

Discussing Marta Civil's "Equity in Mathematics Education"*

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I appreciate Silvia's invitation to me to discuss Marta's plenary presentation. I thank Marta for presenting stimulating and thought-provoking talk about the research trajectory. We thought that part of my discussion would present her with questions to which she would respond here and now. However, we have decided that I will still present questions that were triggered in me by her paper and that she will react to them when she entertains other questions during the plenary follow up tomorrow morning, which, incidentally, is at the same time of a research report for which I'm one of the authors.

Marta's research trajectory has consistently aimed at understanding how different actors—students, teachers, and parents—make sense of mathematics and what role do their beliefs play in the process. Similar to a photographer who accumulates different lenses to capture and understand different photographic situations, over time, Marta has outfitted her analytic camera with different lenses and now her kit of analytic lenses are psychological, social, and cultural, including issues of English language learners. From her work and her description of that work, I have the clear sense that as she examines situations—that is, mathematics learning and beliefs about mathematics—she often uses equity as polarizing filter to sift through the myriad noises in those situations. With her analytic camera, she captures the mathematics learning and beliefs of preservice and in-service teachers, students, and parents.

I want to comment first on the issue of equity. In 2005, the Research Committee of the National Council of Teachers of Mathematics published what essentially is a position paper in an issue of the *Journal for Research in Mathematics Education* to raise the "awareness about equity and issues surrounding equity from a research perspective" (p. 92). The NCTM Research Committee noted that equity encompasses many specific

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components that include *conditions* of learning and *outcomes*. Lipman describes students' equitable opportunities to learn in this way:

[E]quitable distribution of material and human resources, intellectually challenging curricula, educational experiences that build on students' cultures, languages, and home experiences, and identities; and pedagogies that prepare students to engage in critical thought and democratic participation in society (Lipman, 2004, p. 3).

Consistent with this view is Marta's own working understanding of equity speaks to the issue of opportunities. She says in her paper "equity is related to access by **all** students to opportunities to engage in rich mathematics" (emphasis in original, p. 30). Marta's understanding of equity presupposes an equitable distribution of material and human resources and her concern for that mathematics not be lost in our work toward equity underscores the importance of intellectually challenging curricula. Her work with working-class Latino students and their parents and teachers indicate her attempt to build on children's cultures, languages, and identities. A question that arises for me, is whether we can achieve equity if our understanding of it rests on the notion of "equitable distribution of material and human resources" since we live in societies whose economic base is predicated on the gross unequal distribution of material and capital resources. Should we, mathematics educators, who are interested in equity entertain notions of the transformative mathematics education or mathematics education for social justice, advocated by mathematics education researchers such as Gutstein (2003, 2006) and mathematics educators as Frankenstein (1997, 1998)? In his latest book, *Reading and writing the world with mathematics: Toward a pedagogy for social justice*, Gutstein criticizes current the discourse on equity in mathematics education:

The goal of increasing equity within mathematics education does not explicitly position teachers and students as having transformative power to rectify fundamental structural inequalities through their participation in civil society, both within and outside of educational arenas. In this sense, it does not connect schooling to the larger sociopolitical context of society. And there is little discussion in mathematics education about how teachers can concretely create

conditions for students to use mathematics as an analytical tool to understand and begin to work against unjust social conditions (Gutstein, 2006, p. 13-14).

Unjust social conditions, conditions largely determined by the economic and political relations within our societies, affect educational outcomes. To understand what equitable outcomes might mean, I turn to Gutiérrez (2002) who offers a visionary perspective, positing that an equitable society would entail the “erasure of the ability to predict students’ mathematics achievement and participation based solely on characteristics such as race, class, ethnicity, sex, beliefs and creeds, and proficiency in the dominant language [of school]” (p. 153). In work with students, parents, and teachers, how might we respond to Gutstein’s implicit challenge to mathematics education and work toward realizing Gutiérrez’s vision?

In the same 2005, article by the NCTM Research Committee, they recommend that equity be used as a “critical lens.” The equity lens in Marta’s research exemplifies this notion. In her paper, using the same data, Marta indicates how its amenable to a researcher asking questions of them from different analytic lens: cognitive, sociocultural, and equity. In this sense, Marta’s work is an example of how a “critical equity lens” serves to provide more understanding of the complexity of mathematics learning and teaching.

