

# Learning to Teach Mathematics for Social Justice: Negotiating Social Justice and Mathematical Goals

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This article describes teachers' collective work aimed at learning to teach mathematics for social justice. A situated, sociocultural perspective of learning guides this examination of teachers' negotiation of mathematical goals and social justice goals as they developed, implemented, and revised lessons for social justice. Teacher interviews, discussions, lessons, and written reflections were analyzed using grounded theory methodology, and teachers' conversations were examined concerning the relationship between mathematical goals and social justice goals. Analysis revealed that early tensions arose around balancing these goals, that teachers focused more attention on the social justice component, and that the instantiation of these goals in practice proved difficult. Variables that afford or constrain teachers' roles as social justice educators are discussed, and implications for teacher professional development are suggested.

*Key Words:* Professional development; Social and cultural issues; Social factors; Teacher education

Achieving equity in mathematics education is a fundamental challenge facing mathematics educators (NCTM, 2000). Education is intricately linked to economic, political, and social power structures in society that serve to perpetuate inequity in both schools and society (Apple, 1992; Kozol, 2005). Considering these structures in relation to education and the call for equity in mathematics education entails a shift from thinking about preparing students to live within the world, as it currently exists, to thinking about preparing students to restructure “those social systems . . . in order to remove barriers that women, minorities, and others experience” (Secada, 1989). Thus, mathematics education faces a two-fold imperative: to provide students with mathematics instruction that includes the mathematics deemed necessary for success in the current system while simultaneously

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providing students an opportunity to use mathematics to expose and confront obstacles to their success (Gutiérrez, 2002; Gutstein, 2003; Martin, 2003; Tate, 1994, 1995).

Teaching mathematics for social justice (TMSJ) can address both of these components. Mathematics teachers employing social justice pedagogies include mathematics-specific goals for their students (Frankenstein, 1990, 1997; Gutstein, 2006). Through the process of using mathematics to study and understand their world, students strengthen their knowledge of mathematics. Concurrently, students use mathematics to critically analyze their world to ultimately promote a democratic society in which all get an opportunity to participate fully (Frankenstein, 1995; Skovsmose, 1994). That is, mathematics is used to teach and learn about issues of social injustice and to support arguments and actions aimed at promoting equitable change.

Although research that documents TMSJ is limited, a growing number of researchers argue that this pedagogy can support the ongoing struggle for equity in mathematics education (Frankenstein, 1995; Gutstein, 2003; Skovsmose & Valero, 2002; Tate, 1995). Despite the potential TMSJ has for addressing issues of equity in mathematics education, little research exists that examines mathematics teachers learning to teach for social justice, a necessary step in beginning to understand the entailments of TMSJ. This study aims to address this deficiency and contribute to a knowledge base about learning to teach mathematics for social justice.

Specifically, this article reports on a study of eight secondary mathematics teachers who participated in a graduate course that engaged them in a version of “lesson study” (Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999) to create, implement, observe, revise, and reteach mathematics lessons that incorporated social justice goals. The research reported addresses the question of what teachers communicate about the relationship between and their negotiation of mathematical goals and social justice goals when learning to TMSJ. Throughout the article, I attempt to make explicit my mediating role as facilitator in teachers’ conversations and my position as a researcher in this context. I also conjecture about the knowledge and experiences teachers might need when learning to teach mathematics for social justice.

## RELATED RESEARCH

Multiple understandings of teaching for social justice exist and are an example of what Apple (1995) designates “sliding signifiers.” That is, what social justice teaching “actually means is struggled over, in the same way that concepts such as democracy are subject to different senses by different groups with sometimes radically different ideological and educational agendas” (Apple, 1995, p. 335). Varying goals, content, and audiences affect one’s conception of socially just teaching (Chubbuck & Zembylas, 2008) and different conceptions might limit approaches toward justice and equity (North, 2008). My conceptualization of TMSJ draws especially from the work of Paulo Freire (1970/1993), who conceived of a critical pedagogy aimed at creating a society in which humans actively transform their

society to make it better. This “pedagogy of the oppressed” must be “forged *with*, not *for*, the oppressed . . . in the incessant struggle to regain their humanity” (Freire, 1993, p. 30). The purpose of education is not to integrate those who are marginalized into the existing society but rather to change society so that all are included. Thus, education should help students analyze oppression and critique inequities, highlight how these issues connect to their lives, and engage them in challenging those inequitable structures.

### *Teaching Mathematics for Social Justice*

A small but growing number of researchers have begun to investigate teaching mathematics for social justice (e.g. Frankenstein, 1990, 1997; Gutstein, 2003, 2006, 2007; Skovsmose, 1994). Skovsmose (1994), for example, considers whether *mathemacy*, a “competence by means of which we become able to interpret and to understand features of our social reality” (p. 208), can be used for empowerment because it can be a means to organize and reorganize interpretations of social institutions, traditions, and proposals for political reforms. In his work, Skovsmose examined projects focused on mathematics, relevant to Danish students’ lives and related to important processes in society, to support students in achieving a greater awareness of the extent to which mathematics is involved in day-to-day life and to prepare them for democratic citizenship. One such project, *Economic Relationships in the World of a Child*, engaged students in analyzing their personal use of money, examining and critiquing a social program that awards money to families based on the number of children in a family, and designing a budget for a youth club. Skovsmose used each project to highlight particular aspects of critical mathematics education aimed at promoting social justice.

Similarly, Gutstein (2003, 2006, 2007) proposes a theoretical framework for social justice pedagogy that includes goals of students reading and writing the world with mathematics. He defines *reading the world* as using mathematics “to understand relations of power, resource inequities, and disparate opportunities between different social groups and to understand explicit discrimination based on race, class, gender, language, and other differences” (2003, p. 45). For example, students used mathematics to address whether there is evidence of racism in housing data. *Writing the world* entails “using mathematics to change the world,” which is a “developmental process, of beginning to see oneself capable of making change, and . . . developing a *sense of social agency*” (2006, p. 27). For example, students wrote essays and attended community meetings as they used mathematics to examine and confront gentrification in their neighborhood. Through his work, Gutstein (2006) has found that his students grew in their ability to understand complex aspects of society, in which “mathematics became a necessary and powerful analytical tool that students used to study their sociopolitical existence” (p. 70). Further, his data suggest that *Mathematics in Context* (National Center for Research in Mathematical Sciences Education & Freudenthal Institute, 1997–1998) supported students in learning mathematics with understanding and developing mathematical power (NCTM, 2000) and that his students grew in their views about

mathematics, seeing it “as useful in investigating the sociopolitical realities that shaped their lives” (Gutstein, 2006, p. 127).

### *Teaching Teachers to Teach for Social Justice*

Although virtually no research exists about in-service mathematics teachers learning to teach for social justice (Gates & Jorgensen, 2009), a significant amount of research does exist that addresses teachers learning to teach for social justice in teacher preparation programs and disciplines other than mathematics (Adams et al., 1997; Ayers, Hunt, & Quinn, 1998; Barton, 2003; Cochran-Smith, 1995a, 1995b, 1999, 2000; Darling-Hammond, French, & Garcia-Lopez, 2002). This research informed the design of the graduate course for this study and serves as a starting point for thinking about what it means to learn to teach mathematics for social justice.

Teaching for social justice is not a matter of method but a process requiring teachers to adapt to the particular context of which they and their students are a part (Cochran-Smith, 1999). Learning to teach for social justice will not “happen” in one graduate course; it is a “lifelong undertaking” and complex process requiring effort, perseverance, and reflection (Darling-Hammond, 2002, p. 201). It also requires teachers to see it as such (Gutiérrez, 2009). The design of this study holds in tension, then, examining how teachers learn to teach mathematics for social justice while recognizing that “how teachers learn” will necessarily evolve and change over time. The focus for this study is on practicing teachers’ initial engagement in this process, a first look at mathematics teachers’ negotiation of mathematical and social justice goals in their practice.

Four key factors that guide teachers in learning to teach for social justice, and which informed the design of the graduate course for this study, are drawn from Darling-Hammond’s (2002) theoretical model of equity pedagogy: *Self*, *Society*, *Students*, and *Schools*.

Teachers learning to teach for social justice need an understanding of themselves, both personally and in relation to others (*Self*). This includes reflecting on how their beliefs about teaching and learning are influenced by the cultural, historical, and economic contexts in which they grew up (Darling-Hammond, 2002), and trying to understand perspectives and experiences of others to reflect on how their personal biases may impact their teaching (Bell, Washington, Weinstein, & Love, 1997). Because teaching, learning, and schooling are linked to economic, political, and social power structures in society (Kozol, 2005), schools and classrooms are not neutral sites. Teachers learning to teach for social justice grapple with understanding how these power structures interact with their understanding of teaching and learning (*Society*) (Cochran-Smith, 1999).

Teachers learning to teach for social justice must also get to know their students well (*Students*). They must understand their students “in nonstereotypical ways while acknowledging and comprehending the ways in which culture and context influence their lives and learning” (Darling-Hammond, 2002, p. 209). Teaching for social justice involves making issues such as power, equity, racism, and classism explicit parts of the classroom (Cochran-Smith, 1999). Students have

a wide range of reactions to these issues, from excitement to anger to resistance and immobilization (Griffin, 1997). Knowing your students well includes anticipating the myriad responses students might have.

