FABRICATION OF KNOWLEDGE: A FRAMEWORK FOR MATHEMATICAL EDUCATION FOR SOCIAL JUSTICE

Brian R. Lawler

California State University San Marcos

This essay is meant to spark discussion that seeks to pragmaticize the ideals of teaching mathematics for social justice. I wish to build a framework through which teachers can make decisions about the planning for content, pedagogy, and assessment of students' mathematics. The framework attends to three charges for a mathematics education for social justice: to attend to access, authority, and action. The constructivist embracing of knowledge as fabrication, rather than as truth, creates this sort of space for work toward mathematical education for social justice. The notion of curriculum is fundamentally altered, teacher's pedagogical decisions have great potential to be non-authoritarian, and assessment becomes a regular part of the ethical cycle of interaction.

Constructivism, as a theory for knowing and learning, has brought over the past three decades, a renewed wave of reflection and discussion about what it means to know mathematics, how does one teach mathematics, what are the goals of teaching mathematics, and even questions of what is mathematics. Constructivism's primary shift from the established behaviorist psychology of learning was to embrace the idea that the thinking mind could be considered, or at least modeled, while behaviorism restricted itself to considering only observable behaviour (Glasersfeld, 2007; 1995). The behaviorist orientation left the mind as a black box, and studied the inputs and outputs, while the constructivist set out to create models for what might be going on inside that black box. Constructivism embraced the learner as an active agent upon the world, rather than a passive recipient of the world. With slightly greater detail, the constructivist learner was imagined to either assimilate or accommodate the attended to perceptions of the experienced world.

Mathematics education embraced the constructivist view, as seen in promotion of the child as an active learner evident in policy documents of the early 1990's such as United States' National Council of Mathematics Teachers' *Curriculum and Evaluation Standards for School Mathematics* (1989) and those of other countries including Israel, Japan, China, Egypt, Canada, and South Africa (Malloy, 2002). Yet tensions remained about the status of knowledge the constructivist viewpoint suggested, that as a constructed way of knowing the experiential world, the truth of such constructed knowledge was in no way determinable (Glasersfeld, 2007; 1995).

The early 1970's marked a countercultural swing in Western cultures, during which constructivist ideas for education took seed (Papert, 1980; Piaget, 1970; Vygotsky, 1978; Wittrock, 1974), libratory and democratic movements in education found voice (Freire, 2002/1970; Illich, 1971; Kozol, 1972), and postmodern deconstructions of truth, power, and knowledge (Feyerabend 1975; Foucault, 1982/1972) emerged. That

similar goals for education emerged from each perspective, is unsurprising. Viewing children as authors of knowledge and to imbue the child with such authority, embraced the postmodern notions of power relations. Yet, save for the early levels of schooling, institutionalized education seems lost on how to proceed in a post-knowledge world. The unwillingness to relieve mathematics education from the encumbrance of a ontological existence to mathematics, the Platonic sense of truth, Erdös' "Book of Mathematics", has allowed for the unjust stratification of students that is at present the great challenge to cries for Mathematics for All, and other cries for equitable educational outcomes. The privileged knowing ascribed to certain people would not be possible if all learners were conceived as constructors of mathematics and/or mathematical ways of knowing the world.

This essay will go forth from this strong position that takes knowledge as constructed and thus embracing a new politics of truth, to create a 3-pronged orientation to teaching mathematics for social justice and then to consider the work of teaching in order to devise a pragmatic framework through which to enact a mathematical education for social justice.

MATHEMATICS EDUCATION FOR SOCIAL JUSTICE

Although there have been multiple definitions for what it means to teach mathematics for social justice (cf. Gutstein, 2006), here I suggest three cornerstones that help shape the enacting of teaching for social justice, in particular that each prong must be considered: *access*, *authority*, and *action*. For me, social justice in mathematics education does not end with greater *access* to mathematics or to education, or the larger culture. The notions of *authority* for knowing and the confidence and compulsion to *act* are of equal status when devising a notion of mathematics education for social justice.

To elaborate, I draw upon constructivist tradition to recognize a *children's mathematics* (Steffe, 2004), that I as a teacher assume a student to have constructed, the mathematical activity I attribute to the child. For the sake of the remainder of this paper, I will refer to such mathematics as lower case (m)athematics. Furthermore, *mathematics for children* are an adult's ways of knowing and operating, which are drawn upon in order to hypothesize a zone of potential construction for directing interaction with a child. Although still always a constructed knowledge, we as teachers treat this sort of mathematics, that which appears in textbooks and curriculum guides and standards documents, "the race-expression embodied in that thing we call curriculum" (Dewey, 1902, p. 31), as what is to be learned in the classroom. This particular mathematics, a mathematics for children, will be referred to with an upper case (M)athematics.

This distinction allows for further discussion of access, authority, and action. The notion of access is fully about (M)athematics. This privileged power/knowledge, an enlightenment era relic, retains a magnificent standing as a gateway to the cultural capital that schools are directed to deliver. Gutstein (2006) noted that a teaching goal

for mathematics must embrace this potential to read the (M)athematical *word*, quite similar to his teaching goal to succeed academically in the traditional sense. Gutstein extended this argument that mathematics education should embrace the goal to read and write the *world* with mathematics; however he did not note the constructivist distinction in mathematics as I have brought forth here.

