

POSSIBILITIES AND CHALLENGES IN TEACHING MATHEMATICS FOR SOCIAL JUSTICE

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INTRODUCTION

This article is about some of the possibilities and challenges in teaching mathematics for social justice. As such, it reflects ongoing, in-process work. It is based on my collaboration with others over the past thirteen years (1994–2007) in Chicago public schools. I first studied culturally relevant mathematics teaching in a Mexican American context (Gutstein, Lipman, Hernández, & de los Reyes, 1997), then taught my own 7th and 8th grade classes at *Rivera* (a pseudonym) school from 1997–2003 (Gutstein, 2003, 2006a). More recently (2003–present), as an outgrowth of my work at *Rivera*, I have been working at the Greater Lawndale/Little Village School for Social Justice (GLLVSSJ)—not a pseudonym; Gutstein, 2007-b, in-press b). At GLLVSSJ, I was a member of the design team that helped start the school, which opened in Fall 2005. Since then (two plus years), I have been

supporting the school's mathematics teachers, co-teaching, working with students, and continuing to teach and study mathematics for social justice. This piece focuses more on the research, practice, and current issues at the GLLVSSJ, as I explained my work at Rivera in depth in Gutstein (2006a).

Where we come from—our histories—and who we are in this hierarchical, racialized, gendered, and class-based world—our locations—matter in what we say and do. For that reason, I share a little bit about myself. Without belaboring the details, I am white, anti-racist, political activist involved in social movements in the U.S. from my youth through the present. I was fortunate enough to come of age during the radical social period of the 1960s, grew up in inner-city New York, and was strongly influenced by the Black Liberation Movement, the anti-Vietnam War movement, and other social movements at the time. I was a politically active high school student, graduated in 1970, and have been involved in political struggles ever since. My path took me eventually to academia (late), and since 1993, I have been a mathematics educator as part of my continuing efforts to effecting social change in the U.S.

OVERVIEW OF TEACHING MATHEMATICS FOR SOCIAL JUSTICE

Teaching mathematics for social justice, or *critical mathematics* (Frankenstein, 1987; Skovsmose, 1994), has many variations and meanings. It is safe to make some general observations about it, such as it is a critical pedagogy (Freire, 1970/1998; Giroux, 1988); builds on culture and experiences; and attempts to engage students to use mathematics to think about, and act on, the world. A good deal has been written on it outside of the U.S., from South Africa (e.g., Julie, 1993, 1998, 2004; Vithal, 2002a, 2002b; Volnick, 1994) to South America (Knijnik, 1997; Valero, 1999), Europe (Skovsmose, 1994, 2004, 2005), and Australia (Arweh & Clarkson, 2001; Zevenbergen, 2000). In the U.S., Frankenstein (1987, 1990, 1995, 1997, 1998) was the principal person writing about critical mathematics in academic journals for years, and there are now several others.

The goals of teaching and learning (mathematics) for social justice include that students learn important competencies in mathematics (or whatever subject they study). For example, students should develop mathematical power,¹ as well as be able to surmount the various hurdles preventing them from accessing advanced mathematical and educational opportunities and full participation in civil society (Moses & Cobb, 2001). In addition, students ideally will change their orientations towards mathematics, away from viewing it as a series of random rules to be rote memorized and regurgitated, to seeing mathematics as a way to create meaning and make

sense of human and social experiences. However, just as important, and intimately related, students also need to develop a critical comprehension of those experiences, using mathematics as a key analytical tool. That is, students, through using mathematics and in mathematics classes, can develop sociopolitical consciousness of their immediate and broader contexts and can also develop a sense of *social agency*, or an understand of themselves as actors capable of working with others to effect change towards social justice. The two sets of goals—mathematical and social justice—dialectically interact with each other. Thus, although there are specific times at which one set may take precedence over the other, they are inextricably connected in complicated ways that need to be resolved in the practice of the moment and over the long term.

TEACHING AND LEARNING FOR SOCIAL JUSTICE—HISTORY AND FRAMEWORKS

Each of us draws on multiple sources to create our evolving theoretical perspectives. In my case, the two primary ones informing my educational research and practice are the work of Paulo Freire and the historical traditions of African American education for freedom. I turned to Freire while teaching at Rivera in the late 1990s. Freire's contributions to liberatory, critical education are many and include, among others, his writing on the role of *conscientização* (critical sociopolitical consciousness), his assertion that education was always political and never "neutral," his advocacy of *problem-posing* (as opposed to *problem-solving*) pedagogies, his contention that the starting point of liberatory education be learners' *generative themes* (the dialectical relationship of key social contradictions in people's lives and how they understand them); and the unmasking of *banking* education in which teachers "deposit" dead morsels of pre-digested "knowledge" into the open mouths (minds) of "passive recipients" (students). Finally, Freire consistently wrote about the need for teachers and students to join together in partnerships in the struggle to make a better world, and that teachers be learners and learners be teachers; this point is particularly relevant to my discussion below.

