Negotiating Social Justice Teaching: One Full-Time Teacher's Practice Viewed From the Trenches

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This case study examines the practice of a full-time mathematics teacher and social activist working in a secondary school with the twin missions of college preparation and social justice. Findings detail how this teacher views the relationship between mathematics education and social justice and how her conception of teaching for social justice is enacted in her mathematics classes. Interview data and excerpts of classroom practice are used to describe how the teacher negotiates 2 dilemmas in her teaching: the challenge of fostering students' independence/interdependence and the problem of dominant mathematics as a necessity/obstacle to social justice.

Key words: Critical theory; Equity/diversity; Secondary mathematics; Social and cultural issues; Teaching practice

Although access to mathematics education has been a social justice priority for some time (Moses & Cobb, 2001; Oakes, 2005), both researchers and classroom teachers have recently been drawn to teaching mathematics for social justice as an explicit pedagogy. Mathematics lessons that explore social, economic, and political issues appear in resource publications (e.g., Gutstein & Peterson, 2005; Stocker, 2007) and in respected practitioner journals (e.g., De Maio, 2007; McCoy, 2008; Turner & Strawhun, 2007). Universities offer courses on teaching mathematics for social justice (e.g., Gau, 2005). Moreover, hundreds have attended conferences linking social justice with mathematics education (e.g., Creating Balance Conference, 2008).

Although this phenomenon could be explained as a straightforward attempt to interest students by expanding the pool of real-world problems, the research literature theorizes the goals of social justice mathematics teaching more ambitiously.

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Taking the view that neither mathematics nor mathematics education are neutral activities and that access to mathematics education will not necessarily guarantee equitable opportunity or voice for all, advocates of teaching and learning mathematics for social justice seek to broaden equity goals beyond significant mathematical learning for all groups to include the development of skills for fighting systemic oppression (Gutiérrez, 2002; Gutstein, 2006; Martin, 2003; Mukhopadhyay & Greer, 2001; Skovsmose and Valero, 2002). This stance privileges a relational—over a moral or distributive—definition of social justice in which domination and oppression reflect institutional constraints on social groups' self-determination and self-development (Young, 1990).

From this stance—as I later discuss—practitioners and researchers have begun to examine empirically methods for incorporating analyses of social issues into mathematics classes in ways that seek to serve justice goals and, at the same time, develop students' mathematical knowledge. And yet, at the secondary level, research has not examined full-time teachers who are not primarily researchers working independently to teach mathematics for social justice in public schools. Hence, we know little about such practice or whether teachers can maintain such teaching alone in a sustained climate of high-stakes education. Further research is needed.

Of the studies to date at the secondary level, design-based studies are most common. Such studies do not consider other approaches that may develop organically through the situated practice of mathematics teachers with a variety of social justice aims. Perhaps full-time mathematics teachers teach for social justice differently from university-based researchers—even researchers who are activists. Thus, as we work to develop our understanding of social justice mathematics teaching, we need to consider how a focus on design studies in isolation from other methods might both limit our capacity for understanding and potentially feed into deficit notions of teachers. For example, as frames for characterizing teaching mathematics for social justice gain purchase in the mainstream research literature, it would be easy to assume that teachers who struggle with this work do so because they lack pedagogical, mathematical, or political sophistication in comparison to university experts. Although this is a definite possibility, current research is insufficient to make that claim. Moreover, as we work to address social justice, it is important that our frames are generative. That is, findings that merely characterize what counts or does not count as social justice mathematics teaching are less helpful for teachers trying to do this work than findings that reflect a dynamic, practice-oriented vision of the effort.

Toward that end, this article reports on a portion of a larger case study of mathematics teaching in Beals School,[1] a public, open-enrollment secondary school (grades 6–12) dedicated to college preparation, community connection, and social justice (Gregson, 2011). This article examines tensions and dilemmas in the practice

[1]The school, neighborhood, teacher, and student names are pseudonyms.

of an eighth-grade mathematics teacher, Katherine Myles, as she tries to teach mathematics for social justice in her context.

BACKGROUND LITERATURE

The mathematics education literature typically frames equity as a process of providing all students the opportunity to learn the dominant (Gutiérrez, 2002), classical (Gutstein, 2006), or academic (Brantlinger, 2007) mathematics, including specific content, processes, and norms.[2] This includes efforts to help marginalized students (e.g., African-American students, Latina/os, students from low-income families) bridge differences between their everyday cultural and linguistic knowledge and the dominant, domain-specific knowledge of mathematics (Nasir, Hand, & Taylor, 2008). The Algebra Project (Moses & Cobb, 2001) is a frequently noted example. The Algebra Project uses a pedagogy influenced by philosopher W. V. Quine, curriculum driven by common student experiences such as class trips, and also problems from advanced mathematics (see Road Coloring, Budzban & Moses, 2009).[3]

The Algebra Project is modeled on a "community organizing approach to educational innovation" (Moses, Kamii, Swap, & Howard, 1989, pp. 438–439). This approach includes community discussion of the purpose for algebra and how all children might gain access to "the college preparatory mathematics curriculum" (p. 428). In this description, the focus is on access to the dominant mathematics through the equitable distribution of existing mathematical goods. More recent literature positions the focus of the project on access as well (Greeno & Hall, 1997; Gresalfi, Martin, Hand, & Greeno, 2008). Such a presentation contrasts with critical conceptions of equity that consider access but that also address questions of social influence—how students' relationship to mathematics and mathematics' relationship to students is reflected in social, economic, and political relations.[4] From a critical perspective, outcomes of equitable mathematics education must include the capacity to navigate and reduce social inequity both *with* and *despite* the power of mathematics.

Critical Perspectives on Mathematics Education

Critical educators primarily outside of mathematics education assert that education should help people recognize inequity as a result of human-created social and economic relations that can be challenged (Darder, Baltodano, & Torres, 2003).

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[2]These terms similarly describe officially sanctioned, high-status mathematics knowledge necessary for advanced study.

[3]Early in my career, I participated in Algebra Project training and coordinated efforts to implement the project at a middle school at which I taught. Thus, my knowledge of the project is both personal and from the literature.

[4]The Young People's Project (http://www.typp.org/) is an organization associated with the Algebra Project. The Young People's Project explicitly addresses both access and influence. However, this connection is not readily apparent in published research on the Algebra Project and generally not emphasized in mainstream mathematics education circles.

Grounded in the constructs of *dialogue* and *praxis* (Freire, 2000), critical education engages social problems in the classroom and beyond (e.g., Duncan-Andrade & Morrell, 2008). Such educators view knowledge as an ongoing socially mediated process—simultaneously subjective and objective, and ever affected by power relations. Hence, those who take a critical stance toward education must necessarily grapple with matters of identity and power. This is as true in mathematics education as in other domains (Gutiérrez, 2007, 2010). For instance, critical educators recognize that students marginalized by racism or social class will not automatically overcome their marginalization by acquiring advanced mathematics skills; they need additional tools of analysis and resistance.

The critical mathematics education literature advocates helping students confront and make use of mathematics in ways that allow them and others access to just futures. Frankenstein (1987) provided insight into how Freirean theory might inform this work. Frankenstein used dialogue and coinvestigation in statistics courses to help working-class adults understand statistics as a human creation, practiced in specific historical and economic contexts and used to both maintain and confront inequity. Moreover, in the 1990s, researchers writing about culturally relevant approaches to mathematics education in K–8 contexts brought explicit attention to the political nature of such work (e.g., Gutstein, Lipman, Hernandez, & de los Reyes, 1997; Ladson-Billings, 1995; Tate, 1995). However, such research provides insufficient detail for secondary teachers interested in implementing critical approaches in their daily practice (Miranda, 2008).

Teaching mathematics for social justice. Critical mathematics has most recently emerged in the literature as teaching mathematics for social justice.[5] Of the empirical studies at the secondary level, two entail design-like practitioner research. In one study, the researcher taught a 9-week high school geometry class to low-income urban students (Brantlinger, 2007); a second study involved 8 semesters of middle grades mathematics over 6 years at one predominantly Latina/o middle school (Gutstein, 2006). In neither study was the researcher a full-time teacher. A third study examined student agency in the context of three social justice units (Turner, 2003). The researcher collaborated with a sixth-grade teacher to coplan units that the teacher implemented. A fourth study considered high school teachers using lesson study to develop and implement social justice lessons during a professional development course (Gau, 2005). In a fifth study, a researcher conducted action research with a teacher intern attempting to incorporate social justice issues in geometry classes (Moore, 2005). Thus, existing research has focused on curriculum development and implementation by researchers teaching part-time, or by full-time teachers with strong support from university researchers.

Of these studies, Gutstein's work (2006, 2007) is the most detailed. Drawing on both African-American and Freirean discourses of liberatory education, Gutstein's social justice mathematics teaching involves two sets of dialectically related

[5] I use *critical mathematics education* and *social justice mathematics* interchangeably.