As another spin on the issue of equity, it is important that Marta names quite specifically her population of interest: working-class Latinos residing in a predominantly immigrant community in a highly racially and economically stratified society, one that is vocally and legislatively questioning the immigration influx of Spanish-speaking peoples from the Americas. This population that Marta studies is a specific cultural group with particular ethnic and linguistic characteristics. Importantly, it is a group with particular structural relations to the economic means of production in the United States of America. Their relation to the means of production produces certain constraints and affordances. For instance, on the one hand, a constraint constructed by Latino’s immigrant and working-class status is their relatively low at-home access to computers and the Internet. On the other hand, an affordance of Latino’s immigrant, working-class status is the relatively high potential for Latino children to develop deep understanding of underlining the algebraic structure of arithmetic algorithms by comparing and contrasting the

arithmetic procedures that their parents and elders know and those that they learn in school.

The study and use of students' cultural knowledge is a perspective from the research program of ethnomathematics. Powell and Frankenstein (1997) discuss this in their book, *Ethnomathematics*, and working with a middle school teacher, Powell has published two examples: Powell and Temple (2001), and Powell and Temple (2002). And with Frankenstein, Powell has extended one of the examples from a critical perspective.

Returning to Marta's characterization of the population with whom she works, calling students and their parents Latinos as opposed to "minorities" brings to mind their immigrant culture and raise questions about how the conditions that led them to migrate from their home country and the conditions under which they live here in the US influences how they experience mathematics learning in reform-based classrooms.

Focusing on Parents

For me, it is particularly powerful in that she invites us all to focus not only on to students and teachers, which, as she noted is the theme of the conference, but also to attend on parents. In her work, she has focused on parents' views of their children's mathematics education as part of efforts to better understand children's mathematical performance.

1. Marta works to understand working-class Latino parents' perspectives and not on parents' mathematical abilities as an explanatory variable of children's performance.
2. She listens to parents describe their unmet expectations and frustrations with the level and pace of their children's school mathematics
3. She hears parents compare their knowledge of mathematics instruction in Mexico with what they have learned about mathematics instruction in Arizona.
4. She inquires into what happens when parents are helped to understand new arithmetic algorithms prescribed by reform-based curriculum.

This focus on parents is receiving increasing, though perhaps not sufficient, attention by mathematics educator researchers. There has been some work with parents:

such as Family Math, out of the Lawrence Hall of Science in Berkeley, CA. Their program has been replicated in many locations around the United States of America and in other parts of the world. In New Jersey, I developed a program with parents of children who are in the early years of elementary school.

The program is called, *I Like Math!*, a name I plagiarized from the title of a secondary-school mathematics textbook series that Paulus Gerdes and his colleagues published in the southern Africa country of Mozambique. Our program, *I Like Math!* engages parents to play and talk with their children about games of strategy and chance from different cultures. The idea of the project is to move away from constructing parents as an extension or apparatus of teachers by helping children with homework and instead to construct a space whereby together parents and children develop their mathematical and strategic reasoning.

In terms of research, Martin (2000, 2006) has investigated African American parents' agency and how their agency affects on their children pursuit of mathematics. Also, through the MetroMath Center at my own university, Rutgers, and at the University of Pennsylvania, researchers focusing on mathematics homework, are attempting to understand whether the roles that parent and caregivers enact around homework align with expectations of their role within the context of a particular reform-oriented curriculum and how parents perceive and negotiate that curriculum as from its instantiation in homework.

Marta's descriptions of working-class, Latino parents' beliefs about the mathematics education of their children in reform-oriented classrooms and their resistance to performing the new arithmetic procedures of reform-oriented curricula reminds me of the following quote by Dias:

The consequence has been the steady marginalization, separation and subordination of difference and diversity of the world-wide existing human and cultural experience and its multifaceted expressions. This domination structure has as its correlates the privileging and selective imposition of reduced cognitive structures, of one-sided interpretation patterns, of restricted scientific and technical solutions and of monolingual habits (Dias, 2002, p. 205).

I wonder about the extent to which reform-oriented curricula unwittingly are creating new inequities to the extent that reform-oriented curricula do not allow for students to work on their mathematics in culturally appropriate ways. Marta's research findings seem to point in the direction of the need for a culturally relevant curriculum. What do culturally relevant pedagogies look like? What is the alignment of these practices with Standards-based curriculum?