Predating Freire, and eventually influencing him, is the tradition of education for freedom that was a central component of African American liberation struggles from the time of slavery in the Americas to the present (Anderson, 1988; Bond, 1934/1966; DuBois, 1935; Foster, 1994; Marable & Mullings, 2000; Payne, 1995; Perry, 2003; Siddle Walker, 1996; Watkins, 2001; Woodson, 1933/1990). A common theme running through this history is the collective efforts of communities so that youth could have educational opportunities in order to lead their people (Anderson, 1988). Hu-

manization was also a fundamental precept. Echoing Freire's philosophical tenets, Perry (2003) paraphrased the exhortations of Malcolm X:

Read and write yourself into freedom! Read and write to assert your identity as a human! Read and write yourself into history! Read and write as an act of resistance, as a political act, for racial uplift, so you can lead your people well in the struggle for liberation! (p. 9).

A key idea central to both African American liberatory education history and Freire's work is that teachers and students are (and need to be) partners in the joint struggle for freedom and humanization. This was the foundation of many of the sacrifices adults made for their children's education. For example, Anderson (1988) wrote about African American adults in the South who were told in 1866 (just one year after emancipation) that their children's schools would be closed by the Freedman's Bureau (the agency responsible for funding southern schools during Reconstruction). The adults requested that they themselves be additionally taxed to pay for the schools, and they submitted a 30-foot petition of 10,000 names (many of them signed with an "X") demanding that the Bureau reverse the decision. Similarly, Freire wrote often about the need to reconcile what he called the basic contradiction between teachers and students and referred to their common struggle, "... we cannot say that in the process of revolution someone liberates someone else, nor yet that someone liberates himself [sic], but rather that human beings in communion liberate each other" (1970/1998, p. 114). Along the same lines, he also wrote, "No one can, however, unveil the world for another" (p. 150). Rather, this "naming" (coming to consciousness) had to be done in genuine collaboration: "So it is that the leaders [including teachers] cannot say their word alone; they must say it with the people [including students]" (p. 159).

In general, despite these histories and traditions, understandings and/or definitions of social justice pedagogies may be somewhat, or sometimes, limited. That is, there are sources of liberatory educational practice that the progressive education research community at times overlooks. For example, generations of African American teachers have taught mathematics in their communities and to their people. The goal of many Black teachers historically, especially in the segregated schools of the south before the 1954 U.S. Supreme Court decision that stated that such schools were inherently unequal, was the advancement, education, survival, and freedom from oppression of African American communities (Anderson, 1988; Bond, 1934/1966; Perry, 2003; Siddle Walker, 1996). In mathematics education, the work of Bob Moses, the *Algebra Project* (AP), and the *Young People's Project* (YPP) (Moses & Cobb, 2001); *Project Seed* (Phillips & Ebrahimi, 1993); that of renowned African American mathematician Abdullalim Shabazz (Hilliard, 1991); and

other mathematics teachers would be similarly described. However, these educators have generally not used explicitly critical contexts as learning sites. That is, neither the AP, YPP, nor Project Seed usually have students use mathematics to investigate injustice, study racism, or examine institutional discrimination. The situations from which students learn mathematics may be sports, games, other real-world settings familiar to students, or abstract mathematical structures, but they tend not to be critical analyses of social relations and institutional arrangements. Nonetheless, the framework of these programs is firmly grounded in self-knowledge, social justice, equity, and self- and community-empowerment. It is important to recognize and value the multiple paths towards social justice, and to appreciate that the form and content, and meanings and practices, of social justice pedagogy will differ in specific historical circumstances and localities.

SITUATING MATHEMATICS EDUCATION IN A GLOBAL CONTEXT

Discussions in mathematics education, especially in the United States, do not often involve broader analyses of world affairs, contending geopolitical forces, and larger economic contradictions and reverberations as they relate to teaching and learning. But in the present context of the neoliberal drive to privatize, commodify, and marketize all forms of life, it is relevant to ask the question of what role could, and should, mathematics education play in resisting the domination of the world and its peoples by U.S. empire, and contributing to the creation of a counter-hegemonic trend.