	Pedagogical goals	Central curriculum	Time allocation	Instructional features
Mathematics	Reading the mathematical word Succeeding academically in the traditional sense Changing one's orientation to mathematics	*Mathematics in Context*	80% to 85% of the year (29–31 weeks)	• Focusing on conceptual understanding • Encouraging multiple solution strategies • Exploring problems with multiple solutions • Positioning students as "arbitrators of knowledge, correctness, and reasonableness" (p. 103)
Social Justice	Reading the world with mathematics Writing the world with mathematics Developing positive social and cultural identities	Social Justice Projects (3–4 per semester)	15% to 20% of the year (5–7 weeks)	• Using real situations to understand math concepts and applying math concepts to understand real-world questions • Normalizing politically taboo topics • Developing political relationships with students • Creating a pedagogy of questioning

Figure 1. Key components of Gutstein's mathematics for social justice pedagogy. Compiled from Gutstein (2006).

pedagogical goals and an interrelated repertoire of instructional features. In the interest of brevity, key components of Gutstein's pedagogy are provided in Figure 1. In practice, these features are less distinctly categorical—social justice projects and reform-oriented curriculum support and help to define one another. Gutstein emphasizes that mathematically rich curriculum and instruction are essential for social justice teaching. However—like other critical educators (e.g., Cochran-Smith, 2004)—he asserts that social justice teaching involves instructional features beyond those typically recognized as essential to supportive learning environments. Thus, Gutstein drives both mathematical and social inquiry with a *pedagogy of questioning* modeled on Freirean problem posing (2007). Gutstein prompts students to raise meaningful social questions and to develop ways to use mathematics to explore them. For example, Gutstein's students used mortgage rejection-rate data to explore the

question of whether racism was or was not a factor in loan rejections (2006, pp. 57–61). The mortgage project exemplifies Gutstein's other projects. It was relevant in his specific context; it addressed atypical topics for a mathematics class—namely racism; it used quantitative data to reveal discrepancies and open the door for further inquiry; it provided a springboard for discussion of the roots of injustice; and it helped students connect their experiences to those of others. Moreover, in this and other projects, Gutstein helped students develop their capacity to make and support sociopolitical arguments with mathematics (pp. 132–133). They did well by standard measures of mathematics learning and showed social agency by asking questions and being willing to critique other's claims.

Critical response to Gutstein's approach. Gutstein's approach raises questions for critical mathematics educators. Brantlinger (2007) questions whether the trade-off between gaining political knowledge through real-world projects and gaining academic knowledge as traditionally defined may be too high (pp. 366–369). Taking another perspective, Nolan (2009) argues that Gutstein's focus on social justice curricula underemphasizes the complicity of mathematics itself as an oppressive social construction (p. 211). For Nolan, social justice teaching should help students see mathematics not only as a tool for understanding and influence but also as a construct that can obfuscate and unduly influence.

In response to these concerns, it may be argued that Gutstein avoids the easy separation of academic and social justice mathematics that Brantlinger supposes by presenting these as dialectically related. That is, students necessarily bring their life experiences, identities, and cultures with them to academic study. Students from marginalized perspectives are no exception. For them, academic study of mathematics necessarily involves political considerations. In addition, Gutstein's stance addresses Nolan's suggested terrain. For example, his pedagogy of questioning provides students permission and opportunity to question the discipline.

Given the current pressure on educational researchers to frame research questions and to report research results in terms of simple binaries such as "what works" and "what doesn't work," there is a danger that concerns such as Brantlinger's and Nolan's may be understood as definitive statements about whether or not the use of social justice curriculum is best for marginalized students, or whose teaching—Gutstein's or Brantlinger's or Nolan's—is the correct way to approach teaching mathematics for social justice. Given the situated and contingent nature of the contexts in these and other potential examples, such simplistic conclusions would be unwise.

TENSIONS AND DILEMMAS OF PRACTICE

Researchers have argued that teaching dilemmas provide both a context for knowledge creation and a means of articulating the dialectical relationship between theory and practice. Adler (2001) describes teaching dilemmas as contradictions in practice with which teachers must continually struggle. She asserts that the teaching dilemma, "at once practical, personal, and contextual," captures well the

complexities of teaching (p. 56). Furthermore, she argues that the language of dilemmas helps make teaching concrete without reducing its complexity, and thus provides fertile terrain for developing more nuanced understanding of teaching (pp. 55–56).

Other researchers—who, like Adler, are concerned with equity—have focused their inquiry on tensions and dilemmas. Pollock (2004) highlighted dilemmas inherent in race talk at one school. She describes how both not talking about race and talking about race using "de-raced" language were obstacles to reducing racism. Similarly, Gutiérrez (2009) presented the tensions of being *in charge/not in charge* of the classroom, *knowing/not knowing students*, and *teaching/not teaching* mathematics as essential to teaching from an equity stance. For both of these researchers, tolerating ambiguity and embracing uncertainty are requirements for insight.

Within Gutstein (2006), one can identify three dilemmas in his practice: whether a pedagogy of questioning *leads/does not lead* to relativism, whether to *reveal/not reveal* his views to students, and whether mathematics was *sufficient/insufficient* to address complex social questions. A fourth inherent tension is that Gutstein's identity as a white educator *limits/does not limit* his capacity for helping students develop their social and cultural identities. If we consider these not as problems to be solved, but as inevitable tensions of practice necessarily negotiated differently in different contexts, they provide practitioners with both language for discussing similar tensions in other contexts and permission to move forward with social justice teaching—expecting the tensions to be negotiated differently in their own practice. As a result, identifying dilemmas can open space for richer dialogue.

Take, for example, Gutstein's dilemma of revealing his political views or remaining relatively silent to allow students to develop their own views. Honest and respectful inquiry cannot exist if teachers are unwilling to put forth their own ideas. And yet, Gutstein acknowledges the potential of teacher voice to limit student voice, especially when students' prior experiences with schooling position the teacher as sole expert. Given this dilemma, the productive question for those trying to understand social justice teaching is not whether Gutstein should share or not share his views, but rather, what happens when he does so in his context.

Recognition of this dilemma offers a third more complex yet fluid alternative to revealing or not revealing—the understanding that one's views will both inhibit and support students' own capacity for reflection and action. Thus, teachers may avoid the misconception that such problems have simple or definite solutions that can be transferred statically between contexts. The dilemma frame has the potential to help teachers begin from a position of deeper understanding. As Allman (2001) writes, "Relational thinking does not replace categorical thinking, but it does open up the possibility of the development of more complex and accurate understandings" (p. 63). If students are to develop agency—mathematical or social—teachers concerned with social justice must engage the dilemmas of their contingent practice. Research that attends to this negotiation provides both a record of and language of possibility for this work.

RESEARCH QUESTIONS

In the larger study within which this research was conducted, I examined the practice of 2 middle school and 2 high school mathematics teachers. This article reports specifically on the practice of 1 of those teachers, Ms. Myles. Guiding questions for this case are:

1. What is Ms. Myles's conception of teaching mathematics for social justice, and what does this look like in her practice?
2. What tensions and dilemmas complicate Ms. Myles's efforts to teach mathematics for social justice, and how does she negotiate them?

STANCE AND METHOD

Like many U.S. teachers, I am a white, English-speaking, middle-class woman. Before conducting this research, I taught mathematics for 15 years, predominantly to marginalized students. During this time, I began to consider the limits of my individual practice in terms of both meeting the vision of mathematics for all put forth by the National Council of Teachers of Mathematics (2000) and also addressing the realities of my students' lives. I came to recognize that my privilege as a white, university-educated woman both positioned me differently in society from how my students were positioned and, in many ways, blinded me to their perspectives on mathematics and mathematics education. I realized that even if my low-income students of color were to follow paths similar to my own (i.e., taking advanced mathematics courses in high school, attending college, choosing mathematics-focused careers), their experiences would be very different. Although I had good relationships with my students, my knowledge of their lives and goals was limited. To be a more effective teacher, I needed to better understand students' experiences and how my teaching might support them both individually and collectively.

This reflection, in combination with my belief in the importance of social activism, led me to seek research contexts that acknowledged the need for transformative social change (Allman, 2001) and that encouraged educators to work together to support marginalized students. Hence, I was drawn to mathematics education research from a critical perspective. For me, the critical mathematics literature provides a language and structure for engaging mathematics education as social process—affected by and having an effect upon inequitable race and class relations. At the same time, as a former public school teacher, I am concerned with capturing and understanding classroom practice in all its complexity. This study addresses both sets of goals.

I used the case study method in this research (Stake, 1995). The larger study examines equitable mathematics teacher practice in an urban secondary school. Reported here is the case of the practice of one of these teachers. Case study allows inquiry into such real-life phenomena "when boundaries between the phenomenon and context are not clear, and when it is desirable to use multiple sources of evidence" (Schwandt, 2001, p. 23). According to Schwandt, case study methods

focus attention on the case rather than on variables. Thus, case study is more appropriate for exploring concepts necessarily defined in social and historical contexts, such as *equitable practice* and *social justice teaching*. By identifying tensions and dilemmas in the particular practice of a teacher trying to teach mathematics for social justice, I hope to provide insight for others with similar goals.

Over the larger study, because I wanted to support teachers and because learning requires social interaction, I was a participant–observer (Bogdan & Bilken, 2003). This facilitated my understanding of the case and allowed me to use my content and pedagogical knowledge to support teachers—if only in small ways. For example, I located resources, led small-group activities, and chaperoned field trips. My actions aligned with an expectation, expressed by an administrator early on, that visitors be active participants in the educational environment.

I collected data in Ms. Myles's class from February 2007 until February 2008. Primary data include field notes (FN) from 120 hours of observation; 92% of these hours occurred from February to May 2007. I observed over 90 periods of mathematics instruction. In addition, I observed over 30 read-aloud, reading, and advisory periods because I wanted to see what Ms. Myles's teaching was like in her nonmathematics classes. I visited Ms. Myles's class 2–3 days per week, primarily as an observer, but I also engaged students in mathematics discussions and assisted with tasks such as the collection of materials. I occasionally tutored students after school. In field notes I recorded classroom observations, paraphrased dialogue, and descriptions of mathematics activities. I also recorded my in-the-moment thoughts, questions, and notes on conversations with students or Ms. Myles that occurred between classes, at lunch, after school, and during field trips. In the fall of 2007, I returned briefly to Ms. Myles's classroom to observe 10 more hours of instruction, primarily to support, or call into question, initial findings.

