Pointing the Way: Possible Avenues of Development in the Field of Mathematics Education


Reviewed by:

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PAINTING A LANDSCAPE OF THE MATHEMATICS EDUCATION FIELD

The National Council of Teachers of Mathematics (NCTM) introduced The Standards in 1986. The Standards, a positioning document, incorporated the preexisting and developing shift in the underlying beliefs about the nature of mathematics and mathematics education, and propelled a determined front to reform the teaching of mathematics. Over the past two decades, the NCTM has attempted to establish and promote in the field of mathematics education what some (e.g., Romberg, 1992) would call a constructivist philosophy of learning.

The principles of constructivism, when sifted through a mathematics education screen, hold that students construct mathematical knowledge through their social interactions and their experiences in their natural worlds. Constructivism is founded on a central tenet of the importance of attending to the child’s experience within the learning situation. As in other fields, these constructivist leanings are tied to Piaget, Vygotsky, and Dewey.
When the NCTM introduced *The Standards* 15 years ago, the discussion in the mathematics education literature seemed to center on whether and how teachers could become reform-minded practitioners. An important article that captures the tenor of the times is entitled, “When the Problem Is Not the Question and the Solution Is Not the Answer: Mathematical Knowing and Teaching” (1990), authored by Magdalene Lampert. In this article, Lampert shares her experiences as she attempted to live *The Standards* in an elementary school (fifth-grade) classroom. Lampert, whom I consider an influential figure in the mathematics education reform movement, is coeditor (along with Máiréad Dunne) of *Talking Mathematics in School: Studies in Teaching and Learning*, one of the books under consideration in this review.

In a similar classroom practice-based vein, Deborah Loewenberg Ball (1993) captured her attempts to develop curriculum in the classroom that exemplified the philosophy driving the new mathematics education reforms. I mention these articles in this depiction of the mathematics education landscape because they demonstrate the preoccupation in the field with questions of whether teachers could reform their practices to meet the vision of the reforms within *The Standards*, and what such a practice would look like. Both of these researcher-writers had a profound influence on my classroom practice, perhaps not at the time of their initial publication, but certainly as I entered graduate studies as a practicing elementary school teacher interested in engaging in meaningful professional development.

Quite expectedly, such a dramatic shift in approach as is called for in *The Standards* creates a debate in the field. In my research, I characterize this debate as a fracture line running through the mathematics education landscape; others capture the essentials of the debate, naming it “The Math Wars” (Ross, 2001). This debate pits what could be described as traditionalists against constructivists. This contested ground is found in California (Sowder, 1998), Wisconsin (Borsuk, 2003), and elsewhere, most recently in New York (Carson, 2000).

**READING THE FIELD THROUGH A LENS OF “EXPERIENCE”**

Fifteen years ago, when the new position papers were being introduced, I was still in the elementary school classroom, teaching sixth graders. I heard little of the opening volleys of the debate. However, by the time I began my research project in Bay Street Community School in 1998, the mathematics education reform agenda had engulfed the province in which I lived and practiced. A new curriculum, testing procedures, and reporting mechanisms were all being put into place through a new, more centrally located power base for education. The situation was ripe for study,
and I entered a third/fourth split-grade classroom to investigate how these reforms would intersect with the practice and knowledge of a classroom teacher.

Almost immediately I was swept up in the lives—the experience, the knowing—of this teacher and her third- and fourth-grade students. My newfound position of observer of teachers and children taught me an unexpected lesson about the centrality of experience in education (Ross, 2003). An example of how student experience shapes mathematics curriculum in the classroom is seen in this story about HonMan:

Wednesday, February 17, 1999
Room 34
Bay Street Community School

There is a third grader, a boy named HonMan. His first year in North America is the first year I began my research in his classroom. He teaches me, in our first year together, an important lesson about education. As we sit together at a small table one day surrounded by his classmates and teacher, I watch as he creates his personal curriculum within an official curriculum. He designs a lesson determined by his experience, self-developed to meet his learning needs.

The problems are written on a chalkboard on the north wall of Room 34. I am reading the problems, which involve various computations about a book with 12 chapters and 11 pages per chapter, when HonMan comes to the table to get some help with his writing. The arithmetic component he does easily in his head, to the consternation of the other children at the table. HonMan’s personal curriculum that he creates to meet his learning needs set by his experience is a language lesson. What he takes away from the curriculum is mathematics, yes, but also language and leadership learning. What I take away is a lesson about the centrality of the child’s experience in the mathematics curriculum.