In the U.S., the current agenda promoted by the Bush administration includes the American Competitiveness Initiative (ACI), a relatively far-reaching plan with multiple components. An important part of the ACI is the National Mathematics Panel that was formed to recommend policy initiatives to the Bush administration and Department of Education. The ACI, developed in part from several influential reports (Kirsch, Braun, Yamamoto, & Sum, 2007; National Academy of Sciences, 2006; National Association of Manufacturers, 2005; National Center on Education and the Economy, 2007), is based on a series of interlocking premises—none of which by themselves are new—that have significant implications on a global scale as well as on mathematics education in the U.S. (Gutstein, in preparation). The first of these basic contentions is that the U.S. is becoming (or is already) a second-rate global economic power, despite its clear military dominance. The second major assumption underlying the ACI is that education is a major way (if not the primary way) for the U.S. to counter the economic efforts of other nations such as China, India, Brazil, South Korea, Russia, Japan, and the European Union. The final argument, embedded

in the series of reports and the ACI itself, is that mathematics, science, and technology education are the real motive forces needed to overcome the economic threats and potential woes to the U.S. position posed by these global competitors.

The ACI includes, besides the *National Mathematics Panel*, the *Math Now* programs (in elementary and middle schools), a corollary of the *Reading First* initiative which will only promote "scientifically based research"; the recruitment and rapid preparation of 30,000 mathematics and science professionals to be high school math/science teachers (a program that emphasizes content knowledge rather than pedagogical content knowledge, knowledge of students and their communities, or sociopolitical context); relatively small grants for either high-achieving high school and college students, or those in technological fields (for example, grants of only \$750 a year for first-year college students); a proposed large increase of advanced placement courses and test-takers in urban high schools; as well as a huge infusion of research dollars in technological fields. However, what the ACI fails to do, in a major way, is to support students who are neither high-achieving in school, nor in mathematics/science fields—that is, the majority of low-income/working-class students and students of color. There are no plans to sink massive resources into neighborhood public high schools, such as those in Chicago, where the ACT mathematics mean is 15 in non-selective schools, and where three-quarters of the African American male students fail to graduate (Greater West Town Community Development Project, 2003) and where this abysmal failure of the schools to educate Black students can be traced to the long history of racism within the U.S. including disinvestment and deindustrialization in urban communities, segregated and ghettoized substandard schooling, and a profound lack of resources compared to more affluent areas (Demissie, 2006; Kozol, 1992; Lipman, 2004; Boger & Orfield, 2005). There are no scholarships for struggling students at the margins, with C averages, only for high-achieving ones. Nor are there plans to explicitly reach students who have been so mis-educated (Woodson, 1933/1990) that they are on the brink of being forced out or no longer even in school. The ACI's goals are to improve the U.S.'s standing and position vis-à-vis global economic competitors, and nothing in it directly aids the mass of low-income youth of color—only those who can be selected (or "creamed," as U.S. social activists in the 1960s referred to this) and adequately prepared to alleviate the perceived national calamity of being second rate economically. Its documents do not even give lip service to economically and socially marginalized and disempowered urban and rural communities *except* where their needs coincide with those of capital and the corporate elite; this latter is the *interest convergence* principal about which Derrick Bell (1992) wrote. In other words, equity is not part of the real agenda, and the idea of increasing access for those who lack it, such

as it is in the proposals, exists only to defeat the presumed competition. This is a step backwards even from the NCTM's (1989) infamous statement that "We cannot afford [emphasis added] to have the majority of our population mathematically illiterate. Equity has become an economic necessity" (p. 4). These words, then—and now—shamelessly strip any moral imperative and genuine commitment to rectify historic injustice from social and educational reforms in general, and those within mathematics education in particular. In this, the ACI is thoroughly complicit.

Thus, to consider the role of mathematics education, and the life possibilities for low-income or working-class students and communities of color in the U.S. today without contextualizing them within this broader situation and corporate/governmental programs prevents mathematics educators, researchers, and teachers from more fully comprehending and responding to various initiatives. Furthermore, the lack of the broader framing also potentially hampers our vision in conceptualizing, envisioning, and actualizing alternative mathematics education programs. One does not often view mathematics education as a vehicle through which students may study their social surroundings and learn to be active change agents for social justice. Mathematics education is rarely referred to as a "weapon in the struggle" for social justice and equity, but nothing in principle prevents us from enacting such a vision. And, there are increasing numbers of teachers and mathematics educators engaged in such practices (see, for example, Gutstein & Peterson, 2005). I turn now to the potential of how mathematics education might resist the global designs of empire and instead support the efforts of people of the world to be free from oppressive forces. As a practitioner involved in this work, I am well aware of the challenges we face in actualizing these possibilities; these also are part of my discussion.