Other primary data are handouts collected in Ms. Myles's classes, as well as an 80-minute initial and a 60-minute final interview with Ms. Myles. Interviews were audiotaped and transcribed. Focal Teacher Interview 1 (FTI1) occurred in March of 2007 and served as a baseline for understanding the background and motivations of this teacher, her participation in the school's creation, how she views the school's mission and goals, and how she views her mathematics teaching in relation to these. Focal Teacher Interview 2 (FTI2) occurred in February of 2008. In that interview, Ms. Myles responded to questions about the Equity Principle (NCTM, 2000). She also responded to questions that arose during data collection and early analysis.

Secondary data include a proposal for the school's creation coauthored by Ms. Myles; state report cards; school vision and mission statements; and the transcript of a focus group (FG1) I held with 9 of Ms. Myles's students in May 2007. The focus group addressed students' views of mathematics and their perceptions of mathematics instruction at Beals.

As is typical for qualitative research, data analysis was recursive and began as field notes were collected (Schwandt, 2001, p. 6). I processed my field notes daily—clarifying them, adding detail, and posing questions. Each week, I reviewed the research questions in relation to the data collected thus far, adjusting my focus as

necessary. Before the first interview, I adapted a general protocol, tailoring questions to Ms. Myles's background and roles and adding questions that arose after early observations. I similarly adapted the protocol for FTI2 prior to the final interview.

In June 2007, I began analysis of existing field notes and FTI1. I coded the field notes using preexisting categories.[6] For example, the code *Power* represented instances in which Ms. Myles made power relationships transparent to students. With each pass through the data, I expanded, collapsed, and added codes, as needed, to characterize Ms. Myles's practice (Miles & Huberman, 1994). For instance, I expanded *Power* to *P-context*, *P-gain*, and *P-resist* to differentiate instances when Ms. Myles directed attention to (a) contexts involving inequitable relations, (b) strategies for gaining social power, and (c) ways to resist inequitable relations.

As new codes were generated, I added descriptive characteristics as appropriate. For example, when the *Quality Mathematics* code was expanded to *QM-process* to specify instances in the transcript involving teacher support for mathematical processes, I generated a list of related characteristics that I would expect to see in an equitable classroom.[7] I coded excerpts in which one or more of the characteristics were present as *high* QM-process. Excerpts in which none of the characteristics were present or where the enacted emphasis worked against a characteristic were coded as *not high* QM-process. It was possible for an excerpt to be coded as both high quality and not high quality with respect to different characteristics.

After the first interview, I generated codes from the transcript by identifying passages of interest and then organizing those into common themes. I made several passes through the data, refining codes with each pass. As the study progressed, I used the same methods to process additional field notes and FTI2. I then began secondary data analysis.

To identify tensions and dilemmas, I entered information from the coded field notes into a spreadsheet to facilitate sorting and grouping (see Table 1). I sorted excerpts by code, looking for patterns and exceptions. For example, with respect to the QM-process code, I compared situations in which students' strategies were validated with situations in which student strategies were ignored or dismissed. Based on the context, I judged whether discrepancies were anomalies or instances of a pattern of similar circumstances associated with contradictory teaching moves that represented a tension of practice. I repeated this process with each code.

I also repeated this process across categories with potential for contradiction. For instance, I compared field notes coded as pedagogy supporting "individual responsibility" with examples coded as support for "community building." I then turned to the themes of FTI1 and FTI2 to decide whether Ms. Myles's perspectives and goals resonated with or were at odds with the interpretation of the tensions and

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6 I used five categories of codes representing different dimensions of equitable mathematics practice: quality mathematics, student identity, pedagogy, power, and student agency. These were developed from dimensions proposed by Gutiérrez (2007) and key components of Gutstein's social justice mathematics pedagogy (Figure 1).

7 These include validating student strategies; allowing for problems with multiple solutions; urging multiple approaches; requiring justification; helping students identify and use pattern, organization, and structure; and maintaining the complexity of tasks with higher cognitive demands.

Table 1
Field Notes Spreadsheet Sample Entries

Code	Page	Comments and partial quotes
QM comp	4	Building formulas quiz 1, algebra patterns, next-current formula.
QM comp	14	(NOT) area of a parallelogram, "I will show you all the ways you can do it"/draws pictures with altitudes to various sides drawn in for each, all have 90º mark clearly shown, altitude shown as dotted line.
QM comp	112	Plain and iced cookies, writing an inequality to match a story.
QM comp	124	Immokalee problem set, survey.
QM comp	133	Opener, "Is there a relationship between height and arm span? How would we find out?"
P all	94	(NOT) Boys calling out, girls silent.
P all	108	"I know lots of you know, but I am not sure (choral response) is helping us all. Let's keep it to yourself so that those who need more time . . ."
P ind resp	93	"If you don't have it, I am not chasing after you." "It is not hope-less for anyone." "It is within you, the capacity to pass math."
P ind resp	109	"I don't want to be the police, I want to help the people."
SA c act	79	Teacher pushes students to work on finalizing survey for the crimi-nalization of youth project.
SA c act	120	Immokalee workers project, protest, letter writing campaign.
SA c build	11	Students allowed to explore without adults for part of the [local] Museum trip, discussion of trust and responsibility to school/group/each other.
SA c build	11	Advisory, students who stay ed behind discussed talk with Dean/explained why teachers were being hard on them/KM said all could do it, everyone capable/Class made a pledge that they would make sure all would make at least a C in mathematics the second semester.

Note. QM comp = quality math complex; P all = pedagogy all participate; P ind resp = pedagogy individual responsibility; SA c act = social agency collective action; SA c build = social agency community building.

dilemmas of her practice that I was developing.

The following sections briefly describe Beals School and Ms. Myles's background. Subsequent discussion focuses in greater detail on two salient tensions of Ms. Myles's practice with respect to teaching mathematics for social justice and how she negotiated them. I discuss these findings and the implications of this research for teachers and teacher educators.

BEALS COMMUNITY SCHOOL

Beals School is located in Hampton Park, a neighborhood with a rich history of progressive activism.[8] Opened during the past decade as a result of organizing by

local educator–activists, Beals is a public, open enrollment, college preparatory school (grades 6–12), with a social justice vision and mission. The school's existence reflects the power of "ordinary people organized to make a change" (Ms. Myles, FN, p. 69) and is but a recent example of a local legacy of both youth and adults acting together to improve education.

Beals's student body is diverse and includes recent immigrants from Africa, Asia, and Latin America. Overwhelmingly, Beals serves students typically marginalized in U.S. society: students from low-income families, students of color, and English-language learners. Demographic information for Beals during the study is given in Table 2. Class size is typically small ($n \leq 22$). Each grade level has approximately 85 students. Mathematics classes are 54 minutes long. Students are not tracked.

Middle grades teachers work in interdisciplinary teams, one team per grade. Integrated units on topics such as violence and the criminalization of youth, civil rights, and labor movements are a regular part of instruction—though not necessarily in mathematics classes. The middle school uses *Mathematics in Context* (*MiC*), and the high school uses *Integrated Mathematics Program* (*IMP*). Middle grades students engage in 10 extra minutes of mathematics each morning, and there is an additional weekly period dedicated to mathematics problem solving.

KATHERINE MYLES

Eighth-grade teacher Katherine Myles was chosen as a focal teacher because of her extensive experience with community organizing in Hampton Park, her

Table 2
Student Demographic Data

			Racial/Ethnic background						Other information		
Year	Enrollment	A/PI	B	H	MR/E	NA	W	LEP	LI	M
2006–2007	433	4.6	71.6	19.6	2.1	0.2	1.8	8.1	98.8	25.7
2007–2008	556	3.8	74.1	16.2	3.2	0.2	2.5	4.5	91.2	32.2

Note. A/PI = Asian/Pacific Islander; B = Black; H = Hispanic; MR/E = Multiracial/Ethnic;
NA = Native American; W = White. LEP = Limited English Proficiency Rate; LI = Low-Income Rate; M = Mobility Rate. Categories and data in this table come from annual State Report Cards.

[8]Gentrification, the exclusion of low-income residents, and the demonization of youth of color by white property owners has been a subtext for conflict in this neighborhood for decades.

involvement in the creation of Beals, her commitment to the school's social justice mission, and her leadership role among the mathematics teachers. Ms. Myles is a white woman who has lived in Hampton Park for over 30 years. Her children attended neighborhood schools. Over the years, she has been involved with local schools as both a parent and an advocate. For example, she has served as a parent, a community representative, and a teacher representative to advisory committees for neighborhood schools. She was part of a team—at the underperforming school closed to make room for Beals—who collaborated to improve student achievement. At Beals, she has played a key role in maintaining achievement by standard measures. Under No Child Left Behind regulations, Beals's mathematics students made Adequate Yearly Progress in each of its first 3 years.