The students and teacher enact curriculum in ways that grow out of their experiences. Further, that which is learned from a lesson, what each person takes from the mathematics curriculum, is both shaped by and shapes the unique personal and shared class experiences of those participating. My research changes the way I read mathematics education literature. This new appreciation of the role of experience in mathematics teaching and learning colors my reading of the mathematics education literature. With their philosophical ties to Piaget, Vygotsky, and (especially for me) with Dewey, I appreciate the constructivist view of learning that emphasizes experience in mathematics education.

Thus originates the central question I pose to myself, to the education establishment, and to the mathematics education research community in this review: whether it might be time to enlarge the emphasis of the reforms to include not only the question of whether and how teachers can teach these reforms, but also whether and how student experience can be given more credence in the field.
LOCATING THESE BOOKS IN THE MATHEMATICS EDUCATION FIELD

I would argue that the authors of these three books fit within the camp of mathematics education reformers who are interested in moving the field into a constructivist view of learning. In their book *Assessing Children’s Mathematical Knowledge: Social Class, Sex and Problem-solving* (2000), Cooper and Dunne provide a historical context for their research interests (see Chapter 1). In establishing the context of their study, Cooper and Dunne trace the trends on the British professional knowledge landscape (Clandinin & Connelly, 1995) in England during the 1970s and 1980s. They focus on the mathematics education field, describing the reform agenda shaping practice at the time as structured around the argument for “an approach in schools that favoured ‘relevance,’ ‘applications,’ and ‘a relatively active learner.’” (p. 194) They detail the present circumstance of high-stakes conjoined testing and reporting practices with this reformed mathematics instruction and assessment practice:

Following the introduction of a curriculum that incorporates notions of “relevance,” “applications,” and “active learning,” in the late 1980s the National Curriculum shifted “to a primary emphasis on group testing via paper and pencil tests, a situation had arisen by the 1990s in which children’s knowledge and understanding were being assessed primarily by “realistically” contextualized items in two timed test papers given at several points in their school career. Furthermore, as a result of an ever increasing degree of publication of children’s and schools’ performances in “league tables,” these assessments were “high stakes” indeed. (Cooper & Dunne, 2000, p. 194)

In reading Cooper and Dunne’s depiction of the reform movement in Britain, I find powerful parallels between the mathematics education contexts there and in North America. Important themes of relevant problem solving and active learning are found throughout the NCTM standards. Here in North America, the echo of high-stakes testing reverberates in the lives of children and teachers. Although I hesitate to draw too close a comparison between two such different contexts, I do see certain benefits to looking at the parallels in the reforms in Britain during the 1970s and 1980s. In my own mind, I characterize the mathematics education reforms in Britain as one short footstep ahead of us. In this way, Cooper and Dunne’s book provides an interesting glimpse into the future, an exploration of the possible trajectory for some actions that we are in the midst of today.

In the second book under discussion, *Talking Mathematics in School: Studies in Teaching and Learning* (1998), edited by Lampert and Blunk, several researchers explore various mathematics instructional situations. As I read this book, I was reminded of earlier studies concentrating on whether and how teachers can teach the new reforms. However, the heart
of the inquiries in Blunk and Lampert’s compilation is the unifying thread of inquiry into the connection between communication and learning mathematics. I find the positioning of Cooper and Dunne’s book alongside Blunk and Lampert’s text extremely helpful in reading the field of mathematics education. Whereas Cooper and Dunne’s British perspective may give us a glimpse of where we are headed—the reforms they discuss are in many ways forerunners to similar reforms that we have initiated in North America—Blunk and Lampert give us another lens through which to view mathematics education reforms. They invite Deborah Hicks, an expert in language and literacy education, to explore the possibilities of how language and language learning fit into the learning of mathematics in schools. The interesting cross-disciplinary perspective in this book allows the reader to follow another trajectory. As with the British mathematics education reforms of the 1970s and 1980s (as outlined by Cooper and Dunne), the literacy education field may also provide important lessons for the mathematics education community, having embarked earlier on reforms emanating from a similar philosophical and theoretical school of thought. An examination of the recent experience of reform in the field of literacy education may therefore inform those in the field of mathematics in important ways.


Brown sets himself the central task of examining and evaluating “grand narratives” (Clandinin & Connelly, 2000) in the mathematics education field. The two “unquestioned ways of thinking about things” (p. 22) within the mathematics education reform movement that Brown examines in this book are the promotion of problem solving and the emphasis on applications of mathematics to the “real world.”