Finally, teachers learning to teach for social justice need to consider their evolving understanding of self, students, and the social contexts that affect learning and teaching so as to develop and enact classroom practices that support their students (*School*). It is here that teachers begin to develop social justice pedagogies that maintain connections with students and their social contexts while also building on students' existing knowledge to create new knowledge.

This study addresses the question of how mathematics teachers learning to teach for social justice negotiate the two goals of (a) mathematics and (b) social justice in their practice. Do they consider both simultaneously and attempt to achieve a balance, does one become more important than the other, or does the prioritizing of the goals change in different situations? The purpose of focusing on this negotiation is both to reaffirm the complexity, time, and introspection required for teaching mathematics for social justice and to underscore this negotiation as a necessary part of the initial and ongoing learning process. I move beyond simply describing what TMSJ looks like to examine how teachers initially understand it and make sense of it—how they struggle to think about and understand what they are doing as they learn to teach mathematics for social justice.

## METHOD

I offered all secondary mathematics teachers in my university's local school district the opportunity to enroll in a course on learning to teach mathematics for social justice and receive free graduate credit. Data for this study were obtained from eight secondary mathematics teachers enrolled in that 15-week graduate course. Seven of the eight teachers were employed as mathematics teachers in one of four comprehensive high schools in the Lakeview District,<sup>1</sup> a medium-sized district consisting of approximately 50 schools. The eighth teacher was a licensed science teacher employed as a full-time substitute teacher in the district, regularly substituting in mathematics classrooms. Like many other school districts in the United States, 90.9% of Lakeview's school professionals are White (source: Lakeview School District) and all the teachers in this study were White. Like other small Midwestern cities, the racial and ethnic demographics of the student population in the schools have changed in the past 15 years. All four high schools have experienced a growth in the percentage of enrolled African American and Latino/a students alongside a decline in the percentage of enrolled White students. Table 1 displays the ethnic demographics of the student population in the four high schools represented in this study.

To make the course available to the greatest number of teachers, the participants split into two groups, meeting on separate evenings. Of the four teachers in Group 1

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<sup>1</sup> All proper names of participants, schools, and the district are pseudonyms.

Table 1  
*Student Enrollment by Ethnicity and School (2003–2004)*

		Franklin	Montclair	Nelson	Xavier	Total
White	N	1260	1210	1496	1351	5317
	%	60.2	73.2	67.9	64.2	66.0
African American	N	453	227	315	283	1278
	%	21.9	14.1	14.6	13.2	15.9
Hispanic	N	145	114	150	220	629
	%	7	7.1	7	10.2	7.8
SE Asian	N	163	62	67	57	349
	%	7.8	3.8	3	2.7	4.3
Other Asian	N	65	24	159	177	425
	%	3.1	1.5	7.2	8.4	5.3
Native American	N	8	16	15	17	56
	%	0.4	1	0.7	0.8	0.7
Total		2094	1653	2202	2105	8054

(Pat, Gerry, Jamie, and Chris), three taught at the same high school and the fourth was the substitute teacher.<sup>2</sup> Two teachers in this group were female and two were male. The teaching experience across Group 1 teachers ranged from 4 to 17 years. The three mathematics teachers each had a bachelor's degree in mathematics and the science teacher has a bachelor's degree in biology, a doctorate in philosophy, and a Quantitative Reasoning score of 800 (out of 800). All four teachers in Group 2 were female (Holly, Roxy, Ann, and Dana), and they taught at three area high schools. The teaching experience across Group 2 teachers ranged from 6 to 16 years, and all four teachers had bachelor's degrees in mathematics.

#### *Experience With Equity and Mathematics for Social Justice*

All the participants in this study were simultaneously engaged in district-wide professional development on equity. One component of this professional development included examining and discussing the racial achievement gap statistics for their schools. Additionally, beginning with the year prior to this study, all the teachers participated in mandatory sessions titled *Courageous Conversations about Race* (Singleton & Linton, 2007) in which they explored concepts such as institutional racism and White privilege and how these intersect with teaching.

Two teachers, one from Group 1 and one from Group 2, had prior exposure to notions of TMSJ through involvement in a yearlong professional development

<sup>2</sup>Throughout this article, I am intentionally not listing certain teacher characteristics, such as years of teaching experience and school affiliation, and am using gender-neutral names, to protect anonymity.

seminar the year prior to this study focused on the equity principle in mathematics education (NCTM, 2000). The teachers read articles that described the central tenets of social justice pedagogy and how these tenets might play out in mathematics classrooms. They discussed their conceptions of teaching mathematics for social justice and engaged, as if middle school students, in Gutstein's (2005) mathematics lesson examining whether racism was a factor in mortgage lending. These two teachers said that they enrolled in the graduate course to engage explicitly with the ideas of mathematics for social justice to which this seminar had introduced them during the previous year. Additionally, one teacher from Group 1 had prior exposure to notions of social justice through teaching of courses (in a prior career as a university instructor) such as Legal Philosophy and Environmental Ethics.

To summarize, all four teachers in Group 1 were engaged in the district-wide equity initiative and two of the teachers had prior exposure to notions of teaching mathematics for social justice. The other two teachers in Group 1 had no prior exposure to teaching mathematics for social justice and stated that they enrolled in the course because they were concerned with how to "deal with the changing demographics of the student population" and because the course was a free opportunity to get graduate credit.

In Group 2, all four teachers were also engaged in the district-wide equity initiative, and one of the teachers had prior exposure to notions of teaching mathematics for social justice. Additionally, one teacher (different from the one with prior exposure to mathematics for social justice) functioned as a representative for her school's equity team, facilitating discussions on equity, and three were enrolled in a master's program at a local university in which they engaged in discussions of equity in education. Although the master's program mission statement does not focus explicitly on social justice, the undergraduate program does, so one might conjecture that faculty at this institution integrate a social justice focus into their graduate courses as well. Finally, all four described ongoing, substantive involvement (attending meetings and participating in formal and informal discussions) in equity initiatives at their school sites.

### *The Graduate Course*

I taught the graduate course that served as the focus for this study. This graduate course consisted of two main components. The central activity for the first part of the course was discussion and analysis of readings focused on teaching for social justice in general and teaching mathematics for social justice specifically. To situate their study of these readings in the activities of mathematics teaching, the group examined sample mathematics lessons and mathematics teaching cases. I provided verbal and written reflection prompts to guide our discussion and to facilitate teachers' formation of conceptions of teaching mathematics for social justice. Given that teachers were engaged in discussions about race and equity in their school settings, the course did not focus explicitly on supporting teachers in developing an understanding of themselves in relation to learning to teach mathematics for social justice (Self) or examining how the larger social, historical, and political

dynamics of teaching intersect with teaching mathematics for social justice (Society). Instead, this first stage focused on developing teachers' conceptions of what it might mean to teach mathematics for social justice, recognizing that teachers would still grapple with issues of self and social contexts as they engaged in these activities and discussions.

The central activity of each seminar in the second part of the course was teachers' collaborative work to design, implement, observe, and revise one mathematics lesson that incorporated social justice goals (School). This second phase of the graduate course was informed by research about lesson study, the principal form of teacher development in Japan. Lesson study is an inherently collaborative process. Teachers work together to design, implement and observe a lesson aimed at meeting a communal goal for student learning. Drawing from a broader knowledge base than that of one teacher creates increased opportunity for the lesson to provide a quality learning experience for students. Teachers continually interact about effective teaching methods and develop shared understanding of how to improve students' learning (Stigler & Hiebert, 1999; Takahashi & Yoshida, 2004). However, teachers engaged in lesson study in Japan traditionally teach at the same school, whereas that is not the case for the eight teachers in this study.

A primary focus of lesson study is the improvement of student learning. One aspect of lesson study that sustains this focus is its careful attention to anticipating students' responses (Fernandez, Cannon, & Chokshi, 2003). When designing a lesson, teachers must consider what knowledge students are likely to bring, what strategies students may use, and how students' knowledge connects to the various mathematical concepts. Anticipation of student responses is the first step in this process; observations and reflections provide further opportunity for teachers to examine the lesson for evidence of students' thinking and knowledge development. This detailed observation and reflection focused on student thinking enables teachers to develop an understanding of how students think about and learn from the tasks in which they engage and to determine what makes certain learning experiences effective for students (Fernandez et al., 2003).

Furthermore, lesson study focuses on promoting teacher self-reflection. "Rather than asking teachers to examine their practice with the premise that reflection leads to teacher growth, lesson study asks teachers to plan, implement, and refine lessons with the premise that this leads to reflection" (Fernandez & Yoshida, 2000). In the context of learning to teach mathematics for social justice, lesson study could support teachers not only in the development of mathematics lessons that incorporate social justice goals but also in collaborative reflection about what it means to be a mathematics teacher for social justice.

Although one course is not enough to develop mathematics pedagogy for social justice, a course combined with lesson study can potentially support teachers' initial development of this practice in thoughtful ways. The lesson study model aimed to offer to teachers a forum to go beyond simply describing what teaching mathematics for social justice looked like, and even beyond the development of mathematics lessons incorporating social justice goals, to struggle with and

understand what becoming a social justice mathematics educator might mean, situated within teachers' current, realistic contexts. I believed that lesson study's inherently collaborative process centered on teacher self-reflection and explicit discussion of anticipated student responses could support teachers' discussions of the often controversial and sensitive topics that might arise in thinking about teaching for social justice (Self). I also believed it could require teachers to recognize the multitude of ways, anticipated and not anticipated, that students might respond to the social justice goals of a lesson (Students) and, in doing so, it could require them to consider how issues of injustice are situated within larger structures and institutions (Society).

