Book Report

Winning the Math Wars: No Teacher Left Behind

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Winning the Math Wars: No Teacher Left Behind, is a book written by four Seattle Pacific University scholars, who present a well-articulated and non-biased assessment of the state of mathematics education in the world, in the United States, and specifically in Washington State. The authors divided the book into four chapters, which address the following four topics respectively; what the world is thinking about math education, the American dilemma about math education, math education in Washington State, and ending with a discussion about the implications and conclusions of the math debate. The focus of the book is to present a broad analysis of the math wars and to come to some conclusion about what's needed in order to realize effective change in the teaching and learning of mathematics. The underlying theme throughout the discussion of reform mathematics is the lack of attention that has been given to the teacher's role in education reform; "effective reform requires the coordination among standards, assessment, and instruction," (pg.123).

The authors begin by exploring the historical development of the math wars and comparing the United States educational system to that of other cultures. This comparison is helpful because it addresses some of the cultural implications for differences in performance between American students and students from other countries. For instance, Japanese students typically spend far more time on homework and math study. Japanese and American teachers also differ fundamentally in their approach to math teaching. "Japanese teachers think of mathematics as a set of relationships between concepts, facts, and procedures, and they feel their students should find it deeply interesting to explore those relationships" (pg.55). By contrast, American teachers tend to view math as procedural and formulaic. Perhaps due to the fundamentally divergent views towards mathematics, there is not an agreement among the international community about *what* students ought to learn. For instance, the American system puts high priority in preparing students to take calculus in high school, whereas the European system emphasizes statistics and applied mathematics. This disagreement about what kinds of mathematics are most important for students to be successful in the high tech economy is the

basis of the math wars at the international level. These debates effect teachers at the 5-12 level because there is no consensus about the mathematical topics or skills that will best prepare students for the demands of the 21st century. Teachers, therefore, cannot be certain that they are adequately preparing their students to be competitive and ready to meet the mathematical challenges of the world.

The four authors also surface discussions about the quality of math education, which "is driven by concerns about global economic and technological competition" (pg.11). In the United States these concerns are exacerbated by the fact that the number of Americans completing degrees in mathematics is declining, and doctoral degrees in mathematics completed by foreign students at US universities is rising. Consequentially, Americans "fear that America may find itself in a position where its economic and military dominance falters" (pg.15). Fear of falling behind the rest of the world is not a new sentiment. The origin of this fear can be traced back to the pre-Sputnik era and the economic crisis of the 1980's. Together, the economic crisis of the 1980's and the launch of the Soviet Union's satellite, led to falling confidence in the West and a heighted need to "fix the system."

A question that the authors pose, however, is "is the system truly broken?" or have we simply not implemented reform to its end? For example, the author's point out that the rise in foreign students completing doctoral degree in mathematics in the US might suggest that "American universities are attracting the brightest students from around the world, which helps maintain the quality of our research and which also benefits US students enrolled in those programs" (pg.13). Another fact that is inconsistent with the view that America is falling behind is that within a seventy year time span, between 1930 and 2000, the number of students taking physics increased by 31% (pg.13). This suggests a rise of interest in math intensive study by American youth. Lastly, evidence for America falling behind is questionable because comparisons that have been made between elite science and math academies in other countries to random public high schools in the United States is not a fair comparison. A more

honest comparison would be to “compare a group of students at highly selective European gymnasia to students in an elite prep school such as Lakeside in Seattle, WA” (pg.15). Therefore, perhaps American youth are not too far behind their peers in other countries. Yet, regardless of whether or not America is truly lagging behind the rest of the world in mathematics education, reform efforts are in effect with the goal to increase the mathematical performance of American youth and prepare them for the more technological demands of the future. Although participants in education reform differ in their agenda, all “want mathematics to be understood better, more deeply, and more widely, applied more routinely, appreciated more universally, and approached with less fear of its being too difficult or too abstract for most people to understand and use” (pg.19).