Unlike Cooper and Dunne’s and Lampert and Blunk’s books, which are grounded in recent research studies, Brown’s text is grounded in decades of thinking and writing within the field. Brown’s retrospective view provides an excellent contextualization of the current field of mathematics education in North America, and makes interesting comparison when read in juxtaposition with Cooper and Dunne’s account of the British context. The two books by Cooper and Dunne, and Brown (or rather selected portions of these books) provide excellent portraits of mathematics education contexts that I use with my preservice mathematics teachers to help them understand the world of practice that they are entering.

In addition to the connections between the contexts depicted, another important link between Brown’s writing and Cooper and Dunne’s research is the questioning of the idea of “real” in “real life.” Brown is more explicit in advocating that the mathematics education community needs to consider in a deeper and more profound way the notion of “real” in “real
world.” Cooper and Dunne’s questioning of “real” is more implicit in their work. I believe that their argument would be that many of the children in their research have different “real” worlds that inform their thinking about mathematics and about problem solving, as compared with the “real” world of the test makers. Brown’s questioning of the emphasis on real-life problems offers an interesting counterpoint to the concerns raised in Cooper and Dunne’s research findings. As Cooper and Dunne, and Brown question what place “real” has in mathematics education, I am reminded of my own questions about the place of children’s experience in the mathematics curriculum as it is enacted in the classroom. I believe that children, through their experiences, shape what is “real” in their worlds.

I have sketched the central arguments in these three books to demonstrate the connections between the authors and those in mathematics education who favor the reform of teaching and learning practices. Although the authors fit within the mathematics education movement that envisions a more constructivist approach to the learning of mathematics, I believe that these authors are looking for ways to push at the borders of the thinking within this movement. As they do so, I find that they address my concern of whether and how student experience can fit into the mathematics curriculum.

POSSIBILITIES IN MATHEMATICS EDUCATION

The authors of these three books suggest directions for future growth and development of the field of mathematics education overall. I believe that the suggestions for growth in each of these books are narrative in quality. By that I mean that the authors trace out a historical past, explore a present-day circumstance, and in their suggestions, look to the future for the field. Although I believe that each of these authors supports the notion that children construct their own mathematical knowledge, their unique positioning within the field offers differing perspectives. These perspectives in turn lead to diverse suggestions for the direction in which mathematics education as a field could move for continued growth.

Cooper and Dunne argue from a position firmly grounded in their research. They speak to the problematic elements found in assessment practices in mathematics education at present in Britain. From a sociological perspective, Cooper and Dunne present the findings of their study as applied to the effects of social class and gender on mathematics assessment performance. The central argument of their book is “that many children as a consequence of the confusion over the requirements of ‘realistic’ test items, fail in tests to demonstrate mathematics knowledge and understanding they possess” (book cover). One of the authors’ central findings is that social class has a greater impact than gender regarding the confusion that children have about which “real-world” knowledge to bring to
bear when solving “realistic” problems. They argue that because children have differences in knowledge about the world, it leads to an inherent bias within the assessment process. In this age of testing and public reporting, such a bias is detrimental to students and teachers.

In considering assessment practices as represented in specific context, Cooper and Dunne are struck by the absence of the role of experience. Although filtered through the lens of sociologically driven forms of defining experience (for the purposes of this study, the researchers focused on gender and social class), Cooper and Dunne remark that “At times, when reading the mathematics education research literature, one might be forgiven for wondering whether cultural experience leaves any traces at all!” (p. 195). It is this lack of recognition of the role of experience in shaping children’s knowledge that leads to the bias within assessment instruments. Certainly, Cooper and Dunne would argue that student knowledge should factor into mathematics assessment. I believe that they would argue that the question I pose (whether and how student experience can play a more central role in mathematics curriculum) is a moot point. In their study on assessment procedure, the authors clearly find that students’ experiences are a fundamental shaper of mathematics learning. Although they have suggestions as to how some of these concerns might be dealt with on the assessment front, they do not attempt to address the broader curricular concerns at the heart of my framing question for this review; it simply is not within the scope of their study.