Specific to this study, both teacher groups collaboratively designed lessons reflecting their definitions of mathematics for social justice and with consideration of anticipated student responses. Teachers taught these lessons and observed one another during these teaching sessions. After each lesson implementation, teachers met immediately for a debriefing session of approximately one hour to discuss the lesson's effectiveness in terms of student learning of mathematics and social justice. Teachers then revised and retaught the lessons.

## ANALYSIS

I audio recorded all the interactions I had with teachers in the graduate course, in lesson implementation debriefing sessions, and in informal interactions. The data analyzed for this article consist of (a) 24 (12 for each group) graduate course and debriefing session meeting transcripts, (b) written teacher reflections, (c) all lesson plan artifacts, (d) teachers' final course papers reflecting on the lesson study process, and (e) pre- and post-seminar teacher interviews for each teacher.

### *Data Analysis*

Situated, sociocultural perspectives of teacher learning and professional development (Lave & Wenger, 1991; Putnam & Borko, 2000) guide these analyses. Sociocultural theories of teacher learning center on the concept of learning as situated social practice, which includes discourse, social interaction, and participation structures. That is, teachers are jointly engaged in mutual enterprise with a shared repertoire of actions, discourses, and tools (Wenger, 1999) and are influenced by interactions within various social communities. Particular to this study, teacher learning was gauged by looking at how teachers' conversations about teaching mathematics for social justice changed over time and by examining these ideas in practice.

I collected data during a single semester and analyzed the data systematically. I drew on grounded theory approaches (Glaser & Strauss, 1967; Strauss & Corbin, 1990), analyzing these data for recurring themes. In the analytic process, I made initial conjectures from the existing data record and then continually revisited and revised those hypotheses in subsequent analyses. Data analysis involved a constant comparison of all these data to ensure that the larger claims

made accurately reflected the evidence leading to those claims. The data were searched, looking for both confirming and disconfirming evidence that either supported or challenged a particular assertion (Erickson, 1986). When disconfirming evidence was found, the data was searched for additional instances and the results presented here include consideration of all such evidence.

During the semester, audio recordings from each meeting were transcribed and teachers' written reflections were collated. Afterward, I noted major themes appearing in the data. During several initial readings of the transcripts and written reflections, I broadly categorized the data with respect to my research questions. In particular, I categorized them as pertaining to (a) teachers' conceptions of teaching mathematics for social justice, (b) teachers' perceptions of social justice in relation to their students, (c) challenges teachers recognized that they faced in learning to teach mathematics for social justice, and (d) teachers' conversations pertaining to the relationship between the mathematics goals and social justice goals of the lessons. I then identified a number of more descriptive themes that consistently emerged and re-emerged across the semester, creating focused codes for each of the themes that reflected the content of the conversations (Table 2). I used these focused codes to code all the transcripts and written documents. This article focuses on the data related to teachers' conversations pertaining to the relationship between the mathematical and social justice goals of the lessons, which necessarily includes data related to teachers' definitions of mathematics teaching for social justice.

### *Role as Researcher*

I, too, played a role in this research, both as instructor of the graduate course and as the primary instrument of study design, data collection, and analysis. As a White woman who had never before supported teachers in learning to teach for social justice, nor examined my own practice as a secondary mathematics teacher (prior to graduate school) from a social justice lens, I was ever aware that my own unexamined assumptions and misconceptions might constrain my ability to fully push participants' self-reflection. I reflected regularly, alone and with colleagues, about the ways my own limited experience might hinder my ability to support the teachers in this study. Further, as a novice qualitative researcher, I was concerned that too much influence from me as the facilitator of the graduate course (e.g., sharing my own understanding of a sociopolitical context versus understanding teachers' perspectives) might jeopardize the integrity of the study. To mediate these concerns, I chose to use questioning as a means to push participants' thinking during discussion. For example, if I was concerned that the teachers had not fully considered the range of ways students might respond in a given situation (and thus were not fully contextualizing a complex issue), I would ask, "How might students who have had these other [different from those mentioned by teachers thus far] experiences respond differently here?" In the sections below, I attempt to make explicit my stance on various issues (even though I did not always express this to the participants). I highlight instances in which I used questioning (or not), and other means

Table 2  
Primary Codes That Drove Data Analysis

Framing code	Focused code	Explanation
Teachers' conceptions of TMSJ <sup>a</sup>	Cultural difference	TMSJ <sup>a</sup> means relating mathematics to all cultures so all students can be involved.
	Student awareness	TMSJ means developing students' awareness of issues.
	Action	TMSJ means motivating students to take action to make change.
	Racism	TMSJ means dealing with issues of racism in the classroom.
	Opening gates	TMSJ means preparing students to pass through the gates of standardized tests (e.g. SAT, ACT) and college entrance.
	Using mathematics	TMSJ means using mathematics in society, both in terms of general mathematics applications and using mathematics to confront inequity.
Teachers' perceptions of social justice in relation to their students	Anticipating student responses	Teachers' anticipated student responses to TMSJ.
	Learning from student responses	Teachers' comments and/or adjustments to the lesson after learning from student responses.
Challenges teachers faced in TMSJ	Knowledge of social issues	One challenge faced is developing knowledge of social issues.
	Knowledge of pedagogy	One challenge faced is acquiring knowledge of pedagogy.
	Knowledge of students	One challenge faced is developing knowledge of students' experiences and interests.
	Knowledge of self	One challenge faced is dealing with the implications of discussion of social justice on one's personal life.
Teachers' conversations pertaining to the relationship between the mathematics goals and social justice goals	Existing math curriculum	The math curriculum is already full and well-defined, we can't take anything out, yet it is important to connect TMSJ to this existing curriculum.
	Rigorous, legitimate math	It is important when teaching mathematics for social justice to have students engaging in rigorous, legitimate mathematics.
	Connects to students lives	It is important that TMSJ connect to students' lives (not just curriculum).

Note. <sup>a</sup> TMSJ stands for teaching mathematics for social justice.

to push participants' thinking. A researcher with a different background might have pushed or supported respondents differently.

## FINDINGS

What teachers communicate about the relationship between mathematical and social justice goals when learning to teach mathematics for social justice guides the findings I report here. I first suggest findings with respect to Group 1, then with respect to Group 2. Across both groups, I first present teachers' evolving conversations pertaining to definitions of teaching mathematics for social justice to provide a context for subsequent discussion. Next, I present three themes that emerged from my analysis of teachers' communication about the relationship between mathematical goals and social justice goals for each group of teachers. First, teachers noted early in the semester a tension between incorporating both mathematical and social justice goals into their lesson designs. Second, although teachers included both types of goals in their lesson designs, both groups seemed to focus more on social justice in the lesson design stage. Third, the instantiation of these goals into practice proved difficult for teachers, in one case leading to the math "trumping" the social justice and in the other case leading to a "divided" lesson in which the mathematics and social justice components remained separate. In the course of presenting these findings, I highlight details about the lessons and the mediating role of myself as facilitator. I discuss the findings for the second and third themes in the context of the lesson design process for each group to provide the reader with a sense of the interactions within the groups.

### *Group 1: Teachers' Evolving Conversations Pertaining to Definitions of Mathematics for Social Justice*

In Group 1 (Pat, Gerry, Chris, and Jamie), teachers' early conversations indicated that three out of the four teachers had narrower definitions of teaching mathematics for social justice that became more elaborated and consistent over the duration of the course. The fourth teacher (Chris) seemed to come in with a substantive definition of TMSJ that remained consistent throughout the course.

#### *Group 1: Initial Conversations*

Pat and Gerry's initial conversations pertaining to TMSJ suggest it was about relating mathematics to all cultures so that all students can be involved in the mathematics. Gerry, for example, saw teaching mathematics for social justice as "looking at all societies and cultures and the different ways people may accept math into their home life," hoping that doing this would give all students "an opportunity to learn mathematics no matter how they appear." Gerry and Pat's initial conversations also acknowledged that TMSJ must connect to society, but they were not explicit about what the notion of "connecting to society" meant. For example, Pat suggested that TMSJ was "for the purpose of opening [students'] eyes to different

aspects of our society and what's going on in the world and relating that to maybe mathematics." Similarly, Jamie saw such teaching as developing students' awareness of issues, suggesting that it would "enlighten [students] in a way that's maybe different from just kind of like teaching the topic of mathematics." Although there was some mention of connecting mathematics to society, the initial conversations of these three teachers made no explicit mention of students looking critically at how larger societal issues connect to their experiences or of students acting upon their world to transform it. Chris, on the other hand, did seem to define teaching mathematics for social justice in this way, suggesting that it means students "use math as a tool for dismantling systems of oppression. It entails teaching ways that math can analyze and address societally constructed inequalities."