POSSIBILITIES AND CHALLENGES IN TEACHING MATHEMATICS FOR SOCIAL JUSTICE

In Gutstein (2006a), I argued for the following reconceptualization of mathematics education:

Students need to be prepared through their mathematics education to investigate and critique injustice, and to challenge, in words and actions, oppressive structures and acts—that is, to "read and write the world" with mathematics. (p. 4)

The *reading of the world*, to paraphrase Paulo Freire (Freire & Macedo, 1987), refers to the process of developing sociopolitical consciousness of immediate and broader contexts through studying the life conditions of

one's community, being involved in social movements, reflecting on experiences, and various other means. Freire developed, and put into practice, many of his ideas in Latin America and Africa (e.g., his native Brazil, Chile, Nicaragua, Guinea Bissau, and other countries) in which he led, provided support to, or participated in literacy campaigns (as well as post-literacy, political development work). In Freire's (Freire & Macedo, 1987) endeavors, learning to *read the word* (i.e., develop text literacy) always followed a critical reading of one's world through which learners examined their lives using political, social, economical, historical, and cultural lenses in an attempt to distance themselves from their immediate circumstances and begin to investigate the root causes of oppression and injustice. A variety of mathematics education projects have attempted to "reinvent" (Freire's word) his principles, theories, and practices and have tried to provide students the opportunities to read the world with mathematics (Brantlinger, 2006; Frankestein, 1987, 1998; Gutstein, 2006a; Peterson, 1995; Turner, 2003).

But reading the world is only part of the dialectical process of transforming society, and needs always to be linked to *writing* the world (Freire & Macedo, 1987). This refers to the process of acting in the world as a conscious human agent to remake reality. Freire linked reflection to action (a unity that he called *praxis*), and this unity is captured in his description of the dialectically connected processes of reading and writing the world:

Reading the world always precedes reading the word, and reading the word implies continually reading the world. . . . In a way, however, we can go further and say that reading the word is not preceded merely by reading the world, but by a certain form of *writing* it, or *rewriting* it, that is, of transforming it by means of conscious, practical work. (Freire & Macedo, 1987, p. 35)

Some reading and writing the world with mathematics work has occurred in Chicago (and other cities') public schools, often under the conditions of high-stakes testing and draconian accountability regimes (see Lipman, 2004; Lipman & Haines, 2007). An instance of these practices is the work at the GLLVSSJ in Chicago (Blunt, Buenrostro, González, Gutstein, Hill, Rivera, & Sia, 2007; Gutstein, 2007b, in press-b). The school grew out of a hunger strike initiated mainly by Mexican immigrant mothers for a new school in an overcrowded neighborhood (Russo, 2003; Stovall, 2005). At the school, students study a NCTM-reform-based mathematics curriculum (the *Interactive Mathematics Program*, Fendel, Resek, Alper, & Fraser, 1998) and also use mathematics to investigate aspects of injustice through what we call "real-world projects." A small core group of students has emerged who voluntarily spend extra time after school and weekends and who function as a coresearch team. They study mathematics, code and analyze data from previous real-world projects, prepare presentations, and develop their own

capacity to lead and teach others how to read and write the world through social justice mathematics projects. In the 2006–2007 school year, tenth-grade students from the school presented a social justice mathematics project, or their own research on how students in the school as a whole have been learning social justice mathematics, at six national or regional academic and educational activist conferences (in addition to graduate-level university classes). Part of their role is to help conceptualize and plan how to spread their high level of commitment and engagement in social justice mathematics to the rest of the school, as well as to the broader public. In these ways, they are inserting themselves in the teaching and learning process as conscious agents of social change, and they represent the seeds and possibilities of a potentially powerful counter-hegemonic trend.

The reality is that what is doable is always constrained by objective conditions and power relations, but teacher agency and spaces to work against the grain do exist, despite the obstacles (Carlson, 2002). There is clear evidence of students beginning to read and write the world in classrooms, in a variety of settings, in which they participated as co-constructors of a social justice learning environment (e.g., Morrell, 2004). In these classrooms, teachers have begun the process of developing *political relationships* (Gutstein, in press-a) with students that incorporate, and go beyond, the caring relationships many competent, caring teachers build with their students and families; I say more about this below. While it is always difficult and problematic to assign responsibility for students' growth to any specific experiences (perhaps particularly to those in school), both epistemologically and methodologically, and also hard in terms of the processes through which people develop critical awareness, there is evidence to suggest that urban youth of color in public school mathematics classes can begin to develop sociopolitical consciousness and a sense of social agency (Blunt et al., 2007; Gutstein, 2003, 2006a, 2007a; Turner, 2003, 2005).