The problem with reform is not a lack of will or shared interest by participants it’s more a lack of complete attention to all components. Discussions about problems in mathematics education at the national level usually include some mention of time pressure, problems in the curriculum, or limited teacher preparation. Attempts to fix these problems have included increased attention to changes in curriculum, heightened attention to assessment and evaluation, and requiring more schooling by teachers and proof of competency. In the United States, reform efforts since the 1980’s “have been led by government agencies and have focused on raising standards and improving teaching to enhance student performance” (pg.49). In response to reform interest, the National Council of Teachers in Mathematics (NCTM) published its *Curriculum and Evaluation Standards for School Mathematics* (1989), which is a set of standards that outline learning goals for K-12 mathematics education. This publication greatly influenced the development of mathematics curriculum and mathematics teaching theories. One of the most controversial issues in mathematics education is centered on which teaching theory, traditional versus constructivism, is most beneficial to student learning. Both parties have strong arguments and are well supported by data. Currently, the constructivism teaching theory is the dominant model in U.S. schools, although the authors point out that “no

one really knows what goes on in the classroom because teacher training and in-service work have not kept pace with theory and textbook development" (pg.46). There should be less energy spent on debating which theory is better, since both are effective in certain circumstances, and more energy spent on the instructional component of reform.

If the reform efforts that began in the 1980's are going to be truly realized than more attention needs to be given to the teachers, who are the ones on the front line carrying out the reform. Attention to curriculum, assessment, and pedagogical theory has overshadowed consideration to the actual teaching and learning that occurs in the classroom. It has been wrongly assumed that teachers can easily adapt to whatever curriculum change or mandate occurs without sufficient support. However, changing instructional practice is a very challenging endeavor, and one that requires intensive training and support in order to be carried out with success. The authors support the belief that much greater attention needs to be given to supporting teachers in developing their instructional abilities. Putting teachers first on the reform agenda could be the answer to finally realizing the change that has been sought after since the 1980's.

Supporting teachers in developing and changing their instructional practice is a complex endeavor. First of all, it requires knowledge about what actually makes a good teacher. This is still largely unclear and "the research to date indicates that we have not yet developed a sufficiently comprehensive knowledge of these skills to be able to train math teachers to be uniformly excellent" (pg. 93). Although, there is enough research to point to three bodies of knowledge that are definitely required to be an effective math teacher, namely, (1) knowledge about math, (2) knowledge about how students learn, and (3) knowledge about how to teach math. Teachers must possess a vast and thorough understanding about mathematics in order to make meaningful connections between mathematical ideas. Teachers must also understand how students learn math so that they can predict potential problem areas and questions that students might ask. This will assist teachers in addressing student needs. Teachers must also

have a rich understanding of the “big picture” objectives within each math course, along with the overall design of the curriculum in order to teach the individual topics effectively. Knowledge in all of these areas is not something that all American teachers currently possess, nor something that universities are necessarily prepared to offer. Therefore, there needs to be greater effort put towards developing programs that support teachers in learning about math and learning about teaching math. Teachers will need accessible resources that help them to increase their content knowledge and develop better methods to convey this knowledge to their learners. One suggestion is to revamp teacher education to include more direct study between mathematical content and specific ways to teach the content. This way, teachers not only increase their knowledge of the subject but they also learn effective ways to share this knowledge.

In addition to developing more programs to support teachers in building knowledge, there also has to be greater attention to training teachers on how to use the curriculum and how to apply new pedagogical theories. It cannot be assumed that teachers will easily transform their practice and habits because of changes to standards and curriculum mandates. This has been a detrimental assumption to date.

Finally, to truly realize improvements in math education there needs to be more opportunities for teachers to learn from one another and participate in continuous dialogue and the sharing of ideas. This is one of the major strengths of the Japanese math program. Japanese teachers meet regularly to work together on lessons and to talk about ways to improve instruction. American teachers would benefit greatly from more time to collaborate with colleagues to talk about the positives and negatives of individual lessons. This type of focused attention on the improvement in instruction is exactly the type of change that is wanted. We have quality standards, we have powerful curriculum…we just don’t have fully knowledgeable teachers. We do, however, have teachers who are ready and eager to receive support, and who are excited about learning more about their content and learning about powerful ways to share this knowledge with their students.

Reference List

Abbott, M., Baker, D., Smith, K., & Trzyna, T. (2010). *Winning the math wars no teacher left behind*. Seattle, WA: University of Washington Press.