### *Group 1: Evolving Conversations*

Almost immediately after the course began, Group 1 teachers' conversations pertaining to TMSJ began to expand. It is not surprising that teachers' conversations began to evolve at this stage, given that the first part of the course focused primarily on discussion and analysis of readings focused on teaching for social justice. Furthermore, these conceptions remained consistent for the remainder of the course. Jamie's comments expanded to include an explicit mention of students' recognizing "that social injustices do exist" (i.e., it is no longer just about connecting mathematics to society but is about exposing injustice) and included an action component, where "once there's awareness then there can be analysis and actions that follow those things." Similarly, Pat and Gerry's conversations maintained the notion of mathematics for social justice as connecting mathematics to society and expanded to include an action component. Gerry thought that their lesson reflected TMSJ because students were "using their math skills and social issues to . . . create a plan of action . . . and make them realize how often they really use math in our world." Pat, in the final paper, stressed the notion of student empowerment along with the importance of confronting inequities, and Chris consistently remarked (from beginning to end) that TMSJ "address[es] the social justice issues that [students] might run into in their lives. They'll use it to examine racism, classism, sexism, as it pops up in their lives and in the larger society" and then will have to consider "what could we develop with the knowledge we gained." However, with the exception of Chris who articulates TMSJ as "dismantling systems of oppression," the purpose of the action component for teachers in Group 1 is not clear. That is, they recognize that action is a critical component of teaching mathematics for social justice but do not take a stand on whether that action is about students transforming their world.

### *Group 1: Early Tensions Arose*

I now turn to the three themes that emerged from analysis of teachers' communications about the relationship between mathematical goals and social justice goals. Early conversations suggested a tension between incorporating mathematical and social justice goals in a single lesson. In Group 1, three of the four teachers

commented about this issue early on. Gerry, for example, stated that one of the challenges in TMSJ was making the decision of, “no matter what, what do you teach? What do you leave out?” Chris also identified the relationship between the mathematical goals and the social justice goals early on, suggesting, “what we have is a bunch of problems that are connected to our curriculum . . . And then what we’re hearing and reading is we should have curriculum that’s connected to students’ lives. . . . And those two . . . I think those two are so polarized.”

As Group 1 teachers began thinking about designing their own lesson, the challenge of negotiating the mathematics and the social justice goals reemerged for all four teachers. Chris asked, “if we get any of these kinds of questions as ‘How could we as a society decrease the prison population?’ how do we bring math into an open-ended question like that?” Jamie suggested, “in terms of how we’re going to ask questions in the classroom, I think some of them have to be left for discussion and some of them lead to mathematics. I think we have to accept that some aren’t going to lead in the direction of the mathematics.”

#### *Group 1: Prioritizing a Focus on the Social Justice Component*

Although teachers incorporated both mathematical and social justice goals into their initial lesson designs, they tended to prioritize a focus on the social justice component during the lesson design process. To situate these results, I present teachers’ goal statements over time in the context of their group’s lesson study process. Necessary background information about the lesson itself is included to contextualize these results.

#### *Group 1: Initial Lesson Design Incorporating Mathematical and Social Justice Goals*

Group 1 teachers designed a lesson around the topic of prison populations and school achievement. The impetus for this topic came from a student night where Group 1 teachers invited their students to the university to act as consultants. A small group of students shared powerful, personal stories about injustice that they experienced in their schools and in their lives. Group 1 teachers compiled a list of social issues of interest to students and in subsequent discussion talked about a direction for a lesson, including ideas such as “related to sexual orientation,” or “maybe something with credit cards or cash stores.” One teacher mentioned that the student stories connected to an overall theme of “punishment” and suggested, “Some interesting ideas of prisons could be discussed.” A brief discussion of possibilities with the “prisons” topic led Group 1 teachers to choose to focus on prisons and schools.

#### *Group 1: Addressing Issues of Race and Racism*

At this same time, a discussion emerged pertaining to the issue of opening up one’s classroom to the sometimes controversial and discomfiting topic of racism. Pat asked early in one session whether the group wanted to go into “real personal [issues] like racism or you know some ‘ism’ of some sort?” One teacher<sup>3</sup> immedi-

ately replied that the topic of credit cards might be nice “because it’s not quite as controversial.” They agreed to brainstorm more ideas and eventually came to the consensus that something with the prison system and schools would be a good idea. Shortly after this decision, one teacher shared that another teacher, who was not present, had requested that the lesson “didn’t . . . do anything with racism and . . . [didn’t] . . . bring up anything too controversial.” Another teacher replied immediately, saying that personally, “I’m ready to dive into the deep stuff.” A second teacher also replied immediately, arguing, “being noncontroversial is so political” and a moment later that same teacher remarked that, “maybe race is uncomfortable because [that teacher] is White. And [that teacher] doesn’t feel confident and, and dealing with African American students with issues of race, there’s a huge risk that you know the kids are just going to go, ‘you’re racist.’” At this point, I stopped the conversation because I did not think it was an appropriate discussion without that teacher present. One teacher continued to make comments that evening to confront the issue, asking “How do we do something without a racial component and what do we do when the kids make it racial?” and stating later, “we have to deal with our population, and I think that’s going to put anybody that’s not comfortable with racism in a tough spot.” For the next three sessions after that evening, the teachers in Group 1 focused on developing and refining a lesson plan. No explicit discussion of racism occurred during these classes. I did not push the issue; rather, I wanted to see whether and how it emerged within the group.

### *Group 1: Initial Lesson Design*

For their initial lesson design, Group 1 teachers wanted students to extract necessary information from data presented to use mathematics to gain awareness of the costs associated with schools and the costs associated with prisons. Specifically, teachers presented students with a table illustrating the annual cost per pupil in their state and school district, by year, for 15 years. Additionally, teachers presented students with an excerpt from a newspaper article about prison spending in their state, which gave students information about the amount of money the state spends per year on the state prison system and prison inmate population totals. Using the data, teachers asked students to calculate the cost of a student for one day and the cost of a prisoner for one day and discuss possibilities for why these costs might be similar or different. Students were also asked several questions about the data beyond these first two calculations, including why they thought a prisoner might cost more, whether they thought the calculations of the daily cost of students and prisoners were surprising, and to explain how a 267% increase in prison spending might have been calculated in the data presented.

As Group 1 teachers were developing their lesson and articulating mathematical and social justice goals, I did not intervene. Instead, I told them I was “going to sit back, and I really just want you to engage in developing your lesson.” I viewed my

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<sup>3</sup>Teachers’ pseudonyms are purposefully removed here to further protect study participants.

role as a facilitator, helping to search for relevant data when requested and pushing them with such questions as, “What do you want your students to get out of this lesson?” “Why does that matter, that we’re spending more on prisons than schools?” and “What are the social justice goals of this lesson?”

Group 1 teachers’ mathematical goals for this initial lesson focused on having students analyze data and make comparisons. For instance, Jamie suggested that the mathematical goal of the lesson was for “students [to] be able to work with data, to generate comparisons between like quantities (find per student/per person costs). Students should understand percent increase.” Group 1 teachers also expressed that although these may not be new mathematical ideas for students, a goal of this process was that students apply their knowledge. Gerry questioned, “But do they know why they do it and use it? They know how to do it but do they know how to use it? . . . Well I mean it’s, it’s all math that they’ve done for a long time. But have they been forced to use what they know?” Chris summarized, “we’re connecting math with an important social problem . . . they’re using math to understand the world.” This notion of using mathematics to understand the world resonates with Group 1 teachers’ initial and ongoing conversations that teaching mathematics for social justice was about connecting mathematics to society; mathematics connects to students’ lives as they consider how to use mathematics in their lives (e.g., as Chris states, “news media can be assessed from math perspectives”).

The social justice goals for Group 1’s initial lesson focused on having students recognize the costs of prisons and schools, connecting prison issues and school issues. For instance, Jamie conceived of the social justice goal as “well, I think it gets back to the idea of just like getting them informed about some of the costs associated with prisons and schools so that they’re aware of some of these facts that are out there.” Similarly, Pat wrote that the social justice goal was for students to “be aware of money spent (public education isn’t free and neither is the prison system). Maybe it would start the wheels turning.” Again, these goals align with the teachers’ initial conversations about teaching mathematics for social justice; it is about connecting mathematics and society. Gerry and Jamie also considered the lesson’s goals in terms of taking action and student empowerment, aspects now a part of their conversations pertaining to teaching mathematics for social justice, but again did so without much detail. Gerry noted, “I am really working towards . . . bringing issues that are current into students’ lives through the classroom . . . using their math skills to develop reasoning skills and create a plan of action.” Jamie reflected, “the goal of the lesson is to provide students use for math in context, which empowers them to investigate other issues in a similar manner.”

Even Chris noted that the social justice goal of this lesson was “to get students to consider the causal relationships between spending money on schools and prisons; which will pay off more?” Chris also noted, however, that right then he saw this lesson as “not . . . accomplishing much pedagogically” [whether he was referring to mathematics or social justice aims is not clear], but that it was about “four teachers have a foot in the door for teaching math for social justice. Now the more interesting question is, where do we go with this?”

It seems that Group 1 teachers' centered their goals for this lesson on student awareness more than on specific understanding of and action toward confronting injustice. In doing so, teachers perhaps avoided grappling with sociopolitical issues in the complex ways that their lesson warranted. I return to this idea later.

### *Group 1: First Lesson Implementation*

When Group 1 implemented their lesson for the first time, students did not get as far as the teachers had expected. Students calculated costs per day for students and inmates and addressed the question of why an inmate might "cost more," but most did not get much farther than this. In the debriefing session, teachers' comments focused on the fact that it was a good lesson; they just did not have time to get through it all. After all the teachers had spoken and after they had started making revisions to their lesson, I asked them whether they felt they had reached the social justice goals of their lesson. Jamie noted, "I don't think as is, it addresses any [inequity or social justice issue]." I agreed with the group that this needed to be a major focus of their revisions.