This is not to suggest that using mathematics to read and write the world in urban U.S. schools is simple—the effort is filled with complexities. Some are well known and familiar to teachers, such as the accountability constraints I mention above that can drive out culturally relevant pedagogies, critical literacies, and teachers' use of students' home languages to develop bi- and multi-lingualism (Lipman, 2004). Student resistance to new modes of mathematics pedagogy and curriculum are commonly acknowledged. Other challenges include that students sometimes initially exhibit a sense of powerlessness when they are confronted with sober realities beyond their immediate experiences, although they can move beyond this state (Bigelow, 2002). In addition, schools in this country not only do poor work in teaching students how to think, but in addition, they do an excellent job in teaching students how to *not* think; Macedo (1994) referred to this as "literacy for stupefaction."

Of the various challenges in teaching mathematics for social justice, the two on which I concentrate in the rest of this article are one, the complexity of using students' generative themes (Freire, 1970/1998) from which to develop social justice curricula, and two, teachers not seeing their role as *political militants* (Freire, 1998) and consequently not building the political relationships with students that can support their development of sociopolitical consciousness and sense of social agency.

CURRICULUM BASED ON GENERATIVE THEMES

As I mention above, Freire (1970/1998) described generative themes to mean the dialectical interaction between key social contradictions in people's lives (objective reality) and how people understand and act in relation to them (subjective interpretation). He called them "generative" because, like fans, they may be unfolded to reveal deeper or overarching, other themes. For example, in our research group with students in the social justice high school, we raised the (mathematical) issue that there are two males for every three females in one of the communities in which students live. When we asked students to explain the data, they said things like, "because the men are dead or locked up." Missing Black men from the community is itself a generative theme leading to the theme of Black men in prison, and that leads to other themes when we ask students to further explain the phenomenon, such as uncovering the reasons behind the over proportion of African Americans in the U.S. prison system (yet another concept with important mathematical components).

Freire's (1970/1998) concept of a *problem-posing pedagogy* is relevant here. He meant by this that teachers and students together needed to ask questions about significant generative themes and to dig beneath surface-level phenomena, that is, to make a "problem" out of what one sees, and often normalizes, such as the dearth (and death) of Black males in the neighborhood. Objective phenomena in students' lives have complex sociopolitical geneses. When educational settings (including, but not limited to, schools) are structured and afford the opportunities so that participants (teachers and students) can deeply investigate, study, reflect on, and interrogate the roots of injustices, with the ultimate aim of rectifying the causes that spawn them, then they are enacting a problem-posing pedagogy. A core component of the intricate (and non-linear) process is the uncovering of generative themes that lie in the community's knowledge and experience so that teachers (and other partners including parents and students) can create curriculum based on the study of the themes as aspects of complex social reality (Freire, 1978). The process does not end there. One has to also provide a framework for the investigations so that students will develop

the academic competencies, and cultural capital, that not only has society demanded that they need to achieve "success"—but equally or more importantly, so that students themselves are more fully prepared to read and write the world. Curriculum development, then, is a necessary aspect of social justice teaching and learning, from a Freirean problem-posing framework, but definitely not sufficient by itself. As educators well know, quality curriculum (in the narrow sense of curriculum), of whatever form, is only one of many components. This may be especially true in social justice-oriented classrooms.

Creating problem-posing pedagogies and developing curriculum based on students' generative themes is difficult work. I briefly discuss some of the challenges in our work at the GLLVSSJ in Gutstein (2007b, in-press b). In addition, there is international experience that we may draw upon. In Porto Alegre, Brazil, the *Citizen Schools Project* has been developing such a praxis for the past 15 years (Gandin, 2002). Gandin described the process in Porto Alegre, where educators refer (with similar meaning) to generative themes as *thematic complexes*:

The starting point for the construction of curricular knowledge is the culture(s) of the communities themselves, not only in terms of content, but in terms of perspective as well. The whole educational process is aimed at inverting previous priorities and instead serving the historically oppressed and excluded groups. The starting point for this new process of knowledge construction is the idea of Thematic Complexes. This organization of the curriculum is a way of having the whole school working on a central generative theme, from which the disciplines and areas of knowledge, in an interdisciplinary effort, will structure the focus of their content. (p. 140)

In Porto Alegre, the work has been challenging enough (I. Martins de Martins, personal communication, 3/22/05), even though the city administration was supportive of the Project and worked with its participants to rearticulate the notion of citizen involvement to counter neoliberal trends in Brazil (Gandin & Apple, 2003). Developing curriculum based on generative themes in Porto Alegre required a detailed, not entirely linear 10-step process, including interviews of community residents, large open forums with community members, and much interdisciplinary and collaborative work among teachers (Gandin, 2002). To do so in a U.S. or similar context, with high-stakes testing and accountability regimes may be substantially more difficult. Nonetheless, the possibilities exist. I do not have space here, but refer readers to the earlier references I cite about developing curriculum based on generative themes (and what we refer to as *community knowledge*) at the GLLVSSJ (Gutstein, 2007b, in-press b).