Ms. Myles has a bachelor's degree in biology and earned her teacher certification through an alternative master's program at a city college. At the start of the study, she had been teaching for 12 years. Prior to Beals, Ms. Myles taught at a local elementary school and then at the middle school that was disbanded upon the creation of Beals. Reflecting on her background, she notes,

> I think a lot of who I am comes from Hampton Park. I didn't do all this in college. And, I hadn't lived in cities, you know in very ingegrated situations, or seen very many lower income people. I didn't know those issues. (FTI 2, p. 9)

Her path to teaching was an extention of her community-organizing and activist work. For example, Ms. Myles was involved in an anti-lead campaign in which activitsts educated themselves and others about the dangers of lead to children's health. The group pushed officials to acknowledge and address the prevalence of lead-based paint in local rental housing and the resulting high levels of lead in children's blood. Ms. Myles has also participated in directly addressing local education problems. To combat the effects of schools that were not serving students well, organizers created after-school and summer programs for neighborhood youth. In this environment, Ms. Myles gained experience with approaches to social justice pedagogy that she has continued to develop over her career.

Although Ms. Myles acknowledges that not all Beals faculty share her vision of what it means to teach for social justice (FTI2, p. 5), she talks about how her team works to develop their collective capacity for social justice teaching. One support for this is an inquiry group of Beals teachers and other local educators. Ms. Myles describes the group as "a core of people who have spent some time really thinking about what is social justice" (FTI2, p. 4). Thus, the group fosters shared understandings of teaching for social justice. Ms. Myles contrasts the group's view of social justice teaching with that of others who may think "social justice just mean[s] equity, fairness, being nice to my students, respecting them" (FTI2, p. 5). She broadly characterizes the inquiry group's definition of *social justice teaching* as "teaching in a manner that puts our students in the leadership of the fight against oppression in the long term." This definition includes the positive presuppositions that marginalized students not only are capable of leading but also that social justice requires their leadership. Moreover, in contrasting equity and fairness with "the

fight against oppression in the long term," Ms. Myles distinguishes between a view of social justice limited to relational equity (Boaler, 2008) and social justice as an ongoing struggle directly related to inequitable power.

Ms. Myles has experience with reform-oriented curricula and supports reform goals. She describes how her teaching is different from her own mathematics education:

> I just memorized rules, but now I emphasize constantly that fractions, decimals, and percents are different names for the same thing. You can go from one to the other. You decide which is most useful for the problem you are trying to solve. (FTI2, p. 20)

She says the reform-oriented curricula convey this well and require teachers to help students "discover algorithms or principles and not just tell them and drill them afterward. Because clearly that hasn't worked. You end up teaching kids the same thing year in and year out because kids don't remember from year to year" (FTI1, pp. 16–17).

As the member of the Beals design team with the most mathematics experience, she was instrumental in the choice of *MiC* as the middle school curriculum and *IMP* as the high school curriculum. She is very familiar with Gutstein's efforts and knows him personally. Ms. Myles sought Gutstein's advice on the *MiC* curriculum, they share resources, and they continue to work together in an Inquiry to Action Group (ItAG) around integrating mathematics education and social justice.[9]

Based on this familiarity, Ms. Myles notes that Gutstein's context—both in his earlier work (e.g., 2006) and in his current work with another local social justice high school—is different from her own. For example, in the earlier work, Gutstein taught Latina/o students in both general track and honors classes, whereas her classes have a majority of African American students and are not tracked. Ms. Myles also works relatively alone in her daily practice, whereas university-based social justice educators have access to a number of resources and supports not available to her, including graduate students' assistance (K. Myles, personal communication, July 25, 2010). Moreover, Ms. Myles's position as a full-time middle grades teacher involves elements of practice not yet considered in the literature. For example, she not only teaches mathematics, but she and her teammates each teach one period of reading and a shorter advisory/read-aloud period every day. This structure, along with practices such as interdisciplinary units, not only aligns with conventional norms for successful middle-school teaching (National Middle School Association, 2003) but also allows Ms. Myles to distribute her social justice teaching across the instructional day and to share the responsibility of social justice teaching with team colleagues. At the same time, she notes, planning for multiple subjects and collaborating with colleagues across subject areas takes significant time.

From the first week of observation and throughout that semester, Ms. Myles raised justice issues in her reading and advisory periods, and to a lesser extent in her mathematics classes. Figure 2 shows the multiple entry points for social justice

[9]This group is a subgroup of the aforementioned local teachers-for-social-justice group.

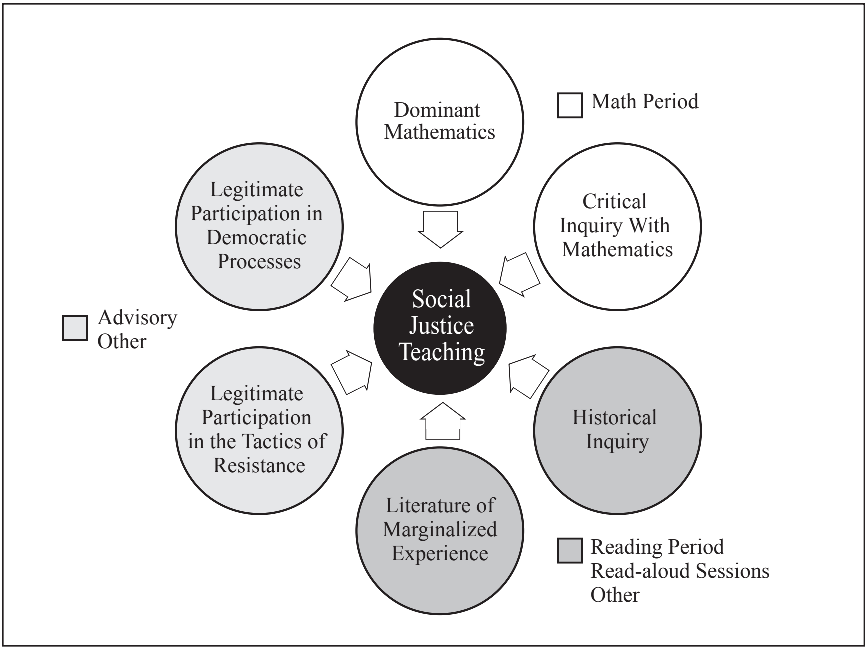

Figure 2. Entry points for social justice teaching in Ms. Myles's practice.

topics in Ms. Myles's practice. Entry points were distributed throughout the instructional day, with some types of activities occurring more regularly at certain times. Involving students as legitimate participants (Lave & Wenger, 1991) in democratic processes, or in developing strategies for resisting unjust treatment—such as clarifying rights with the police—typically took place during advisory or during special activities (e.g., assemblies, field trips). Exploring the literature and history of marginalized experience typically took place during the reading period or during special activities. Mathematizing social justice situations generally took place in mathematics class.

Ms. Myles comes to her practice with rich experience in working for justice and knowledge about both social justice and mathematics education drawn from her experience as an educator in an activist community and from the literature. This experience, her students, and her context uniquely shape both her goals for teaching and her enacted practice. The next section presents examples of that practice drawn from field notes. I then discuss two of the most salient tensions of Ms. Myles's practice: the problem of dominant mathematics as *necessity*/*obstacle* to social justice and the challenge of fostering student *independence*/*interdependence* necessary for social justice. Each of these is paired with discussion of how Ms. Myles negotiated that tension in her eighth-grade classes over the course of the study.

MS. MYLES'S MATHEMATICS PRACTICE

The following classroom excerpts provide glimpses into Ms. Myles's teaching. These events occurred during a data analysis unit that she taught in May 2007 [FN, pp. 171–204]. The curriculum is *Mathematics in Context: Insights into Data* (Encyclopaedia Britannica, 2006). Although these excerpts are generally representative of the lesson structure, dialogue, and approach to content and process seen in Ms. Myles's teaching, they were also chosen because they offer examples for subsequent discussion. To provide a richer sample of dialogue in limited space, excerpts occasionally include snippets from more than one class on the same day.

The first excerpt (E1) involves discussion of an opener Ms. Myles created to set the stage for a modeling activity and to assess understanding of key vocabulary from the previous lesson: *sample*, *bias*, *population*, and *random*. Ms. Myles typically begins class with an opener. Students respond in mathematics notebooks. Students sit in threes or fours at round tables. They choose their own seats and are permitted to work together. The following problem is displayed:

[The local television station] wants to find out who is favored for president. They mail a survey to all [local daily newspaper] subscribers, and 1,875 mail it back. Obama is the overwhelming favorite.

1 *Ms. Myles*:	Why is this survey biased?
2 *Deon*:	Some people have no mailbox.
3 *Ms. Myles*:	Let's try something less obscure.
4 *Kevan*:	Some can't read.
5 *Ms. Myles*:	Let's try something less silly. There are some pretty obvious reasons.
6 *Eddie*:	The sample size is too small.
7 *Ms. Myles*:	That could be a problem, but it doesn't have to be if the people you choose to survey are well chosen.
8 *Deon*:	Some people don't like Obama.
9 *Ms. Myles*:	That's not relevant.
10 *Tim*:	How many is it?
11 *Ms. Myles*:	Let's say it's a large enough sample. Guys, what do we mean by unbiased? Unbiased means an equal chance for all voters. Who are we leaving out?
12 *Raheem*:	People with no money.
13 *Tim*:	People who don't subscribe.
14 *Deon*:	People who are less involved with current events.
15 *Ms. Myles*:	He's our senator, our favorite son! [There is a lot of cross-talk.]
16 *Mia*:	Who's his father? [Referring to Ms. Myles's "favorite son" comment]
17 *Ms. Myles*:	That's just an expression.
18 *Kevan*:	He's black.
19 *Ms. Myles*:	Okay. There are a lot of black people in [our city], but less in the country as a whole. More black people live in urban areas and [our city] is the [*n*th] largest.
20 *Jamie*:	Some people can't pay for stamps or they don't care for junk mail.
21 *Ruby*:	What's the point of voting if your vote doesn't count anyway?