Over the next 2 weeks, Group 1 teachers worked to revise their lesson. I could not be present during these 2 weeks and asked the teachers to meet twice (once per week) and report to me via e-mail. The group reported once that they had revised the lesson to include social justice goals (nothing specific mentioned), had addressed all the questions I had left for them (which I describe subsequently; again nothing specific was shared in the e-mail), and only needed to meet once to make the revisions. I trusted their progress and was looking forward to seeing their revisions, but would not see them until the revised-lesson implementation day.

The group decided to add a component to the lesson that emphasized the teachers' perceived *relationship* between prisons and schools, not just the costs associated with both, feeling that such a lesson would address inequities and make more explicit a social justice goal. In my absence, I left the Group 1 teachers with a list of questions to discuss in an effort to support them in translating their definitions of teaching mathematics for social justice into practice. This was my way of continuing to push their thinking even when I could not be physically present. I framed these questions around teachers' previous statements about teaching mathematics for social justice, asking them, for example, whether they would characterize their lesson as academically rigorous, to consider the various ways students might engage (or react), how the lesson could best support engagement of all students, and to reiterate the lesson's mathematical and social justice goals. I also chose to reintroduce the topic of race and included one reflection question, asking the teachers, "there's a direct correlation in many people's minds between racism and prison incarceration patterns. Why isn't this coming up in your lesson? Is it relevant? If it is not relevant, why not?"

In addition, because I believed that Group 1 teachers would need to develop more knowledge about potential sociopolitical issues that arise when thinking about relationships between prisons and schools, I gave them copies of recent local news

stories related to their topic. These stories were about the state's exploding prison population, the state's rates of incarceration along lines of race in comparison to national data, proposed alternatives to prison for drug offenders, and opinions from local residents about each of these stories. I also gave them a report from the Justice Policy Institute about the funding of higher education and corrections and their impact on African American men (2002). I cannot know whether or how they engaged with these materials, but I do know that there was no discussion of these materials on the transcript from their meeting when I was not present.

The revised lesson plan began as before; students would examine the costs associated with prisons and schools, but the number of questions for students to address was decreased in an effort to support teachers getting farther along in the lesson. Next, the teachers planned to present students with a graph of local GPA data by race (which showed that Asian and White students had consistently higher GPAs than African American, Hispanic, and SE Asian students did over a period of 4 years). Teachers then planned to show students the following quote: "More than 6 in every 10 persons held in correctional facilities were Black or Hispanic. All inmates: 48% of inmates were Black, non-Hispanic; 36% White, non-Hispanic; 14% Hispanic; 1% Native American; and 1% Asian/Pacific Islander." Once these data were presented, teachers planned to ask students whether there was a connection between the two, trying to bring out the teachers' perceived relationship between prisons and schools (which will be discussed in the context of the lesson debriefing discussion). Recall that I was not present when the teachers decided to make these changes. The first time I saw these revisions was during the lesson implementation, which I discuss in the section on instantiating goals in practice.

### *Group 1: Revisiting Issues of Race and Racism*

In planning these revisions, Chris noted that it would "bring a lot of issues of race up." Jamie responded to this, "I know. I think that's part of the intent. Just, where's the inequity in this world?" In responding to my explicit question about whether issues of racism were relevant to their lesson, the teachers in Group 1 believed that they had addressed this issue with the changes they had made. Chris asked the group, "Why didn't we do it originally?" to which Jamie responded, "Because we didn't think of it." Gerry explained, "I think we thought at first it was probably going to be too controversial, but yet when you hook it into district data . . . it still could be controversial . . . but we're using what the district has already vocalized." Chris then asked, "What are the risks of talking about race issues?" and Jamie responded, "I might offend somebody." Pat asked, "Like in which way?" and Jamie replied, "I have no idea." Jamie later went on to say, "Here's the thing, mathematics is pretty neutral . . . I don't think I can offend too many people by talking about areas of objects, but in talking about race in the classroom, I think there's a chance."

In the aforementioned discussion, it seemed that Chris was leading the group down this path, noting early on that issues of race will come up and addressing colleagues with questions to push the groups' thinking. It is worth noting, however,

that Group 1 teachers were talking about their own comfort with discussions of race and racism; they were not explicitly considering how their lesson might prompt potentially “controversial” discussions. That the group was still struggling with what this discussion of race and racism might mean for their particular lesson goals is visible within the various social justice goals they suggested for this revised lesson.

The social justice goals suggested by Group 1 teachers now included wanting students to recognize that education is important, that more money should be going toward schools, and that racism may be at play. However, Group 1 teachers were not in complete agreement about the social justice goals for this revised lesson. Gerry and Pat felt that a social justice goal would be for students to recognize that more money should go toward schools. Pat stated, for example, that, “we don’t want to stray too far from the point, and that is how we decrease the amount of money having to go toward prisons, increase the money for schools.” Chris disagreed, stating, “I don’t think it necessarily is that we should be spending more money on schools” but that it is about “how we are spending money and then maybe a solution to this prison thing is not to put more money in schools but direct more money into educating people.” From there, the group took this up and agreed that one social justice goal was for students to see that education is important. Chris noted that, “it’s good to emphasize that education is important. And I think that’s part of our goal,” and Pat agreed that, “teaching people that school is important” was a goal.

Group 1 teachers had different ideas about some additional social justice goals for the lesson that were not resolved before the lesson was next implemented. Gerry felt that one social justice goal of the lesson was for students to see “it’s not saying you personally are going to jail or prison, it’s saying we don’t want you to, we want you to look at this stuff, get yourself educated, get yourself right, and so you aren’t there.” Pat and Jamie both agreed with this statement. This could align with these three teachers’ conversations pertaining to TMSJ as connecting mathematics to society. In other words, students were using mathematics to understand the social problem that the state spends a great deal of money on prisons (and more than on education). The action component, then, may be students’ personal action—working harder at succeeding within the educational system as currently defined—to “transform” the situation in that not as many people will be in prison, therefore freeing up more money for education. Unfortunately, I was not present for this discussion of goals, which is highly problematic and does not adequately contextualize the complex social, political, and historical issues related to their topic of prisons and education. Nor does it seem to consider multiple, alternative student responses. Chris attempted to push the group, disagreeing and stating, “I don’t think that that’s, I think what we were going for was the race piece.” He elaborated, “This looks maybe like racism and maybe it is, but how are more black people and more Latino people ending up in jail? I mean this is a fact, these are the numbers on paper, folks. I’m not making this up, and I’m not saying that you’re black or you’re Hispanic, you’re going to jail. I’m not saying that.” The other teachers did not take this up. Instead, they continued

to list their own thoughts about their goals for the lessons and about how they thought students might respond. It seems Group 1 teachers focused on creating a list of goals, and were not necessarily considering whether they all agreed on that list.

### *Group 1: A Change in Focus*

Although Group 1 teachers had initially included both mathematical and social justice goals in their lesson design, as they worked to redesign their lesson plan in the ways described in the previous paragraphs, they focused explicitly on articulating the social justice goals for the lesson and agreed that mathematics did not have to be tied in all the time. They focused on revisions around the social justice goals of the lesson, adding the problematic relationship component, leaving the rest of the lesson, though shortened, virtually unchanged. Additionally, the lesson itself did not develop new mathematics content for students. The teachers seemed content with this decision because this was their first time teaching mathematics for social justice. For instance, just after the first implementation of the lesson, Jamie said, “In terms of this first lesson, it’s not as important [that the lesson be mathematically rigorous]. Because I think we’re trying to get used to including these social justice goals into our class.” Similarly, Pat reflected, “I knew that the math was important for the lesson plan we implemented but more importantly with our first lesson plan involving social justice, the social justice issues were more important.” Thus, the teachers explicitly recognized and rationalized their decision to focus the lesson not on developing new mathematics knowledge but instead focusing on what they thought their lesson could address with respect to social justice. However, instantiating these goals in practice (in part, because they were problematic and not shared among all group members) proved difficult for Group 1 teachers.

### *Group 1: Instantiating Goals in Practice*

As described previously, Group 1’s revised lesson focused on the costs associated with prisons and schools and on the teachers’ perceived relationship between prisons and schools, specifically asking students whether there was a connection between local GPA data broken down by race and data about the prison population according to race. Jamie implemented this revised lesson with the other teachers observing (except Chris, who could not attend). The bulk of the class period consisted of students calculating estimated costs of a student for one day and a prisoner for one day and discussing why they thought a prisoner might cost more. Jamie circulated around the room, asking students questions about their calculations, and the class had a brief discussion about some reasons why a prisoner might cost more (e.g., feeding them more meals per day, prisons operating 24 hours per day). This took a bit longer than Jamie had planned, so he only had time to present (in a computer-generated slide show) the two sets of data (GPA data and prison population data) and to toggle between slides several times. He then put up the question, “Is there a connection?” with just minutes left in class. Several students responded and before they left class Jamie chose to have students write a quick

statement about whether they thought there was a connection, and these statements were collected. It is worth noting that no mathematical discussion about the data took place at this time.