TEACHERS AS "POLITICAL MILITANTS"

Freire's (1998) use (above) of the term "militant" refers, according to Car-men St. John Hunter, one of his translators, to "persons actively committed to justice and liberation—political activists" (Freire, 1978, p. 73). Freire (1998), in a letter to teachers, wrote:

We are political militants because we are teachers. Our job is not exhausted in the teaching of math, geography, syntax, history. Our job implies that we teach these subjects with sobriety and competence, but it also requires our involvement in and dedication to overcoming social injustice. (p. 58)

For many teachers in U.S. schools, the idea and practice of being a "political militant" are not second nature. The demands of teachers' work are difficult enough, even without accountability mandates. To ask them to be activists, above and beyond their already over-taxed work-lives, borders on the extreme. However, the literature demonstrates (and my personal experience corroborates) that teachers who are engaged as activists themselves (in a myriad of ways) also provide their students to have opportunities to become agents of change (Christensen, 2000; Gutstein, in-press a; Ladson-Billings, 1994; Peterson, 1991).

In Gutstein (2006a), I described how my students and I co-constructed a classroom oriented toward social justice when I taught mathematics in a Chicago middle school. I outlined three features that were necessary in my context and in no way assumed nor suggested that these fit all situations. They were what I called "normalizing politically taboo topics" (e.g., making discussions about racism and injustice part of ongoing classroom discourse), creating a "pedagogy of questioning" (Gutstein, 2006b), and developing "political relationships" with students that

... subsume the personal, supportive relationships with students that some teachers see as essential to their pedagogy. Many teachers build quality relationships with students both in and out of class, and they spend time with students and families when appropriate; share stories from their own lives; and talk, listen, and respond to students about any concerns they have. However, political relationships go further. They include taking active political stands in solidarity with students and their communities about issues that matter. Political relationships also entail teachers sharing political analyses with students as much as possible. Finally, they include talking with students about social movements, involving students themselves in studying injustice, and providing opportunities for them to join in struggles to change the unjust conditions. (Gutstein, 2006a, pp. 132–3)

These relationships may not be necessary in all settings to teach for social justice nor to help students develop sociopolitical consciousness and a sense of social agency. However, evidence in the literature on culturally relevant teaching, critical pedagogy, and teaching for social justice suggests that these are important components. For example, teachers may work with students to examine the politics of language, as Delpit (1988) described; directly confront racism in dominant narratives (Ladson-Billings, 1997); critique the political nature of knowledge (Bigelow, 1998; Christensen, 2000); explicitly engage in anti-colonial, liberatory educational practices (Camangian, 2006; Yang, 2006); and support students in learning and using mathematics for social justice, to examine (and ultimately try to change) injustice while explicitly naming racism and other forms of discrimination. I am not prescribing a formula or delineating how these relationships might occur. They are partially based on who teachers are and their own strengths, weaknesses, experiences, knowledge, and orientations/dispositions toward knowledge, social movements, and political struggle. Clearly, like any social process, this is complicated. But educators are involved in this work, and we need to learn the lessons (Gutstein, in press-a).

An important aspect is to support the development of others to become "political militants" and to use and further develop social justice curriculum and pedagogy. This is a challenge for those who have some of the knowledge and experience needed to teach for social justice, much of it gained through participation in social struggles. Traditional teacher education programs are not oriented toward, or, in my view, able to prepare social justice educators. Some have proposed ideas on social justice teacher education (e.g., Darling-Hammond, French, & Garcia-López, 2002; Gautzell, 2005). While there is no room in this article to fully examine the question of initial or in-service teacher education, I offer some thoughts that apply to mathematics teaching and learning and hopefully beyond, to all subject areas.

First, the experiences that contribute to teachers' sociopolitical knowledge mostly occur out of school and in social interaction. If one subscribes to "learning by doing," one would accept that people learn about social activism by being involved in social movements, as Freire (1998) suggested. Anecdotally, this is the case for myself and for all the teachers I know who are politically active and who have experience in teaching for social justice. If a teacher wants to teach for social justice, then it is important for that person to concretely express solidarity with her of his students, their communities, and their struggles, in both words *and* deeds. This may be particularly true for teachers who are outsiders to their students' communities and to those who teach "other people's children" (Delpit, 1988).

Second, teachers whose lives have not yet taken them towards political action may need to seize the opportunity to take such steps. In Chicago, for

example, there are ongoing struggles in students' communities, such as the Little Village and North Lawndale neighborhoods in which the GLLVSSJ is located—for justice and against gentrification, anti-immigrant discrimination, and police violence. These struggles need allies from without, and there are real possibilities for teachers to participate in this role.

