative thought, abstract reasoning and conceptual understanding, then that emphasis will find its way into the classrooms. Nonetheless, the direction in which the Common Core moves math education is in the right one, and I hope that it succeeds.

However, I do not believe that the Common Core will be a success - at least not to the extent of its ideals. I have come to this conclusion based upon my experience with math teachers and the pre-service teachers that I prepare. I don't find a flaw in the design of the Common Core; however, for the Core to be successful it depends upon at least three conditions that I don't believe will occur in the current educational environment.

The first is the necessity for teachers to master the conceptual understandings of the mathematics that they must teach. Do teachers conceptually understand why we add fractions with common denominators? Or why each of the steps of the long division algorithm "works"? Though some might claim reasons such as "you can't add apples and oranges" or "place value", explanations such as these are not enough and I wonder if students (and teachers) really understand them. Teachers with a strong conceptual understanding of these tasks should be able to present activities in the concrete for students to solve, represent these solutions in math symbols, and connect the physical movements of the objects with each abstract step in the final procedure. But to create these tasks and to connect them to the procedures in a step-by-step fashion requires not only a deep conceptual knowledge but also a realization that the procedures of math mimic the physical movements of the objects. Do teachers have this knowledge?

Though conceptual understanding is a challenge for teachers, it is not the only one. The second threat I see deals with teachers' pedagogical knowledge. The Eight Mathematical Practices defined and highlighted at each grade level of the Common Core seem foreign to most teachers – at least at more than a superficial level. The focus is now on <u>students</u> taking the lead in the classroom, for the <u>students</u> to do the "heavy mental lifting". This requires teachers to not only understand the conceptual math but design lessons in which students are given a task in terms that are familiar to them (concrete), are guided in their inquiry through teacher questioning and clarification (facilitation), and then are brought together to discuss similarities in what they have found (generalizations) and how to represent these similarities (the rules of math so common to teachers) in a mathematical manner (symbols). Can teachers create lessons that offer students such challenges?

Interrelated to both conceptual knowledge and pedagogy is the ability for teachers to help students connect the conceptual to the abstract. Many textbooks offer conceptual opportunities as well as tasks designed to teach the standard algorithms. However, often there is no connection made between the two. This void between the concrete and abstract procedures seems evident in the teachers' understandings as well; do teachers understand that the algorithms represent the concrete manipulations, that the two are intimately entwined and co-supportive? Knowing this helps students to "persevere" (the first of the Eight Mathematical Practices) in their inquiry, knowing that if they are able to figure out the problem in the real world then the written work must follow the same logic. As a matter of fact, all eight of the Mathematical Practices rely upon this intimate connection. If students are to:"make sense of problems"; "reason abstractly"; "construct viable arguments"; "model with mathematics"; "use appropriate tools strategically"; "attend to precision"; "look for structure"; and find "repeated reasoning", they will have to not only understand the mathematics at a conceptual level but also see the connection between this knowledge and their abstract representations. But students will only understand this connection if teachers understand it – and design lessons based upon this objective.

The third threat to successful implementation of the Common Core is systemic: time. For students to explore the math in a conceptual manner, identify patterns and structures, test conjectures, and represent these patterns in mathematical symbols, students will require a great amount of class time. Typical of any inquiry-type of activity are starts and stops, restarts, discussion, mistakes and wrong assumptions, etc. For teachers to employ the tasks and questions that rate at the highest levels of Blooms Taxonomy requires more time than those rated at the lower levels. And assessing higher-level questions takes significantly more time. Are schools making the necessary changes to accommodate the additional time required of an inquiry-based education?

Some may claim that the Common Core requires less content for students to learn, and additional time may be found to engage students in inquiry activities, but I think this may be a misnomer. If less content is now required, then will a student graduating under the Common Core have covered less mathematics content than one that graduated under the old standards? I don't believe this is so; if it isn't, then somehow, somewhere the same amount of content must be covered – no matter what the new standards may be professing.

Because of these three threats – teacher's lack of conceptual content knowledge, pedagogical knowledge, and no systemic changes for additional time allotted to the K-12 environment – it seems unlikely that the Common Core will be anything more than an ideal program that will look much like the curriculum of the last 30 years. Moreover, if pushed to achieve the true inquiry benefits of the Common Core, teachers and schools may become very frustrated if increasing their content and pedagogical knowledge is not addressed as well as if class and assessment time are not increased. Should all of this happen, the movement for a more developmentally, intellectually challenging math education may be set back many, many years.

References

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