### *Group 1: A Lesson Divided*

Because this was the first time I saw this lesson plan, the debriefing session served as a place for me to begin to understand how Group 1 teachers were thinking about the mathematical and social justice goals of this revised lesson, both in terms of their intended goals and how the lesson revealed these goals through implementation. I could not believe that they had designed this particular lesson, or that they had asked such a broad, loaded question “Is there a connection?” I was surprised that Group 1 teachers had not considered what seemed to me to be some obvious, highly problematic conclusions students might draw. I took copious notes about students’ facial expressions, body movements, and my own possible interpretations of their question, but refrained from voicing my objections until I listened to the teachers’ thoughts about the lesson implementation. What surprised me even more was that this debriefing session consisted of mostly positive comments from the teachers; they believed the lesson had gone well and had addressed some of their intended goals (recall, however, that Chris did not seem to share these goals, and he was not present for the debriefing). After some discussion, I asked them to clarify what the goals were for the part of the lesson that asked students whether there was a connection between the two pieces of information presented and to discuss how this part of the lesson related to the first part of the lesson.

Group 1 teachers’ statements at this point in time suggest that they were thinking about their lesson in two pieces; the first part of the lesson was the “math piece” and the second part of the lesson was the “social justice piece.” When reflecting on what students learned in the lesson, all references to mathematics referred to the first part of the lesson. Jamie noted, for example, that students “learned to sift through some information and get the numbers and do a calculation.” Gerry suggested that one student’s reasoning, when determining the number of days in a school year, was evidence of learning, noting the student’s response “had some reasoning to it . . . I mean she was thinking about it and then afterwards, she was like, oh I didn’t take off spring break.” Jamie explicitly reflected the idea of a divided lesson later in the discussion, noting, “it would have been nice to have the discussion about that [connection between the data] because I think that’s more related to the social justice goals that we had, whereas the first part is the math piece.” All references to the social justice goals referred to the second part of the lesson and the student discussion, as is described in the next section.

### *Group 1: Unanticipated Student Responses*

With respect to Group 1 teachers’ goals for the part of the lesson asking students about the connection between the items of data presented, Jamie believed that they had reached their social justice goal and that one student’s response, “maybe we

should be spending more money in schools so that these people are better educated so that they don't go to prison," reflected what they hoped students would learn. Both Pat and Gerry agreed, and Gerry expressed excitement about that student's response, noting that "I didn't want to react because it was like okay, I'm not supposed to, but I mean he really hit it right on what we had talked about."

I was quite taken aback by this student's and other students' comments at this point of the lesson and was concerned that the teachers were not reflecting critically on the implications of their lesson with respect to student beliefs or about their own assumptions about the data. I also, frankly, could hold back no longer. I decided to ask the teachers what some of the other student comments were at this point in the lesson, wondering whether they noticed what I had noticed. Gerry reflected that one student had said, "A lot of people are doing bad in school, and they're going to jail." Based on my field notes, what the student actually said, which I shared with the group, was that "Black people are doing bad in school and Black people are in prison." I also shared that I noticed a number of the African American students who had been engaging in the lesson thus far purposefully chose not to participate in the discussion during this time. Teachers responded with surprise, and Jamie noted at one point that it was difficult for him to "think about the perspective that African American students have on this lesson because [he doesn't] know their experiences." I then suggested that we read some of the student responses before continuing our conversation.

As the teachers started reading through student responses to the lesson's question, "Is there a connection?" Gerry noted that students were not reacting in the way in which they had expected. Jamie was particularly surprised. One student wrote, "Yes, because since some African American students are not as wealthy as others, they don't think that school is important so they will skip and maybe commit a crime." Jamie responded, "pretty negative . . . it is more directed toward the idea of the individual rather than the schools." To another student who wrote, "Yes, Black people do the worst in school and more black people are in jail," Jamie responded, "so yeah, these are responses I wouldn't expect."

Once again, a discussion of issues of race and racism surfaced. Here, the teachers noted that there was not enough time to address issues of race sufficiently and, therefore, they did not want to "go there" in this lesson. Jamie commented that he imagined an issue like racism would be "incorporated . . . into a number of different lessons" and that they were not going for "the race piece" with this lesson, but for "if you get an education, if you get engaged, then you're not going to end up in jail." What seems to me to have been unexamined at this time is that there is a "race piece" here and that the issue of a connection between these two ideas (GPA and prison data), in large part because of the "race piece" (the historical and sociopolitical context of race and racism in our society), is highly problematic.

The preceding sections delineate Group 1 teachers' evolving conversations pertaining to definitions of mathematics for social justice and their development of both mathematical and social justice goals for the lesson in relation to these definitions. Although teachers focused their attention on the lesson's social justice

goals, their instantiation of these goals into practice proved difficult. I now examine these themes for Group 2 teachers, noting similarities and differences between the groups with respect to these themes as they arise.

*Group 2: Teachers' Evolving Conversations Pertaining to Definitions of Mathematics for Social Justice*

Unlike Group 1, in Group 2 all four teachers (Holly, Roxy, Ann, and Dana) seemed to have entered the study with substantive definitions of TMSJ that remained consistent over time. Four themes emerged immediately and reemerged at each stage of the data collection process, expressed by all four teachers at one time or another. First, Group 2 teachers' conversations suggested that TMSJ meant confronting the gatekeeping role that mathematics education plays. Ann argued, "since math functions as a gatekeeper to many other opportunities, to teach for social justice must include students developing mathematical power." Similarly, Roxy expressed firmly, "I want to help students make themselves ready so that they can pass through those gates." A second theme that Group 2 teachers' conversations suggested was that TMSJ meant students take action to make change. Dana, for example, stated that TMSJ means "students start seeing that they could use math to make an argument to change something about society."

A third theme that emerged and remained consistent in Group 2 teachers' conversations was that TMSJ meant raising students' awareness of issues. Holly, for instance, expressed that teaching mathematics for social justice will "open students' eyes more . . . and what do they say, forewarned is forearmed." Similarly, Ann suggested that such teaching included "giving [students] the bigger picture of what's going on in the world" and showing students "here's how you can use math to raise your awareness." Finally, Group 2 teachers' conversations referred to TMSJ in terms of the utility of mathematics in which students look at their communities and, as Dana said, "analyze [issues] mathematically." Holly remarked that in their lesson she thought, "students [would] step away from the lesson with a new outlook on how math can be an effective tool in their lives—it empowers them to solve critical, close-to-home problems." Given that these incoming conceptions of TMSJ aligned with those presented in course readings, it is not surprising that teacher's conceptions remained consistent throughout the course.

*Group 2: Early Tensions Arose*

Similar to Group 1 teachers, all four Group 2 teachers commented early on about the tension related to including both mathematical and social justice goals when teaching mathematics for social justice. Dana, for example, said that one of the challenges she anticipated in TMSJ was "figuring out how to teach for social justice while fitting in the required curriculum that meets state standards and testing." In addition, they described this tension as determining what should come first when planning the lesson—the mathematics topic or the social justice issue. As Ann said, "I guess the question is what comes first? You find a situation and you try to

fit it to the curriculum or you look at the curriculum and you go ‘We’re going to be studying this, let’s find a situation that works.’” Roxy replied that, for her, “if you’re going to try to get to the SAT, the curriculum comes first.” In her post interview, Roxy again noted that a danger of starting with the social justice is that “it may lend itself to a sort of artificial bending of mathematics . . . you’re trying to fold the mathematics around some other content that you are trying to cover because you’re trying to infuse social justice.”

Regardless of whether mathematics or social justice issues came first, Holly and Ann expressed the importance of the mathematics. Ann felt that including relevant mathematics “makes it more palatable in terms of why are we doing this,” and Holly felt that “kids would find it more valid if it included math.” It was also important that this was rigorous mathematics. Holly, commenting about an example in a reading, noted that what she liked about it was that “it was hard math. There was nothing soft about the mathematics.” Later, Ann reminded her group that, “I don’t want the message about social justice to be social justice is for lower level mathematics. It’s what you do maybe in algebra 1, but then you go learn real mathematics, and that’s not useful for actually anything.”

### *Group 2: Prioritizing a Focus on the Social Justice Component*

As with Group 1, although teachers incorporated both mathematical and social justice goals in their initial lesson designs, they tended to prioritize a focus on the social justice component during the lesson design process. To situate these results, I present teachers’ goal statements over time in the context of their group’s lesson study process. Necessary background information about the lesson itself is included to contextualize these results.

### *Group 2: Initial Lesson Design Incorporating Mathematical and Social Justice Goals*

The teachers in Group 2 had purposeful, but informal, discussions with students in their classes, and they polled students about what social issues were of interest to them. These conversations provided the impetus for the topic of this lesson: minimum wage versus living wage.

The lesson design began with students completing a homework assignment, providing an opportunity for them to review previously learned mathematics that would be relevant for the next day’s discussion. This homework assignment had students calculate basic measures of central tendency for data and reason about which measure was most appropriate to use in different situations. The next day in class, the lesson began by asking students to use local data to determine the average cost of housing for one person in Lakeview. The teacher then asked students to complete some mathematical calculations to determine how much someone making minimum wage (working 40 hours per week) could afford to pay in monthly rent. Next, students calculated, given the average cost of housing for one person they

had previously found, what hourly wage this person would need to make to afford that housing. In other words, teachers asked students to calculate the living wage. The subsequent planned class discussion centered on the discrepancy between minimum wage and living wage, asking students to brainstorm possible solutions that might alleviate the discrepancy.