22 *Ms. Myles*: Why do you say that?

23 *Ruby*: I don't remember, but it was an adult that told me. [A student brings up two potential problems with voting systems. Ms. Myles verifies that the fairness of different voting systems is contested. She notes that in the Bush vs. Gore election, Gore won the popular vote, but Bush won the election.]

24 *Ms. Myles*: So you may be right for presidential elections, but for local offices your vote counts a lot. What would happen if people didn't vote for their interests? [Ms. Myles writes *alderman*, *advisory committee for neighborhood school*, and *mayor* on the board and then redirects the class to the day's activity—taking a random sampling of students who attend band camp.]

The second excerpt (E2) occurs later in the lesson. After telling students that they are going to simulate the band camp example on pages 12–14 of their textbook, discussion begins with a simpler example.

25 *Ms. Myles*: Anyone familiar with a random number generator?

26 *Jamie*: Lottery!

27 *Ms. Myles*: The lottery, a computer, a calculator, a table.

28 *Ms. Myles*: Let's think, if we want to start with the digits 0–9, how many is that?

29 *Jamie*: 10.

30 *Ms. Myles*: How could we generate random numbers from 0 to 9?

31 *Deon*: Pull from a bag.

32 *Ms. Myles*: So you could make a random sample by pulling from a bag? If you pulled 50 times, how many would be either 0 or 9?

33 *Jamie*: Two out of ten. [Ms. Myles writes this on the board.]

34 *Erica*: Ten over fifty.

35 *Ms. Myles*: Why?

36 *Sienna*: If you need 50, you could write that list five times.

37 *Ms. Myles*: If you need 50, you could write two tenths five times. Erica, how did you get it?

38 *Erica*: Same way.

39 *Ms. Myles*: How else could we get this?

40 *Deon*: Multiply by five fifths [Ms. Myles writes $2/10 \times 5/5 = 10/50$.]

41 *Ms. Myles*: [To the class] You should be taking notes.

42 *Brittany*: I wasn't here yesterday.

43 *Ms. Myles*: You can do this part without what we did yesterday. You have the same book as everyone else. [Students work in pairs to find the experimental probability that a 0 or 9 is chosen over 50 pulls. Brittany's head is leaning on the wall. Ms. Myles begins a low-volume discussion with her.]

44 *Ms. Myles*: You are blowing off stuff that is super easy. Don't you think this is easy? You can't count zeros and nines?

45 *Brittany*: [Loudly] I can count! But I don't get it after that!

46 *Ms. Myles*: But you've got to involve yourself. Just because you were absent yesterday is no excuse. [Ms. Myles moves on to whole-class discussion of the modeling results. Brittany argues with someone at her table and repeatedly interrupts the larger discussion.]

Excerpt three (E3) occurs several days later, prior to a lesson called Interpreting Data (pp. 22–30). The opener includes a scatterplot of arm span and height, with two questions: "Is there a relationship between *arm span* and *height*? How could you *tell*?" Ms. Myles asks students whether they remember investigating this relationship in earlier grades. She gives them time to respond to the prompt and initiates a guided discussion:

47 *Ms. Myles*: What if there was no relationship between height and arm span? What would that look like?

48 *Jonell*: All over. [Ms. Myles sketches an example and labels it "random/no pattern."]

49 *Ms. Myles*: Do you think taller people have longer arm spans? [Students say "yes," and Ms. Myles labels the original sketch "positive."]

50 *Ms. Myles*: Why should I care about this? [Students laugh.] Section C is called Interpreting Graphs. But I am going to call it Misleading Graphs. Imagine a company. Why would a company want to create a misleading graph?

51 *Austin*: To make money.

52 *Ms. Myles*: Who else might want to mislead us?

53 *Martell*: Bush!

54 *Ms. Myles*: Politicians. Good examples. Let me add another example, because I always like to bring it close to home. [Ms. Myles shifts to a topic discussed on previous occasions in her nonmathematics classes, the criminalization of youth.]

55 *Ms. Myles*: People who are okay with the criminalization of youth make a connection between turnstile jumping and bigger crimes. In this neighborhood, there are people so wedded to this idea that they get the police to watch turnstiles. [Ms. Myles attends community-policing meetings where such conversations occur.] They say there is a positive relationship like arm span and height. When people—basically rich people—complain, the police are pushed to listen. They build up the idea that students are going to be serious criminals because of small things.

56 *Ruby*: They should let us go there one day [to the neighborhood police meetings].

57 *Ms. Myles*: Exactly! That is what I am talking about. If we can gather data, we can show they don't have any data to prove this.

58 *Oscar*: What do those rich people's kids do?

59 *Ms. Myles*: The people who complain tend to have fewer children. They complain about you, but no one complains about their dogs—from the poop around you can tell that leash laws are not followed. I want you to understand that there is a problem with this kind of thinking. I want you to be able to defend yourself. Mathematical investigations can show us that these things are misguided or wrong. Even if there is a relationship, it doesn't mean one thing causes another. Because I don't have the data to look at yet, we are going to start exploring relationships with the book. [The lesson continues with discussion of various graphs that are misleading (e.g., the axes are scaled improperly, the origins are excluded, and 3-D pictures are used inappropriately).]

These excerpts are examined in greater detail in the following sections. However, it should be noted that Ms. Myles's intensity may be less apparent in these excerpts

than is typical. Typically, Ms. Myles's mathematics teaching has an urgency that is qualitatively different from her nonmathematics teaching. During mathematics class, she speaks quickly and moves through material rapidly. Instruction takes place from bell to bell. Her intensity is apparent to students:

Malik:	I actually pay attention more in math than I do in any class.
Jasmine:	Because Ms. Myles *is serious*!
Marta:	Because Ms. Myles talks too fast and if you just snatch a little bit, you are not going to get it [laughter]. (FG1, p. 17)

Ms. Myles also provides multiple supports such as tutoring, timely feedback, and acceptance of late assignments. She provides students her home phone number for homework assistance. When students struggle, she contacts guardians for support. Although none of this may seem particularly revolutionary, together these features reflect the responsibility she takes to provide students access to mathematics that they might not otherwise be expected to learn (FTI1, p. 9).

Although such features simply may be dismissed as good teaching (Secada, 1995), they are the very features that Ms. Myles recognizes as missing in local schools. Throughout the study, she confronts the social, structural, and political factors related to access and opportunity to learn mathematics. In conversations and the final interview, Ms. Myles reiterates the belief that local educators and those in positions of power at the city level—despite their rhetoric—have expected little from neighborhood students in mathematics classes (e.g., FTI1, p. 26).

> I don't think they care about the average child of color having any strength in mathematics, or in anything except to the extent they need to look diverse. I don't think they are looking at Hampton Park and saying, yeah, these are the leaders of the future, so we better teach them mathematics. (FTI1, p. 14)

Thus, features of "good teaching" are, for Ms. Myles, necessary for attending to social justice. At the same time, as argued earlier, examination of the most salient tensions and dilemmas of Ms. Myles's practice can provide a more nuanced view of that work.

Dominant Mathematics as a Necessity/Obstacle to Social Justice

The dilemma of dominant mathematics as both a *necessity for* social justice and an *obstacle to* social justice manifests itself in this study. For Ms. Myles—as for researchers in the existing critical mathematics literature—access to the dominant mathematics is a necessary precondition for social justice. However, in Ms. Myles's practice, this very need limits the time she has for helping students understand the possibilities for using mathematics "in a social justice way" (FTI1, p. 8). This dilemma emerges in two ways. The first involves the challenge of both preparing for the test (i.e., mathematics gatekeepers) and preparing for the future (i.e., meaningful use of mathematics). The second involves the challenge of linking mathematics and social justice topics appropriately amidst the complexity of practice.

Preparing for the test/preparing for the future. Ms. Myles describes her understanding of the relationship between mathematics and equity:

> Bob Moses said that algebra is the gatekeeper that keeps children of color and girls out of further math and therefore all the careers that are open to them. . . . I always feel that and feel part of my responsibility—and it *is social justice*—is to open that gate for them. (FTI1, p. 9)

Like Robert Moses, whom she references in both interviews, access to mathematics as a civil right resonates with Ms. Myles. For her, exposing all students to the mathematics necessary for navigating gatekeepers and providing all students with a conceptual foundation that will potentially allow them access to mathematics-intensive fields is social justice in and of itself. And yet, Ms. Myles also sees mathematics and social justice as related by more than an imperative to teach the dominant mathematics:

> We are a social justice school, so I really do want to be teaching about math in the service of how to make the world a better place. Frankly, flashing some stuff on the board about integers or graphing inequalities or what's the area of this polygon isn't that. (FTI1, pp. 2–3)

When Ms. Myles talks about Beals students, she acknowledges that although they attend a college preparatory school, not all of them will necessarily attend college or pursue careers that require significant mathematics. And yet she believes in mathematics educator Dorothy Strong's concept of bi-mathematics—"We are preparing you for the test and we are preparing you for your future" (FTI2, pp. 18–20). For an eighth-grade teacher in Ms. Myles's school system, "preparing for the test" literally means preparing students for standardized tests used both to evaluate Beals[10] and to determine whether students matriculate to eighth grade—even when those tests are inadequate indicators of mathematical understanding. And, because students in Ms. Myles's state must pass Algebra I to graduate from high school, preparing for the test also means preparing students for success in ninth-grade algebra. As Ms. Myles puts it, algebra is the most frequently failed class in high school: "I want my students to be so comfortable with mathematics as they leave eighth grade, that they all pass algebra. They may fail other classes, but they won't fail algebra" (K. Myles, personal communication, July 25, 2010). Simultaneously, for Ms. Myles, "preparing for the future" involves helping students learn mathematics with a level of understanding that expands their future possibilities—including their capacity to use mathematics as a tool for social justice.