Cooper and Dunne suggest that what they see as inadequate attention given to cultural experience as a factor in children’s knowledge construction by researchers in mathematics education may be connected to concerns that such a focus might lead to essentialist thinking. (Conversely, in my reading in the field, I find that studies about the influence of socio-economic class and gender on children’s learning of mathematics abound.) I believe that essentialist notions—for example, that girls only learn through cooperative strategies, or that Hispanic students cannot learn certain elements of math, or that all children from lower socioeconomic groups share common characteristics—are indeed problematic. When student experience is characterized in terms of categories, for example—such as girls’ experience or Hispanic experience—individual students’ experiences are deemphasized. Characterizing experience in terms of formalistic categories—in other words, essentialism—is as dangerous as stereotyping. It shapes the way the teacher sees and interacts with the student; he or she sees the category rather than the child. If teachers overlook individual differences, they become blind to individual needs. As I consider whether and how student experience can play a more central role in mathematics curriculum, I see essentialism and formalistic thinking as working against valuing the role of children’s experience in education. Cooper and Dunne’s book was an excellent starting point for me as I grapple with the issue of the place of student experience in mathematics
curriculum. However, the underlying formalistic assumptions of Cooper and Dunne’s research and analysis became a difficult point for me.

I now move to the second book under review, *Talking Mathematics in School: Studies in Teaching and Learning*, edited by Magdalene Lampert and Merrie L. Blunk. Here, in Hicks’s comments in the afterword, I found a helpful approach in contemplating my central question. As mentioned earlier, Hicks is a literacy education expert whose perspective Lampert and Blunk wished to share with their mathematics education audience. What I found particularly pertinent in her comments was that rather than focusing so strongly on the forms of social class and gender, Hicks links experience to *identity toolkits*, and ties this concept to “mathematical literacies.” While speaking across disciplines, Hicks provides timely, helpful, and provocative suggestions for growth in the field of mathematics education.

Hicks offers both overarching and unifying comments on the studies within this book, and indirectly, I believe, evaluative and instructive comments on the mathematics education field overall. In the process of exploring possible new directions for mathematics education research to move forward, Hicks argues for a place within the mathematics curriculum for students’ identities and for their continuities of experience. She calls on Shirley Brice Heath’s work when discussing the importance of community in shaping literacy, and then directs mathematics education onward:

Studies of relations between students’ community and classroom discourses have yet to have a similarly important impact among mathematics educators. The literacies that are now so skillfully modeled in some mathematics classrooms are assumed to be outside the experience of most children . . . they are something to be learned, not acquired. And yet, the extensive body of sociocultural and sociolinguistic research to which I have alluded suggests that children may bring to the classroom vastly different degrees of familiarity with certain kinds of discourses that in important ways resemble mathematical literacies. (Hicks, in Lampert & Blunk, 1998, p. 246)

While reading these words in Lampert and Blunk’s book and contemplating the role of community in shaping literacy and how that fits with mathematics, I am reminded of a vignette recorded in Cooper and Dunne’s book. It is the story of Mike orally answering a question on the national examination. Mike’s thoughts about the context surrounding the question are recorded in an interview conducted by Cooper. Mike’s responses detail who wears what kind of socks, and what wearing certain types of socks means about a person. In fact, Mike gets so caught up in the socks discussion that he loses track of the mathematics that he is supposed to be doing. This vignette is explored in terms of social class and sex. This vignette captures for me the nexus of Cooper and Dunne’s argument that children’s knowledge is constructed in communities (a.k.a. social class), and that some communities’ knowledge predisposes their children for success while others are set up for confusion and failure. However, I now wonder what
more we could understand from the vignette—what other questions might arise—if Mike’s interview responses could be considered in light of the importance of community in shaping children’s literacies. The notion of identity toolkits, as presented by Hicks in Lampert and Blunk’s book, is a powerful tool to bring to the conversation about whether and how student experience counts in mathematics teaching and learning.

Lampert and Blunk’s book shows how considering literary and language acquisition in mathematics education is an inquiry with many rewards. It is between the role of communication and the learning of mathematics that the connective tissue is built between Lampert and Blunk’s book and Cooper and Dunne’s book. The connections are located with Cooper and Dunne’s findings in their study, which they use to argue that everyday knowledge (imported through language) interferes with some children’s ability to demonstrate their mathematical knowledge in assessment situations. Cooper and Dunne’s research findings (which they framed in terms of social class and gender) and their argument that language, identity, mathematics, learning, and discourses are created within communities and within society, are at the heart of Hicks’s advice to mathematics education researchers that more attention be given to the role of the identity toolkits that children bring with them to mathematics learning situations.