Teachers in Group 2 also articulated both mathematical and social justice goals for their students as they were designing their lesson. In terms of mathematical goals, Group 2 teachers saw this lesson as supporting students' review of basic statistics, ratio, and proportion. For example, Holly wrote that the mathematical goals of the lesson are to "review mean, median, mode, range" and to "have a better understanding of proportion." Ann noted that the mathematics goal of the lesson was that "students will use unit ratios and percent to convert hourly wage to monthly housing budget and housing budget to hourly wage" and Roxy noted that the goal was students' "use of proportional reasoning/algebra to find mathematical answers to real-world problems." Like Group 1 teachers, Group 2 teachers also identified students' review of mathematical concepts in a new context to "read the world" (Gutstein, 2006) with mathematics as an additional mathematical goal. Holly remarked that in their lesson she thought that "students [would] step away from the lesson with a new outlook on how math can be an effective tool in their lives—it empowers them to solve critical, close-to-home problems." Ann wrote that an explicit mathematical goal for students is that they "will understand that mathematical calculations can be used to expose social injustice." This connects directly to Group 2 teachers' fourth theme with respect to their definitions of mathematics for social justice: viewing math as a tool to understand the world in which we live.

The lesson goals identified at this stage in the lesson study process also included three social justice goals for students. First, teachers hoped that students would recognize that a minimum wage is not a living wage. Ann, for example, indicated that she wanted students to "know that there is a serious disparity between the wage required to live in Lakeview and the wages paid to low-wage workers." She stated in class the following evening that "ultimately I don't care if they can come up with really what the average house costs . . . the experience I want them to have is the number a minimum wage person can afford is nowhere near anything in here." This connects to the second theme in Group 2 teachers' conceptualization of mathematics for social justice: raising students' awareness. Here, a goal is to raise students' awareness about a discrepancy between minimum wage and a living wage.

A second goal Group 2 teachers articulated was for students to recognize that everyone should earn a living wage. Dana noted that the issue of the lesson is that "it's not right that somebody works 40 hours a week and can't afford to live." Ann likewise stated that she wanted students not only to recognize that minimum wage and living wage are "really different" but also to "then see that as unjust." Perhaps students seeing injustice is a precursor to a third theme important in Group 2 teachers' conceptions of mathematics for social justice, which suggests that such teaching engages students in taking action to make change in the world.

A final social justice goal indicated by Group 2 teachers was making sure students did not interpret the lesson as a cautionary tale about individual betterment. As Ann stated, this lesson was not about “go better yourself so you don’t have to have a minimum wage job.” Roxy shared similar concerns, wanting students to “[look] at who does this affect” so that they could “take the perspective of other people.” Here, Group 2 teachers seem to be thinking carefully about how their students might respond to this lesson.

### *Group 2: Addressing Issues of Race and Racism*

During this initial lesson planning stage, a discussion emerged in Group 2, similar to that in Group 1, around the issue of opening up one’s classroom to the topic of racism. For Group 2 teachers, this discussion first emerged when teachers were considering what it might mean to TMSJ in the context of a single lesson, as opposed to over the course of a school year, which would be ideal. One teacher noted, in response to an article by Eric Gutstein, “talking about racism in mortgage lending seems like something you can’t even complete a discussion about in such a short amount of time . . . you can’t get kids to anywhere where they’d come to any kind of realization or desire for action or whatever.” No additional discussion addressing her comment occurred, but Group 2 teachers continued to talk about the importance of choosing goals that were manageable for a single lesson that also stayed true to their sense of TMSJ. A few weeks later, Group 2 teachers were discussing the possibility of including a question in their lesson plan asking students, “Who makes minimum wage?” Ann wondered, “Do you think you start getting into stereotypes of, do you get unrealistic descriptions of who makes minimum wage?” Holly replied, “And I have a big group in there, a diverse group I guess I should say, and I’m wondering just exactly if [students will] say it affects African Americans. It affects Hispanics. It affects people that move a lot.” One teacher remarked that she “didn’t want to open that” unless students could think deeply about it, which meant that they would “have to bring up the idea of White privilege.” The discussion was sidetracked for a few moments, then that same teacher explained, “we were scared to kind of open the race door there, because we didn’t really have enough time to handle anything that might come up in a bigoted way.” Other teachers in the group did not follow up on this comment; instead, it seemed to signal an end to the discussion. No additional comments about issues of race or racism occurred again for Group 2 teachers.

Similar to Group 1 teachers, then, there seemed to be some discomfort about addressing issues of race and racism within the context of this study. However, these conversations seemed to be less about Group 2 teachers’ personal discomfort with these issues and more about their understanding of the limits of TMSJ as part of a course assignment. That is, Group 2 teachers seemed to realize that TMSJ is a complex, long-term process, especially when addressing issues such as racism in mortgage lending, and wanted to design a lesson that could do this on a smaller, more manageable scale within the constraints of the course.

*Group 2: A Concentrated Focus*

Similar to Group 1 teachers, Group 2 teachers initially included both mathematical and social justice goals in their lesson design, although Group 2 teachers took some time to focus explicitly on the social justice goals, in particular developing their own knowledge. Holly noted early on that it might be better to focus on the social justice component of the lesson at first. She remarked, “And really my last thought is the math. I think that if I could think of a topic that might be social justice-y, then we could think about the math that’s in it later.” Additionally, one of the central concerns for two of the Group 2 teachers during this time was the need to develop their own knowledge of the social issue of interest. Ann commented that her “knowledge of particular social issues is weak,” and Holly wrote that one concern she had about TMSJ was “opening the door to the unknown because my knowledge on many issues that may arise is weak at best.”

Perhaps driven by this need to learn more, Group 2 teachers requested, and I provided, a list of Web sites to serve as a starting point for their investigation into social justice issues. These were Web sites for various organizations advocating teaching for social justice (e.g., [www.radicalmath.org](http://www.radicalmath.org), [www.rethinkingschools.org](http://www.rethinkingschools.org)). Unlike Group 1 teachers, for whom I provided additional, unrequested reading and data, Group 2 teachers regularly brought in newspaper articles or other information that they found relevant to their lesson to share with the group. One teacher called a local organization to seek out information on Section 8 housing in the area, and another teacher contacted a local legislator for information about local housing issues. One teacher suggested that the book *Nickel and Dime: On (Not) Getting by in America* (Ehrenreich, 2001) was particularly relevant to their discussion. She brought in the book and three of the four group members read the book, drawing from what they read to contribute to the lesson design. Large portions of Group 2’s meeting time during these weeks were spent discussing the information they read and refining the social justice goals for their lesson accordingly. Again, as with Group 1, Group 2 teachers prioritized a focus on the social justice component of the lesson at this time.

*Group 2: Instantiating Goals in Practice*

Group 2’s first lesson, due to some miscommunication, consisted of students completing the homework assignment in class. This homework had students calculate basic measures of central tendency for data and reason about which measure was most appropriate to use. Students then used local data to determine the average cost of housing for one person in Lakeview. Next, students did some mathematical calculations to determine how much someone making minimum wage (working 40 hours per week) could afford to pay in monthly rent. For the final calculation, students calculated what hourly wage this person would need to make to afford that housing (living wage). The subsequent, although brief, class discussion centered on the discrepancy between minimum wage and living wage. As the lesson’s teacher noted, “what didn’t happen, because I didn’t get to that discussion, was we didn’t have the impact of, what are we going to do? This isn’t right.”

Reflecting upon the lesson, teachers noted that students did engage in mathematical discussion of whether mean or median was a better measure of center, and Holly noted that one student “gave a beautiful definition of why the median was the best.” Ann asked, “Was he the kid that said the median because there’s only two super high numbers?” He was. Dana also reflected that she “overheard amazing comments from the kids’ conversations with each other when they were working the homework, like, did everybody get this number? Or, how did you get that?” The teachers made only minor changes to their lesson at this point.

### *Group 2: Mathematics “Trumps” Social Justice Goals*

In Group 2, all four teachers were able to implement the lesson, and after each lesson implementation, teachers debriefed and had opportunities to make changes. The final three lesson implementations took place in varying classroom contexts (e.g., 90-minute and 45-minute periods, regular and honors geometry—in contrast to the first lesson, which was implemented in an algebra class), and the homework was completed by students as planned. None of the teachers, however, sensed that they addressed enough, or any, of the social justice discussion anticipated for the end of the lesson. Ann reflected on the first two lesson implementations:

One thought that I had in watching both these classes and then in thinking about me is that that’s where our comfort zone is. Is in going over this kind of stuff and talking about the mathematics and How did you get this? and How did you get this? and Let’s compare strategies and talk about it.

Dana, the teacher for the third lesson implementation, remarked, “Going over homework took forever and you would think after observing it twice before, I would make more appropriate decisions . . . maybe that was because I wanted to get to the mathematics there. Maybe that’s because that’s where we’re all comfortable.” Finally, the teacher for the fourth lesson implementation, Roxy, reflected, “I went down the same rabbit hole we all did with these openings, homework review, because it was just so math dense, just too tempting.” Roxy later reflected that, as a group, “none of us was able to escape the lure of multiple solution strategies to the same problem, unpacking the mathematical proof in student work, and displaying more than one student solution to a problem.” “We never finished the piece of ‘A living wage is important,’ ‘Not everyone has a living wage,’ ‘How could we solve that problem mathematically?’” It is important to note that Group 2 teachers reported that they engaged in these discussions with their students the following day in their classrooms.