The tension between these goals emerges as Ms. Myles wrestles with implementing a project around the criminalization of youth. In the initial interview, several weeks into the study, Ms. Myles describes the problem and its relevance:

> The police keep stopping our students . . . I am not going to say that they are all innocent, but a lot of them are being stopped doing innocent activities. If we gathered data

[10] Standardized tests are serious for Beals and may determine whether it continues to exist.

> . . . and analyzed their interactions with the police . . . we might be able to show something about youth being stopped unfairly. . . . It would be good to help the kids understand how data is used against them. [For instance], the whole *broken windows theory of crime* [emphasis added]—if you get a kid for breaking windows you are stopping him being a criminal later on [see Kelling & Coles, 1996]—that's not a valid use of correlation, or causation . . . but they act like it is. They'll make a big deal over kids jumping the turnstile. . . . Please don't tell me that [kids] are incipient rapists because they don't have two dollars. . . . You can't make that judgment. (FTI1, pp. 3–5)

At that time, Ms. Myles wants to investigate this question with her mathematics students, but is still working out details. She says, "I am anxious about what I am going to do in terms of these projects . . . because you have to gather data—and I don't have that kind of time" (FTI1, pp. 2–3). She is concerned about both planning time and class time such a project requires. Ms. Myles supports contextualized mathematics instruction, indicating that students learn more when mathematics is attached "to a story of some sort because, as humans, that is what we relate to, a story or a picture" (FTI1, p. 17). And yet she also expresses concern that, although her students are capable of engaging in significant mathematics and complex social justice issues/stories, introducing both at the same time may be a significant challenge for some (K. Myles, personal communication, July 25, 2010). Moreover, time devoted to social justice projects potentially leaves less time for explicitly addressing the range of topics on gatekeeper assessments.

Field notes indicate that Ms. Myles's concern over the time it takes to plan and implement a social justice mathematics project may be warranted. Using a modest example of a contextualized problem (E1, lines 11-20), Ms. Myles initiates a discussion she thinks will be straightforward. Although this contextualized example is far less complex than the project she wants to try, discussion reveals unanticipated confusion about different meanings of the word *bias*. Ms. Myles also discovers that the answer to the opener most obvious to her is not as apparent to students. And she finds that the problem sends some students in unanticipated directions—away from her mathematical goals. Such challenges are documented in the research literature (see, for example, Lubienski, 2000). To Ms. Myles's credit, she adjusts instruction in subsequent periods by, for example, frontloading discussion to access students' prior knowledge and by explicit discussion of the differences between the ways in which the word *bias* is used in everyday language and in mathematics. Nonetheless, this example illustrates challenges she is likely to encounter in a larger project with more complex goals.

Field notes provide another example of students' capacity for engagement in the type of rich, open-ended project that Ms. Myles hopes to pursue. In February 2006, the following discussion took place in Ms. Myles's advisory period. The period was being used to plan for a visit from a police commander—a visit intended to serve as background for the criminalization of youth project. As would be expected when students are developing new skills, helping them develop the capacity to lead was not straightforward. The class had difficulty quieting and focusing on the goal. After considerable wait time and several false starts, Ms. Myles suggested

a vote to determine whether students really wanted to do the project. A vote was taken with near unanimous support. The session continued as follows:

Ms. Myles: Earlier we talked about our rights.

Aaron: We studied our rights in the state constitution.

Ms. Myles: Do we know enough about our rights? Who wants to facilitate? [Ruby volunteers.]

Ruby: What should I write?

Ms. Myles: What rights do we want to know more about? [Ruby records the question on the board.] We are trying to generate ideas. Imagine yourself stopped. What do you want to know about your rights? Let me put it like this, have you heard about the gang loitering ordinance? [Ms. Myles explains the ordinance.]

Kenyatta: The police made me leave the corner in front of my house.

Ms. Myles: Who owns the corner? You have as much right to stand on it as the yuppies and their dogs.

Aaron: The police chased us when we were throwing snowballs outside the old-folks home.

Ms. Myles: Your story is a little different than Kenyatta's, as older people do get nervous when students are roughhousing. But the police can't just move you along for no reason. [Someone interrupts the discussion with a comment to Kenyatta, and an argument ensues. Ms. Myles waits and then proposes a way forward.]

Ms. Myles: Maybe someone has a suggestion of how to mediate [the argument]?

Ruby: Just tune her out! [The class quiets and Ms. Myles presses on.]

Ms. Myles: We have only one thing on the board—loitering ordinance. [Ms. Myles talks about community policing meetings and the types of requests high-income, predominately white, property owners make with regard to the regulation of neighborhood students of color. She again encourages students to pose questions for the police. Jasmine suggests a question and others follow.]

Jasmine: What can we say to the police?

Ms. Myles: Okay, write that down.

Kenyatta: Do we know what to do if the police follow you?

Derek: What to do if the police curse at us? (FN, pp. 29–31)

This exchange highlights differences between students' capacity for self-organization, relational equity (Boaler, 2008), productive discussion, and the level of those skills students will need to develop an effective inquiry project as a group. It is relevant for the mathematics projects Ms. Myles wants to do not only because students will need improved collaboration skills to handle the task but also because Ms. Myles has to weigh this need, and the time it will take to address, against the time she needs to plan and implement instruction that supports access to dominant mathematical gatekeepers.

Although it might be tempting, given the examples in this section, to focus on deficits in Ms. Myles's instruction or to assume that her students are not capable of the activities she would like them to do, such a focus would miss the more productive rationale for identification of Ms. Myles's dilemmas—to provide a fuller picture of the challenges of practice in this setting. In this context, although

preparing students for the test and preparing them for a rich mathematical future are not mutually exclusive, they are far from straightforward.

Mathy enough/too mathy. The necessity/obstacle dilemma emerges in a different way in this case. Referring again to the criminalization of youth project, Ms. Myles articulates another challenge—determining how to make the mathematics involved appropriate for her students. She elaborates, "The pitfall of a project like this is that you find out, wow, this is more complex than I thought, or the data isn't really there, or the data shows something, but not exactly what we need" (FTI1, pp. 4–5). Given limited time for open-ended inquiry, there is a legitimate concern that if students struggle too much with the mathematics, or the mathematics is too tedious, or the data available do not illuminate the problem, students may not develop a sense of mathematics as a powerful tool for social justice. Moreover, if the mathematics needed to explore the social justice problem is not mathematics that is emphasized on gatekeeping assessments, valuable time may be lost.

When Ms. Myles first describes the criminalization problem, she says she needs to make the investigation "mathy enough" (FTI1, p. 3). She clarifies that a project implemented during mathematics time needs not only to contain rich mathematical activity, but should also address the topics students will encounter on gatekeeper assessments (FN, p. 22). Later, when discussing whether she includes student-generated themes in her social justice projects, she indicates that she must weigh the mathematics in any project against the demands of the district and state. Hence, using student-generated themes makes it difficult to address the required mathematics topics.

> I can't run eighth grade math as [students] choose the topics and I figure out how to do all the math we need for the standardized test . . . I don't have sufficient background for that and that would take so much time I just don't know how I would ever do it. (FTI 1, p. 8)

This hesitancy to engage in projects "on the fly"—because they may either lead to mathematics that is too difficult for students, or because they lead to mathematics students can do, but not the mathematics in which state standards indicate students should engage—might again be attributed to deficits in teacher knowledge. However, such concerns are also quite legitimate in an environment in which gatekeepers are truly high stakes.

Ms. Myles also considers whether introducing mathematics is appropriate for a particular project—essentially asking whether a project can be "too mathy." In an early conversation about curriculum, Ms. Myles notes that her team deliberately chose to limit the *Who Built America?* unit to language arts and social studies classes. This was not because the topic is unrelated to mathematics, but rather because obvious kinds of mathematical activity for the unit—such as exploring U.S. Census data—were potentially tedious for students, might not further eighth-grade mathematics goals, and might dampen student enthusiasm for the unit or mathematics (FN, p. 31). This is not to say that creative activities for incorporating mathematics could not be developed, but rather, given the team resources, some topics made more sense than others.

The "too mathy" dimension of the necessity/obstacle dilemma emerges in another way. A few days before standardized testing, as she reviewed with students, Ms. Myles uncharacteristically took a tips-and-tricks approach to a topic she had yet to teach. She told students, "Here is the beautiful thing about parallel lines cut by a transversal—find the angles that look the same." She told the students not to worry about this type of problem (FN, p. 49). When I asked her to elaborate, she said that she wanted students to consider "that one thing briefly because that one thing is on the standardized test" (FTI1, p. 14). She went on to explain that the problem could be important as part of a richer exploration of Euclidean geometry—for example, once students reach high school—but the topic was, in a sense, more mathematical than could be sufficiently explored before testing.