Third, collective study within teacher inquiry groups, for example, of Freire's work, can be important. At the GLLVSSJ, we have started a study group with the mathematics teachers in which we are reading about neoliberalism to understand its impact on the city and the school communities. In particular, we are investigating the relationship of transnational capital and the financialization of the economy to gentrification in North Lawndale; we are also studying how free trade agreements, agricultural subsidies, and other neoliberal policies and international entities (such as the World Trade Organization, International Monetary Fund, and the World Bank) contribute to displacing Mexicans from their lands and creating an impetus for their immigration to the U.S. The teachers have expressed that a deeper understanding of these issues, as part of the larger sociopolitical context enveloping us all, will be useful to develop social justice mathematics projects about generative themes in students' lives.

Fourth, collaborating with students, as I describe above, to design, teach, study, assess, and discuss social justice mathematics is an important component in the learning of all participants. Working with students' as co-researchers and paying deep attention to their knowledge, views, analyses, and perspectives, not only on their own lives (and generative themes) but also on the broader questions involved in teaching and learning about social justice mathematics, is yet another way to support teachers (and researchers) in deepening their understanding of sociopolitical contexts. Those who are open to learning from and with students can significantly enrich their collective understanding of the issues. As well, it can strengthen their political commitment to liberatory education and contribute to the development of political relationships between teachers and students. As an aside, at the GLLVSSJ, we have yet to begin working with parents and other community adults whom we are confident will share many of our goals (Gutstein, 2006c), but whom we believe will challenge and expand our political and pedagogical thinking and direction as well.

Finally, we need to continue to theorize, as well as to capture, the process of creating social justice mathematics programs and the particulars of the mutual teaching and learning that occurs. It is through the documentation and analysis, again, collaboratively with students, teachers, and university faculty as co-researchers, that we accumulate knowledge about critical education. A responsibility of those engaged in this practice is to find ways to describe and share the lessons, appropriately theorized, and to support the development of others.

CONCLUSION

Despite the myriad of challenges of critical mathematics teaching and learning, the possibilities are many. They include students developing sociopolitical consciousness, a sense of social agency, and positive social and cultural identities (Frankenstein, 1998; Gutstein, 2006a; Turner, 2003). There are several central issues involved in the processes which I do not discuss here for lack of space. These include (and are not limited to) a) the dialectical relationship of teaching mathematics for social justice and teaching to develop mathematical power; b) the thorny dilemma of explicitly politicizing teaching and learning while maintaining space for students to develop and advocate their own views (Freire, 1994; Freire & Faundez, 1992); c) the difficulties of teaching across differences such as race and ethnicity, culture and language, gender, and social class (that is, in teaching "other people's children," Delpit, 1988); and d) the constraints of teaching against the grain while in oppressively hierarchical accountability systems (such as Chicago Public Schools).

I conclude this article with a short description of a social justice mathematics project that Joyce Sia (the GLLVSSJ 11th grade mathematics teacher) and I just created and co-taught in September 2007 to the five 11th grade classes. I present this to give readers a more concrete feel for what social justice mathematics can actually look like, at least at a surface level. We have not yet co-analyzed students' work and responses with the student co-research team, but there are some initial observations that relate to the main themes in this article. The project was on the *Jena 6*, six African American high school students in the small town of Jena, Louisiana, located in the U.S. South. Jena has about 3000 adults and was about 85.6% white according to the 2000 census. In September 2006, an African American student at Jena High School asked his principal for permission to sit under a large shade tree on the school grounds known as the "white tree" because only whites sat under it. The principal told him "yes," but the next day, three nooses were found hanging from the tree painted in school colors. While some (e.g., the school superintendent) wrote it off as a "prank," for an African American community in the South, the historical record of thousands of their people lynched from such nooses, made it anything but. In addition, the three nooses were inferred by many to represent the three letters "KKK" for the Ku Klux Klan, a home-grown U.S. terror organization. The racial tensions mounted with a number of fights, and a white man pulled a gun pulled on some Black students. In December 2006, an African American student was beaten up by whites at a party, and two days later, a white student taunted the student in school, at which point some African American students beat him up. They were initially charged with attempted murder with potential prison terms of 100 years. The first

of these students, Mychal Bell, was tried in adult court and found guilty by an all-white jury (his conviction was overturned because he was improperly tried as an adult), and the story continues as of this writing.