## DISCUSSION

Teachers’ negotiation of mathematics and social justice goals when learning to teach mathematics for social justice as seen through these data suggest that engagement in readings and sample lessons around understanding TMSJ and in fundamental components of the lesson study process supported teachers in developing and maintaining substantive definitions of TMSJ. Both groups of teachers

either quickly developed or entered with expanded definitions of TMSJ that remained consistent throughout the course. Given that limited research on mathematics teaching for social justice exists, it could be that teachers' previous exposure to such notions aligned closely with those presented in course readings, thereby supporting them in strengthening and maintaining these definitions. Further, for teachers not entering with well-developed definitions, the consistency of definitions across course readings and with other classmates' initial conceptions might have served to support them in both quickly developing and maintaining similar definitions.

A closer look at the nature of teachers' definitions within and across the two groups suggests they served to guide, and at times constrain, teachers' development and instantiation of mathematics and social justice goals in their practice. For Group 1, though all the teachers entered with or expanded their notions of TMSJ to include an action component, most of the teachers did not articulate this component in much detail. They did not articulate what actions students might take, nor did they describe the purpose of such action (e.g., to transform oppressive structures). This might explain, in part, why the mathematical and social justice goals of their lesson seemed to draw primarily on their conceptualization of TMSJ as being about connecting mathematics and society or about raising students' awareness of a social issue. They wanted students to see how mathematics is a tool to examine costs associated with prisons and schools and that mathematics is useful for understanding the world in which we live.

This primary focus for the majority of the Group 1 members on raising students' awareness, I contend, allowed them to avoid grappling with the relevant, complex, sociopolitical issues their lesson design warranted. If their focus was more on raising students' awareness of the costs of prisons and schools and less on identifying and confronting injustice, then there would be no need to identify an injustice explicitly. Moreover, with no explicit identification of an injustice, there would be no need to examine that injustice from multiple perspectives or develop one's own knowledge of that injustice/social issue. Instead, one could argue that a primary goal for the majority of the teachers in Group 1 was to make students aware of the issue as they themselves interpreted it rather than thinking about the various ways students might critically examine, interpret, or respond to the issue.

Thus, Group 1 teachers did not need to (and indeed did not) adequately contextualize the complex social, political, and historical issues related to their topic of prisons and education. Although these teachers had literature available to them highlighting the complexity of issues related to current prison population demographics and though they were engaged in an examination of their district's racial achievement gap, the data Group 1 teachers selected was problematic. It did not necessarily support the conclusions that the teachers were hoping students might draw. With their data, for example, one cannot simply say that the explanation for disparities in GPA values according to race is institutional racism in the schools, as a number of other factors affect students' GPA levels. In their desire to move students toward general awareness of some statistics in society, which

they agreed later was, for themselves, about noticing and understanding institutional racism as a factor, they ignored other factors and lost some of the complexity of the issue. For example, differences in students' opportunities to learn mathematics in prior schooling experiences (Ferguson, 2001) play a role in GPA disparity. Insufficiently unpacking the myriad factors that contribute to achievement gap patterns, or the potential relationship that these factors may or may not have with factors that contribute to prison population demographics, may have served to reify or give space for students to express existing socially produced misconceptions (e.g., that Black students do not do well in school and go to prison), rather than reinterpreting, resisting, or rewriting them.

There is still a question here, though, about why Chris was not seemingly concerned about the revised lesson that looked at the relationships between schools and prisons. Perhaps this is because he thought that the lesson *was* meeting his goal of "addressing the race piece" (that institutional racism was the primary connection between the sets of data), that this was a shared goal among group members, and that he thought that the lesson would be framed by the lead teacher in this way during implementation. The teachers did not spell out in detail the questions that they intended to ask or the direction in which they hoped to take the lesson for this final discussion, so it is possible that each teacher was filling in those gaps in different ways. If this is the case—that Chris thought that students could meet this goal—a new concern arises. That concern is that Chris may have thought that students could begin to contextualize an issue such as institutional racism adequately through examination of this data in a single lesson discussion. This is not a realistic goal for a single lesson and would even be challenging over the course of a school year. As will be discussed, the grain size of the lesson study model may have contributed to Chris attempting to articulate such an unrealistic lesson goal.

We now take a closer look at the nature of teachers' definitions in Group 2, including how they may have served to guide or constrain the development and instantiation of goals in teachers' practice. All four teachers in Group 2 entered the study with substantive definitions of TMSJ that remained consistent throughout the course. Further, teachers in Group 2 seemed to recognize that the complex nature of the work (e.g., we would have to discuss White privilege) would take time—time they did not have in this context. Thus, teachers in Group 2 produced a lesson that aligned with their conceptions of TMSJ and that seemed manageable within the context of a single lesson. Students would use mathematics to expose an injustice—that minimum wage is not a living wage—and would brainstorm possible actions they could take to affect change. This lesson was manageable in the sense that students' engagement with the injustice was structured, their brainstorming time was set for the end of the lesson, and they were to brainstorm specifically about ways to alleviate the discrepancy between minimum wage and living wage. Nevertheless, what might explain the fact that teachers with incoming substantive definitions of TMSJ were not able to instantiate these ideas in their own practice?

One possibility is that precisely because Group 2 teachers had well-developed definitions of teaching mathematics for social justice, coupled with a recognition of the time and scope required to adequately contextualize social issues such as racism, they were “uncomfortable” and unable to get to the social justice component of their lesson. Perhaps Group 2 teachers recognized how discussions of minimum wage and living wage are situated within larger sociopolitical structures and that these issues could be raised through various student responses to the lesson, such that they avoided addressing them altogether. Not opening that door meant that they did not have to consider what it might mean to adequately contextualize for their students not just that a minimum wage is not a living wage but also why such an injustice continues virtually unquestioned in our society. Perhaps it is better not to do it at all than to engage with the issue in substandard ways. We can never really know whether Group 2 teachers’ initial conceptions might have supported them in their engagement with the complex social, political, and historical dimensions of the social issue of living wage/minimum wage because, quite simply, we did not get to see. A similar issue arises here with Group 2 as with Group 1: if Group 2 teachers *had* reached the social justice component of their lesson, how might they have considered what it meant to contextualize this complex social issue adequately, and how might that have affected their conversations pertaining to what it means to teach mathematics for social justice?

The findings from this study suggest that teachers acknowledged a tension in negotiating mathematical and social justice goals. For both groups, negotiation of the mathematics and social justice goals resulted in lessons that seemed to divide these two foci. The mathematics goals for the lessons were concentrated in the beginning of the lessons, where students used previously learned mathematics to explore data. The social justice goals of the lessons were concentrated at the end of the lessons, where students would discuss their interpretations of their calculations and the implications of these interpretations. As a result, because teachers were not engaging with issues of teaching mathematics for the first time, but with TMSJ, teachers in both groups chose to focus more on the social justice component of the lesson during the lesson design phase. Further, teachers’ definitions of teaching mathematics for social justice guided and constrained their development, negotiation, and instantiation of mathematical and social justice goals in practice. More research is needed to understand what it means to support teachers’ recognition of TMSJ as a long-term, complex process while facilitating their initial engagement with this practice.

In closing, these findings allow me to suggest some particular experiences mathematics teachers learning to teach for social justice might need to best support this practice. These are initial conjectures that need to be examined further with research. First, although the use of lesson study did provide teachers with an opportunity to collaborate, to reflect on their lives and their teaching, and to anticipate student responses to a lesson, the focus on a single lesson plan may have limited teachers’ conceptions of TMSJ. As such, changing the grain size in teacher professional development from one lesson to a focus on continued integration

throughout the school year or examining one's developing practice across multiple grain sizes (e.g., societal, school, classroom, full-year, single-lesson, 3-week unit, individual teacher–student interactions) may be more appropriate. Professional development could engage teachers with questions such as “What does it mean to teach mathematics for social justice throughout a school year?” “What might this look like within and across multiple units, or within a single lesson?” “What would it mean to adequately contextualize this social issue over time?” Additionally, although creating a lesson plan may be a good first step in developing as a mathematics educator for social justice, teachers could explore other avenues. For example, how might engaging with and learning from community members and parents about working for social justice support teachers in initial development of this practice? Adjustment of the grain size for professional development should also include, as Rochelle Gutiérrez (2009) argues for preservice teacher education, explicit discussion with teachers about the fact that learning to teach mathematics for social justice is a complex, long-term process and adequate contextualization of social issues, for example, will not occur in the course of one professional development experience.

Second, to support teachers in the selection of appropriate data that aligns with their goals, teachers could engage in data-driven professional development experiences. Gutstein (2006) found such experiences to be useful for students, so there is reason to believe that they could also support teachers. These experiences could include the identification of appropriate data, asking questions such as, “What mathematics would I need to understand and examine this issue?” “What data do I need to support this conclusion and why?” Teachers could also be asked to give examples of data that would cause them to believe particular arguments. In the context of the lesson designed by Group 1 teachers in this study, teachers could have found examples of data that would cause them to believe that institutional racism was a factor in differential achievement (as indicated by GPA scores) *and* examples of data that would cause them to believe institutional racism was *not* a factor in differential achievement. Addressing these ideas might also support teachers in expanding their notions of what it means to teach mathematics for social justice over time, in depth, and in collaboration and solidarity with their students.

As mentioned, I understand that one course, or even an entire preservice teacher education program, is not enough to become an expert mathematics teacher for social justice. And one study is not enough to learn all we can about teachers learning to teach mathematics for social justice. But such endeavors increase our understanding and expand our assumptions about the goals of mathematics education and about the knowledge required of teachers negotiating various aspects of this practice. This study also contributes to the process of learning how to teach mathematics for social justice, and it contributes to the existing knowledge base about how mathematics teachers engage in critical mathematics pedagogy.

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