Ms. Myles wants her students to make connections between mathematical ideas, to see the social justice relevance of those ideas, and to meet the expectations of dominantly sanctioned measures of achievement. Given that the imminent gatekeeper for Ms. Myles's students in this example is a predominantly multiple-choice test that only superficially addresses a wide range of skills, Ms. Myles again faces dilemmas. She wants her students both to learn the dominant mathematics with conceptual understanding and to develop a sense of how mathematics might be used as a tool for social justice. Time spent on a high-stakes assessment—that addresses neither of these goals—is certainly an obstacle to conceptual understanding. Moreover, because the topic of *lines crossed by transversals* may not be particularly relevant for her students, its inclusion in what Ms. Myles necessarily conveys as an important gatekeeper may widen the disconnect students experience between mathematics and social justice.

Negotiating the Necessity/Obstacle Tension

Ms. Myles negotiated the necessity/obstacle tension in various ways. Although she describes her role as preparing students to solve problems and think mathematically (FTI1, p. 20), interviews and observations indicate that she also spent time considering the gatekeepers and how best to help her students negotiate them. As standardized tests grew nearer, these data sources included discussion of test-taking strategies. Moreover, as in the parallel lines discussion, she made pragmatic and strategic decisions calculated to help her students. She told students how to think about the problem for the test, but she did not spend more time exploring the concept.

Another way that Ms. Myles engaged the necessity/obstacle dilemma was by identifying mathematics she considered both inherently important for access and useful for helping students to become leaders in the fight against oppression. The connections among fractions, decimals, and percents is one of these topics. The use and misuse of data to influence others is another. She worked—to the extent possible given her resources and time—to develop lessons around these topics. For example, students investigated the plight of low-wage farm workers in Immokalee, Florida (Appendix). This project made significant use of fractions, decimals, and percents. It used information from the Coalition of Immokalee Workers

(http://www.ciw-online.org) to help students understand the social context. Some students' personal experience with migrant farm work provided additional context. The project linked directly to immigration and labor issues that students had been studying all year in nonmathematics classes.

Students read fact sheets[11] and other online materials, and answered mathematics questions written by Ms. Myles—questions designed to reveal the discrepancy between what the workers earn and a fair wage (see the Appendix). The fact sheets provided a concrete example of the use of mathematics to support social justice arguments. In language arts classes, students wrote letters to the fast-food chain being targeted, advocating for an increase in workers' wages. During the project, representative Immokalee workers visited locally as part of a national tour. Some students and Ms. Myles were able to attend a rally for the workers. Just before students mailed their letters, the company agreed to the activists' demands—providing a powerful example of how collective organizing can improve social conditions.

In the Immokalee project, Ms. Myles distributed her social justice commitment among other subjects and divided the work with colleagues who share a similar social justice vision. The project was authentic and aligned with themes that the team had stressed throughout the year. Its design encouraged students to connect the personal and local with broader social justice concerns. Moreover, although the project certainly involved work for Ms. Myles, resources for the topic were relatively available. The campaign had a detailed website. The organizing tour generated press releases, news articles, and the opportunity to connect with others concerned with social justice. Ms. Myles's personal resources—for example, her experience with similar campaigns and work as a local activist—positioned her both to become aware of and to respond to the campaign.

Ms. Myles also used the project to help students understand how surveys can promote awareness. Before and after they investigated the problem, students answered surveys addressing their willingness to change spending patterns if that would translate to better working conditions. Ms. Myles shared this information in class. This experience was a potential scaffold to support student creation of surveys for the criminalization of youth project (FN, p. 123; Appendix).

Although the Immokalee project is the main way in which students in Ms. Myles's class used mathematics as a tool for social justice, throughout the study Ms. Myles helped them to recognize mathematics as connected to important issues in small ways (e.g., see E1). The criminalization question was discussed throughout the spring of 2007—predominantly in Ms. Myles's advisory period. However, as the graduation neared, it became clear that the investigation Ms. Myles envisioned would not happen. Rather than abandoning the topic altogether, in the final weeks of the year, Ms. Myles used the topic to generate student interest in interpreting data (see E3).

[11] An updated version of this fact sheet is available at http://www.ciw-online.org/101.html#facts.

Fostering Student Independence/Interdependence in Mathematics Class

In addition to the necessity/obstacle dilemma, the challenge of simultaneously fostering student independence and interdependence exists in this case. Both goals emerge as requirements for social justice. Both are needed for democratic organizing, and both are needed for students to access mathematics and to use mathematics as a tool in the struggle for justice. When Ms. Myles talks about organizing to make the world a better place, she conveys a sense of the importance of both the individual and the group—broadly, and with specific respect to her experience in democratic organizations (e.g., FN, pp. 187, 214). Organizing for social justice at the grassroots level requires common vision, collective capacity, and constant struggle. At the same time, tasks are divided and group members take responsibility for different aspects of the work.

Similarly with respect to mathematics, Ms. Myles's teaching emphasizes the need for self-discipline and personal responsibility. She encourages students to work hard and holds them individually accountable. She expects students to follow actively class discussions, to take notes, and to be able to communicate their strategies in writing and aloud (e.g., E2, lines 32–46). She assigns and grades a nontrivial homework assignment every night. Ms. Myles wants to provide scaffolds for students without doing the mathematical thinking for them.

> [Students] will *never* get an answer from me, really. I'll ask them more questions because I want *them* to figure it out. . . . I'd rather say, don't you remember diameter is twice radius? But, instead I'll say draw the picture, or isn't it in your notes. . . . I could have presented a brilliant lesson, wonderfully constructed so every piece is interrelated, but that's work I did. . . . [That] doesn't give them knowledge. They have to work. Me telling them the answer is me doing the work . . . they might move a little faster because I told them diameter is twice the radius, but they didn't actually learn anything from that. (FTI1, p. 30)

This description both decenters the teacher as expert and conveys a view of sense making as an individual activity.

Coexisting with her desire that students develop work habits for individual access to the dominant mathematics, Ms. Myles also acknowledges that having students work together is

> educational in and of itself . . . it gets kids excited, maybe someone else will explain it better . . . it's that process of discovering, except that you are discovering it in a group and if you have a weakness, maybe someone else doesn't have that weakness. (FTI1, p. 19)

Here, Ms. Myles refers both to the motivational and pedagogical benefits of group work. She notes that collective approaches provide richer learning opportunities than individual approaches—a view supported by mathematics education research (e.g., Treisman, 1992). Some of her students prefer to work alone:

Malik: I am really interested in it [mathematics] and I want to learn and stuff. I want to be able to like do the problem by myself.

Marta: I get mad at my group because they are asking me what to do, and I am like, I don't know, because I want to figure it out [myself]. . . . (FG1, pp. 15–17)

But Ms. Myles wants them to develop collective capacity. In the class excerpt below, Ms. Myles reminds students of the value of working together. Students have been working in pairs for several days on the famous locker problem [FN, pp. 319–320]:

Ms. Myles: Today we are finishing the locker problem. Has anyone found a good method?

Amina: We listed all the factors.

Ms. Myles: I haven't seen anyone else doing that. How will figuring out the factors help you to determine if a locker is open or closed? Someone else besides Amina or her partner? [Explanations are given as Ms. Myles takes notes on the board.]

Ms. Myles: See how much sense their method makes. That's a good method. If you are stuck right now, that might be a good method to use. Anyone else want to share his or her idea? [A number of groups report. Later, as students work, Ms. Myles guides a group of boys who have made little progress.]

Ms. Myles: You two have far too many people touching doors. Seriously, I suggest you find the factors of the numbers because this isn't working for you. If you work together, this won't take as long. Split it up. Somebody do the even numbers, somebody do the odd.

Despite Ms. Myles's suggestion, the boys she addresses work for a few minutes and then return to chatting about other things. They are among two or three groups that have not finished. Ms. Myles reinforces her expectation for the day—that students who have not finished before the discussion will not receive credit:

Ms. Myles: I know this is a long and sometimes frustrating problem. But I've given you a few days. You had the option to stay after school for help. It's crunch time, baby! [Laughter]

Because this lesson was early in the year, Ms. Myles was still in the process of helping students adjust to the norms for both individual and group work expected in her class. This activity was to be followed by an individual test the next day. Because of this test, time for fuller discussion of the implications of the locker problem was abbreviated. When Ms. Myles tells students it is "crunch time," her words reflect not only a desire to see students using time wisely, but also the time pressure that influences her teaching choices on a daily basis. Despite the fact that field notes indicate many groups had a rich understanding of the problem, for some students a lack of time for summative discussion may have diminished the value of taking time for group work. And yet Ms. Myles's decision to move on occurs within a larger school structure that makes it difficult to spend too much time on any one topic.

Allowing collaboration does not ensure engagement, nor does it teach students to work productively together. Ms. Myles acknowledges the challenge of motivating her open enrollment, untracked students on a regular basis to complete their work—individually or in groups. In FTI2, she asserts, "Wow, their work ethic is far removed from what is necessary if you are really trying to pursue anything other than 'I'll get by.' And some of them really aren't getting by, who surely could be" (FTI2, p. 7). Ms. Myles is aware that her high expectations alone do not motivate

all students. Even when students were interested in a topic, they sometimes struggled to work together productively. This was particularly true during the advisory periods dedicated to developing questions for the police commander's visit (FN, p. 29, 55). In these sessions, Ms. Myles worked to share responsibility for classroom leadership with students. And yet she found that lack of relational equity (Boaler, 2008) among the students prevented progress again and again, as did disruptive side conversations and irrelevant disagreements. Given the needs of her students and constraints such as limited time, Ms. Myles struggles to promote individual habits for success in mathematics classes and students' capacity to think for themselves, while simultaneously advocating interdependence. Too much attention to individual effort may keep them from developing either social agency or mathematical understanding, and yet, students must individually meet the challenge of mathematical gatekeepers. As Ms. Myles works to teach mathematics for social justice, she struggles to engage these contradictory goals.