On the second day of class this fall, we began an intense two-week project with the framing question based on Mychal Bell's conviction: If a jury (12 people in the U.S.) was randomly selected in Jena (with 2154 adults, 85.6% white) what is the probability of choosing an all-white jury? (We urge readers to guessimate the answer before going further.) Briefly, we started out by showing students a short video clip from alternate media summarizing the situation, read some interview transcripts from involved individuals, and had students figure out what the jury would have looked like *if* it matched Jena's demographics (i.e., 10 whites, 2 people of color). We did the latter to both politically contextualize the issue (since the expected did not occur, then what are the odds, or chances, that the jury turned out all white?) and to situate the mathematics. One way to answer the principal question is to use combinatorial analysis and compute the quotient of the possible number of all-white juries in Jena divided by the total possible number of Jena juries. These numbers are on the order of 10^{30} and 10^{31} respectively; dividing them yields a probability of ~15.4%. Most people (ourselves included) thought the chances would be substantially higher. The specifics of how students worked on this and developed the generalizations of n C r , (necessary because we did not tell students formulas, but rather provided them opportunities to "reinvent significant mathematics, Freudenthal) are in Sia & Gutstein (in preparation).

In our short writeup of the curriculum we created for a teacher activist group based in the U.S., we outlined the social justice and mathematics objectives (see Table 25.1). Although this project was not based on a generative theme directly related to students' lives, since they have no connection to Jena and our students' neighborhoods are almost entirely people of color, it nonetheless resonated. While we have not yet fully unpacked students' reasons for their engagement in the project, we can summarize from our in-class observations and knowledge of their lives that they related because of their personal knowledge and experiences of racism which leads to a deep sense of justice that they bring with them to school. The African American students live in a community in which an astounding 57% of the adults are in the prison system, either in prison, or probation/parole, or awaiting sentencing (McKean & Raphael, 2002); this means that roughly two thirds of the males are involved. Anecdotally, all the Black students in the school I have asked have reported that they have male family members involved (present or past) with the prison system. The Latino/a students, overwhelmingly Mexican American, have similar knowledge and experience, even if their community experiences less incarceration. Furthermore, they know, directly or indirectly, of undocumented people in

TABLE 25.1 Social Justice and Mathematics Goals for Jena 6 Project

Social Justice objectives:

- Grow in being able to "read the world with mathematics," that is, develop deeper sociopolitical consciousness of reality using mathematics.
- Provide some concrete support to the Jena 6, i.e., take some action;
- Raise awareness about the Jena 6;
- Inform students about how juries are selected;
- Have students answer: "Was the jury for Mychal Bell selected randomly and without bias?"
- Connect the Jena 6 situation to students' own lives and communities.

Mathematics objectives:

- Determine the probability of randomly selecting a 12-person, all-white jury from a town that is 85.6% white, 14.4% people of color (mainly African American), of 2,154 adults (2000 census).
- Generalize the formula for combinatorics, that is, n C r .
- Develop a better understanding of the mathematical concept of "randomness."
- Gain experience in "thinking like a mathematician."
- Understand the role mathematics has in understanding a key social justice issue—and that without relatively sophisticated mathematics, one cannot know the answer.

the area who are forced to live "underground" (e.g., they cannot obtain a drivers license), and the community recently was raided by immigration authorities which outraged (and terrorized) many neighborhood residents (Little Village is the area's largest Mexican immigrant community, and the Chicago region is estimated to have up to 400,000 of the nations 12,000,000 undocumented immigrants).

It is mathematics/social justice projects like this that provide students context, history, and opportunities to learn about, and be engaged in, aspects of social justice as well as social movements—using and learning mathematics at the same time. Although we are well aware that all our goals are never realizable through one particular project, we understand the deepening of sociopolitical consciousness and a sense of social agency to be a dialectical process taking place over a period of years. On September 20, 2007, a major demonstration demanding all charges be dropped on the six took place in Jena (which is 900 miles from Chicago). Many of our students were so moved that they organized a protest at the school and walked out of school (during the school day) to make signs and posters and held their own impromptu rally at the nearest major intersection near the building. This was led by African American eleventh graders, supported by Latino/a students, which had a unifying impact on the school. Furthermore, the tenth- and ninth-grade mathematics teachers in the school also decided to do the project (although they did not emphasize the process of mathematical generalization as much). Thus, the whole school, through

mathematics classes, became involved in the Jena 6 struggle, opening up avenues for continual investigation, links to Chicago issues, and it further develops commitment and awareness on the part of students, as well as of their teachers. It is precisely opportunities such as these that embody the possibilities of teaching mathematics for social justice.

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NOTE

1. I use the following as a definition of mathematical power, "Students confidently engage in complex mathematical tasks... draw on knowledge from a wide variety of mathematical topics, sometimes approaching the same problem from different mathematical perspectives or representing the mathematics in different ways until they find methods that enable them to make progress... are flexible and resourceful problem solvers... work productively and reflectively... communicate their ideas and results effectively... value mathematics and engage actively in learning it." (National Council of Teachers of Mathematics, 2000, p. 3)