To recognize the child both *writes the word* of (m)athematics and *writes the world* with (m)athematics is fully imbuing the learner as an author of their experiential reality, the second key notion for teaching mathematics for social justice. The child is an author of (m)athematics, and an actor upon the world with their (m)athematics. To both attribute this authority to the child, as well as foster the child's own awareness of this authority is the deference of power the constructivist epistemology allows for.

This shift in authority of knowledge justifies more simply the need to act upon society, the call for social action that underlies Gutstein's (2006) theory. That one does author knowledge, mathematical or otherwise, places the knower at the foreground of the world that unfurls in front of them. We know the world, the experiential world of constructivism, through our interactions with it. Insomuch, we have a role in shaping that world. Through our (m)athematics, we act upon the world. To engage students in reflection, discussion, and decision on intentional acts and non-acts upon the world engages them in the ethics of determining and enacting what is fair, a fundamental activity of social justice. That children understand their role in authoring (writing) the world, and their decisions on how that authoring shapes the world, speaks to the third component of social justice education, action.

THE WORK OF TEACHING

In this first cut at creating a pragmatic framework for teaching mathematics for social justice, I simplify the work of teachers to defining curriculum, determining their ways of acting in the classroom—pedagogy, and planning for assessment activities. Constructivism helps distinguish there are two sorts of curricular goals in mathematics education. The first can be thought of in some ways as historical study, that there is a particular (M)athematics to be learned. Secondly, the constructive activity of the learner, that activity that we, as teacher-observers may deem mathematical, must also be developed. Here, one could say there is both a need to teach the child and to teach the discipline.

To intentionally raise awareness of mathematical authority and disperse authority among students (Cohen, 1994) are significant pedagogical moves of the teacher for social justice. And rather than assess to determine what the child cannot do—a orientation toward deficiency (Lee, 2003), assessment must have as its purpose the goal to build models of what a child knows and can do, the constructivist's *mathematics of children* (Steffe, 2004). Such practice allows the teacher to make productive decisions "*to determine the environment of the child*, and thus by indirection, to direct" (Dewey, 1902, p. 31).

The teacher assesses in order to direct, even if by indirection, the child, that a consciousness of this mathematical interaction may make possible for the child to assert his present powers, exercise his present capacities, and realize his present attitudes (Dewey, 1902). So the mathematical development of the child—children's mathematics—is never known before it "appears" in interaction, and then only emerges as mathematics of the child. Dewey's concluding observation, "The case is of Child" (p. 31) is then to say; there is no getting around or free from the child. It is she who makes the mathematics she learns. I take this constructivist orientation to be my underlying premise for a socially just mathematics education.

A FRAMEWORK TO TEACH MATHEMATICS FOR SOCIAL JUSTICE

In sum, the postmodern, post-epistemological, post-knowledge framework for a mathematics education draws upon the demand for attention to access, authority, *and* action. The constructivist perspective redefines what access might be, repositions authority and authorship, and closely binds the embrace of social action as inherent in each of these first two cornerstones.

Students are learners who fabricate knowledge, where fabrication is taken to mean build, design, construct. Although the field of mathematics education seemingly has embraced the constructivist notions of the active learner and the constructing mind, it is most certainly a "softer" (Larochelle & Bednarz, 2000, p. 3) constructivism enacted in schools. The modernist truth agenda remains in place in schools and other educational structures. While student's points of view may be increasingly valued in policy documents and elicited in the classroom, such elicitation only serves to determine what is "wrong" about a student's point of view. Wrong, used in this manner, to mean from the perspective of a pre-existing knowledge, a truth-regime, something that is to be taught. In this soft version of constructivism, the fabrication of knowledge takes on a different meaning; it is a concoction, an invention, a forgery. In essence, the soft constructivism encourages a perspective toward the learner as to be one who constructs untruths, who fabricates lies.

The aforementioned political and social ramifications for a constructivist view on learning, and the related constructed view of knowledge, has yet to be enacted in the mathematics classroom, nor taken seriously when conceiving of the activity of or goals for mathematics education. Treating children as fabricators of knowledge, as little liars, may in fact be a greater injustice to the learner than teaching with the intent to deposit knowledge into the account of the knower, paraphrasing Freire's (2002/1970) banking model for teaching and learning. In the present model for teaching our adolescent fabricators, we engage them in activity, engendering them with a momentary belief that we are truly interested in what they are thinking about their world. And then we tell them how it is, how it should be, how they should have figured, how they should think. We not only continue to act in accordance with a belief that language may somehow transmit knowledge, of course an illusory notion

(Glasersfeld, 1998), but we seem to enforce the modernist knowledge-as-truth agenda onto the adolescent learner.

When unquestioningly engaged in this epistemology of soft constructivism, we treat the learning activity as a process of discovery, holding tight to a knowledge that is to be discovered, listening *for* (Davis, 1997) cues to hear in the child our own ways of knowing this knowledge. The pedagogical practices of the teacher devolve to a guess-what-I'm-thinking state; the pressure of time and the testing of this pre-existing knowledge drive the maddening process of an education that began with a hopeful premise—that children make meaning through active engagement with their experiential world, that children are knowledge constructors, fabricators.

If the radical epistemology of constructivism is embraced and the fabrication of knowledge is recognized not as a construction of untruths but as other truths, a different mathematics education must be conceived. Such a mathematics education would mature from this postmodern epistemology of radical constructivism, and its concordant poststructural concept of power/knowledge (Foucault 1982). Such a mathematics education would be ripe to more powerfully embrace the socially just calls for access, authority, and action.

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