Negotiating the Independence/Interdependence Tension

Ms. Myles negotiates the tension between promoting student independence and interdependence in small ways. As I have noted, Ms. Myles allowed students to work together regularly. And yet she addressed Marta's concern—that working in groups is not always easy or preferable—by allowing, but not requiring, group work on most formative activities and making summative assessments individual. Ms. Myles also negotiates the space between an individual and a collective focus with the frequent question "Does everyone have a way to do this?" (e.g., FN, p. 22). After several students have discussed their approaches, this question prompts students to monitor their own understanding. It positions students as experts on their own practice. At the same time, it implies that students may use different approaches but that everyone needs to have an effective approach as the class moves forward together. As noted previously, hearing a description of these teaching moves—without the benefit of context—one might dismiss them as simply the moves that any good teacher would be expected to make and not indicators of teaching mathematics for social justice. But, given Ms. Myles's long-term, critical goals and students' needs, such moves are steps in the direction she wants to go.

One instance in which Ms. Myles negotiates the independence/interdependence tension occurs in a discussion of how students might support each other's progress. During advisory period, Ms. Myles discusses grades with students. She assures them that each is capable of earning at least a "C" in mathematics for that quarter. She solicits students' advice about how the class might support struggling students. The class agrees to work together toward helping everyone pass and generates suggestions for ways to make this happen (FN, p. 11). This example reflects a theme of Ms. Myles's practice—that organized groups can work together to accomplish difficult tasks.

The Immokalee project represents this theme well and addresses the independence/interdependence tension. Throughout the project—in language arts classes

and in mathematics classes—students develop and use their individual skills both to investigate and to address a larger social problem. On one level, the problem helps students understand how their individual choices affect the wider and interdependent economic landscape. On another, it provides a concrete and very accessible example of organizing for justice.

Although it may seem that Ms. Myles resolves the independence/interdependence tension by striking a balance between, for example, individual work and group work, she engages the independence/interdependent tension differently at different times in her practice. As Ms. Myles helps students recognize their independence and collective agency, she also challenges liberal, individualist ideology.

DISCUSSION

This research seeks to understand Ms. Myles's conception of teaching mathematics for social justice and what that teaching looks like in her daily practice—a practice she must co-construct with her students (Cobb, Wood, Yackel, & McNeal, 1992) in a public education system that has become increasingly more regimented. High-stakes evaluation of mathematics learning under this structure reflects a transmission or "banking" model of education (Freire, 2000) that is at once ahistorical and disconnected from the lived realities of low-income youth of color. As mathematics teachers lose more control of class time to standardized testing, standardized test preparation, and "coverage" of "that one thing because it is on the test," teachers must struggle to teach for conceptual understanding—and simultaneously consider how one might mathematize social justice problems and teach students to explore them. As a teacher working for social justice, this is the challenge Ms. Myles has taken on.

This case study demonstrates that although Ms. Myles is a full-time teacher whose practice is developing organically from her own experience and context, her goals for social justice teaching and the instructional features she employs align with Gutstein's social justice mathematics teaching (Figure 1). During this study, Ms. Myles and her students did not engage in as many social justice projects as Gutstein addresses (2006), and the inquiry that did occur was not at the level of a *pedagogy of questioning*, as Gutstein described it. However, in her mathematics classes, Ms. Myles did engage with critical topics that were highly relevant to her students in both the Immokalee project and in discussions related to the criminalization of youth. With respect to the latter project, despite earlier struggles to implement the criminalization of youth project, in E3 (lines 47–59) Ms. Myles raises this topic again—even when she does not have the data she needs to proceed and even while she knows that if she had the data, it is likely too late for this class of students to explore the topic. In doing so, she not only uses an authentic local problem that draws on students' common experience to pique their interest, but she presents the possibility that students can address that problem. After the lesson moves to the text, students participate enthusiastically in the discussion—including even Brittany, who, at this point in the year, did not typically engage in mathematics class (e.g., E2, lines 41–46).

As we consider the skills and dispositions teachers need to teach mathematics for social justice, the willingness to talk openly with students about complex social problems that might be explored with mathematics is fundamental to a pedagogy of questioning, even when we do not have all the data or are not sure how to proceed. If we cannot frame compelling questions, it is not clear that we can help our students to do so. Moreover, without compelling questions, students will not have sufficient incentive to take on the admittedly demanding work of developing the mathematical fluency necessary both for moving past mathematical gatekeepers and for using mathematics as a tool in the struggle for a better world.

IMPLICATIONS FOR MATHEMATICS TEACHERS AND TEACHER EDUCATORS

This research illuminates the social justice teaching of one full-time mathematics teacher—a teacher with a critical stance towards education working in a social justice school. The research literature on equitable mathematics teaching emphasizes the need for mathematics pedagogy that prepares students for success in the existing educational system while simultaneously preparing them to question and ultimately change that system to make it more equitable (Gutiérrez, 2008). These somewhat contradictory goals are represented in Ms. Myles's practice in her conception of mathematics as a civil right—as providing all students the opportunity to learn or *access* mathematics—and her overarching social justice goal of putting students in the leadership of the fight against oppression over the long term—helping students develop social justice *influence*. As Ms. Myles's practice shows, doing both, under the conditions classroom teachers and marginalized students face, is a challenge—even for an experienced teacher and activist.

And yet, teachers interested in teaching mathematics for social justice should not be discouraged by the difficulty of the task. Although the endeavor is complex and uncertain, the existence of uncertainty should not prevent teachers from developing social justice goals for their mathematics instruction. Nor should it prevent them from working to implement them. Ms. Myles's practice invites teachers to consider how they help mathematics students develop leadership skills and skills for democratic organizing. Because of this research, teachers interested in teaching for social justice might evaluate or reevaluate resources on their own. For example, teachers may consider creating social justice inquiry groups for developing a common vision of social justice teaching appropriate to their setting.

The emphasis that Ms. Myles and her colleagues place on preparing students to fight oppression now and in the future provides perspective for those whose current ideas of social justice teaching are more short-term or prescriptive. Moreover, emphasis in this research on how Ms. Myles negotiates the tensions and dilemmas of her work prompts teachers to consider their own social justice teaching more fluidly. Teachers may ask whether the independence/interdependence or the necessity/obstacle dilemmas have meaning in their own practice. More importantly, Ms. Myles's negotiation of the tensions in her practice may spur teachers to consider

the tensions in their own work—not as obstacles, but as sites for growth.

Mathematics educators and researchers should consider the difficulty of teaching for social justice under real-world conditions and spend more time seeking sites where social justice mathematics teaching is developing organically. University-supported research on teaching mathematics for social justice has much to offer the field, but it is difficult for full-time teachers such as Ms. Myles to study their own practice. Mathematics educators must spend more time collaborating with teachers in their local contexts and do more to support research partnerships with classroom teachers interested in social justice.

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APPENDIX

Immokalee Workers Project Activities
(Created by Ms. Myles using facts and figures available at http://www.ciw-online.org.)

Immokalee Pre-Project Survey

1. We are reading *The Circuit* about the difficult life of farm worker families. Even now, in 2007, farm worker families live and work in bad conditions. What are you interested in learning about farm workers' lives and troubles? How concerned are you about their problems?
2. Most farm workers are immigrants and often don't speak English. How does that affect your interest in them or concern for their problems?
3. Many farm workers receive low pay because large fast food companies drive down the prices of the produce they pick. Would you be willing to pay more at McDonald's or Wendy's or Subway so that farm workers can make a decent wage? How much more?
4. What else should we at Beals do to help ensure that farm worker families have a decent life?

Justice for Immokalee Workers Math Activity

1. If a tomato picker can pick 125 thirty-two-pound buckets in a 10-hour work day, how many pounds do they pick an hour?
2. There are approximately 3 tomatoes in a pound. How many tomatoes do they pick a day? An hour? A minute?
3. If 15% of their time is spent carrying the buckets to the truck and back, then how many tomatoes have to be picked per minute? (How many minutes an hour are they working?)
4. Right now the workers get 40–45¢ per bucket picked. Find how much they make per pound for each price.
5. Because work is not regular and predictable, farm workers in Immokalee are at the site to report for work at 6 a.m., three hours before they start. If they pick for 10 hours and get paid $50, what do they make per hour if the wait time is counted also?
6. What do the farm workers make in a year if they work 5 days a week 50 weeks a year? Six days a week? Why is it unlikely that they would be able to work that many weeks?
7. Prices have risen 312% since 1978, yet wages for the Immokalee workers have not changed. If their wages had risen comparably what would they make per pound? Per bucket? Per day? Per year?

8. What is the minimum hourly wage needed to make a living wage in Immokalee? What about if you have 2 wage earners with 2 children?
9. How would a 1¢ per pound increase change their daily wages? What percent increase is that?
10. What will they make an hour with a 1¢ a pound increase? What will they make in a year?
11. The CEO of McDonald's makes $3,100,000 a year (not counting stock options). If he works the same number of hours as an Immokalee farm worker, what does he make per hour?

Immokalee Project Survey

Based on our study of the Immokalee workers' living conditions, would you be willing to pay more for a meal at your favorite fast food restaurant in order to give the farm workers a decent wage?

No	1¢ more	5¢ more	10¢ more	25¢ more	$1.00 more