In Marta's paper, we have a window into some tensions that exist between Latino students from working-class families and the language and mathematics of school. In a forthright and clear way, she described how her investigations with students, teachers, and parents show that, to quote her, "the pedagogical transformation of community knowledge into school mathematics learning opportunities to be a non-trivial endeavor."

The complexity of the issues must not be swept away. Students' home literacy and mathematics practices are not privileged in school. They live on one side of a linguistic and mathematical divide. One way to bridge this divide is for schools to not to ignore or require students to abandon their cultural linguistic and mathematical practices but rather to acknowledge, celebrate, and leverage their home knowledge, their out of school knowledge. This acknowledgment could proceed from a rich investigation of students' and their parents' practices in mathematics. It's important that these, what Moll, Amanti, Neff, and Gonzalez (1992) term, *funds of knowledge* are not considered non-standard or even non-academic, what has come to be considered standard and academic emerge from the hegemonic cultural and scientific traditions and whims of societies' dominant social groups. Students' *funds of knowledge* can then become both a base onto which can be layered dominant academic literacy and school mathematics. Moreover, and equally as important, students' culturally-based funds of knowledge and the dominant culture's academic or school mathematics are understood by students, teachers, and parents alike that in the case of arithmetic procedures, as alternate, algorithms, and their connections can be explored.

In another section of Marta's paper, she recounts a pedagogical innovation, the goal of which was to align in-school and out-of-school learning. In her teaching experiment, she and her colleagues used an information technology and the programming language Logo to mediate and bring into alignment these modes of learning, while

emphasizing the mathematics of situations on which students were invited to work. Civil used notions of apprenticeship and mathematical community of practice with her participating students and presented to us some of the cognitive and social results of this work.

This work triggers in me a curiosity about the potential of information and communication technologies (ICT) to extend the range of mathematics apprenticeship and community as well as exposure to different out-of-school, informal, or ethnomathematical learning. Issues of how technology is being and can be used are, in some parts of the world, eclipsing equity issues related to access to technology (Smith and Broom, 2003). It is important to note that in the United States of America, researchers (Warschauer, Knobel, and Stone, 2004) have reported important instructional differences in how ICT is used in schools high-poverty schools compared to low-poverty schools. Such inequities notwithstanding, mathematics education needs to respond to changing media and information environments. Sociologists of technology indicate that technology is shaped by its users and its uses, its success in the marketplace, and political struggles around its adoption. Like metal shaped in workshops through being heated and hammered, information and communication technologies are being forged in the workshops of popular culture and in the business. Nevertheless, it should be possible for mathematics learning and teaching to influence the ICT tools so that, for example, English-language learners and English-proficient learners engaged in language-rich, mathematics activities can facilitate English-language learners' development of mathematical ideas and reasoning as well as their facility in English.

In addition to the other questions that I raised, I have two other questions that are related to each other: What are reasons and ways to use ICT to develop an environment that would have some of the characteristics of out-of-school environments that Marta identified in her paper, namely (1) learning by apprenticeship, (2) contextualized problems, (3) control with the task solver, and (4) mathematics often hidden? How can mathematics educators harness or shape information and communication technologies to extend the range of mathematics apprenticeship and community as well as exposure to different out-of-school mathematical ideas and to bridge in-school and out-of-school learning?

To conclude, : The challenges for research in mathematics education exemplified by Marta's work are considerable, especially when considered in the light of current realities. In the United States of America, the current political climate has affected the educational arena in insidious ways. No Child Left Behind (NCLB), signed into law in 2002 has been criticized by both the National Council of Teachers of Mathematics (NCTM) and the American Federation of Teachers (AFT) as being flawed and underfunded. Other politically-charged manifestations include the American Competitiveness Initiative, tying education to Homeland Security¹ and the National Mathematics Panel, created this year by order of President Bush because "The rest of the world is 'gathering strength' and forcing us to catch up."² Education is being increasingly perceived as a closed system of assessment and negative reinforcement à la B. F. Skinner, with dollars taking the role of food. However, the kind of research activity in which Marta and her colleagues engage gives hope since she is clear to focus on students, teachers, and parents taken into her view the analytic lenses of cognition, sociocultural, and equity.

¹ <http://www.whitehouse.gov/stateoftheunion/2006/aci/>

² <http://www.ed.gov/about/bdscomm/list/mathpanel/factsheet.html>

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