The third book, *Reconstructing School Mathematics: Problems With Problems and the Real World* (2001) by Steven I. Brown, continues the conversation about the role of society in shaping mathematics education. Whereas in Cooper and Dunne’s book, this theme is framed in terms of social class and gender, and in Lampert and Blunk’s book, the terms are community, identity, and language learning, Brown suggests that a more humanistic approach be taken in the teaching and learning of mathematics. Within the challenge to move to this humanistic stance in mathematics education, Brown advises us that to achieve a reconstruction of school mathematics, we need to expand our notions in at least three ways: (1) widen our understanding of what mathematics is, (2) broaden our beliefs regarding what constitutes the problem-solving process to include problem posing, and (3) examine what “real” means when we talk about “real-world mathematics.” He asks,

Given a problem, what can be done other than solve it? What kinds of metaphors do students use to construct or retrieve ideas? How does our experiencing of mathematics relate to the ways in which we experience other fields? Given several different solutions to a problem, which do we find aesthetically more appealing? Furthermore, issues of emotionality are not only activated by “right/wrong” radar. The questions and issues abound. (Brown, 2001, pp. 200–201)

In advocating that mathematics educators expand their thinking to explore mathematics and mathematics education in humanistic terms, Brown suggests new possibilities for growth and development for the field. He also
speaks directly to my concerns when he argues for the inclusion of human experience within the mathematics education process.

Brown points out that one assumption on which mathematics textbooks are based is that students lack knowledge and experience as they enter into the learning of mathematics.

Furthermore, it is usually assumed that the purpose of the text is to familiarize students with information or skills about which they supposedly know little or nothing. It is not only that they lack language to describe what will unfold, but rather that they supposedly possess no previous independent experience to enable them to appreciate the topic. There is also the implication that it is the text’s responsibility to be un confusing and to provide clear explanations. Behind this assumption is that the ideas presented not only are uncontroversial, but that they were born full blown with no labor pains to boot. In short, everything, including problems, to be worked on, is “given” with little context for its evolution and little awareness that much is contestable. Most textbooks, especially in mathematics as a post-elementary school level, convey little in the way of conflict, unsolvability, drama and emotionality. (Brown, 2001, p. 203; italics added)

Brown’s characterization of mathematics textbooks as being written without reference to experience (neither students’ nor society’s) echoes a similar observation by Hicks regarding an assumption that she feels underlies the instruction of mathematics as reflected in the various studies collected in Lampert and Blunk’s book. Similarly, Brown’s characterization of mathematics textbooks is also echoed in Cooper and Dunne’s argument that the mathematics education literature does not represent cultural experience as being a shaping force for children. Cooper and Dunne go on to say that mathematics assessment tools represent only certain frameworks of experience—specifically, that of the test makers. Thus, although the authors of all three books use different means and look to different ends, each has an important contribution to the conversation concerning curriculum and experience in the mathematics education field.

CONCLUSION

Plato challenges us to be self-reflective beings, telling us that the unexamined life is not worth living. I believe that this is also profound advice for communities. Communities grow and develop through reflection, which occurs in a community through dialogue and conversation about who we are collectively and where we want to go. These are important and timely questions for the mathematics education community.

I have reviewed these books in this spirit of reflection and conversation, looking for the possibilities for growth offered to the mathematics education field. From their study, Cooper and Dunne examine the problematic issue of bias in assessment procedures. We learn about students and about
student knowledge framed within the construct of social class and gender. In Lampert and Blunk’s book, we see the mathematics education field through the eyes of the other. Hicks, from her position within the literacy education field, shares with the mathematics education community her understanding of the importance of community, identity, and language acquisition and use. Her creation of a liminal space for dialogue between disciplines is essential to the process of reconstructing experience—of creating new meanings from the story that we tell of mathematics education. If, as Brown suggests, we enter into the possibilities emerging from this reconstructing of school mathematics, then stepping out of our experience and seeing from the other’s perspective is essential work. Brown’s suggestions push those in the field to serious reflection and examination of some of our most taken-for-granted beliefs and assumptions about mathematics education. For me, it was impossible to read his book without being excited about the possibilities for the future of mathematics education.

I return to my question of whether and how students’ experience can be taken more into account in mathematics education, a question that emerged from my own research and that I brought as a framework to the discussion of these three books. I find great satisfaction in knowing that the authors of all three books are, in their respective ways, moving the field to consider these fundamental questions. These three books have each inspired in me a sense of hope for the future of mathematics education.

REFERENCES


