Social Justice Mathematics: Pedagogy of the Oppressed or Pedagogy of the Privileged? A Comparative Case Study of Students of Historically Marginalized and Privileged Backgrounds

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Social Justice Mathematics: Pedagogy of the Oppressed or Pedagogy of the Privileged?

A Comparative Case Study of Students of Historically Marginalized and Privileged Backgrounds

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Abstract

Social Justice Mathematics, or SJM, is a mathematics-specific form of Social Justice Pedagogy (Frankenstein, 1983; Gutiérrez, 2002), that aims to teach mathematics content while developing conscientização (Freire, 1970), or sociopolitical consciousness (Gutstein, 2006). Research on SJM has generally focused on teachers’ implementation of SJM, finding that teachers struggle to meet the dual goals of teaching mathematics content while developing students’ sociopolitical consciousness (e.g. Bartell, 2013; Gregson, 2013).

The literature that explores students’ experiences with SJM yields conflicting findings, where some studies indicate student resistance (Brantlinger, 2007, 2014; Frankenstein, 1990) and other studies indicate students feeling empowered by SJM (Gutstein, 2006; Yang, 2009). In addition, students’ reactions to Social Justice Pedagogy (of any subject area) appear to differ substantially depending on students’ level of privilege and/or marginalization (e.g. Camagnian, 2009; Seider, 2008; Swalwell, 2013).

This comparative case study focuses on two sixth grade mathematics classrooms, one in an elite private school and the other in a Title I public school. The present study investigates how teachers’ and students’ backgrounds and their experiences with privilege and/or marginalization influence how they make sense of SJM, with consideration of the fluid and context-dependent nature of privilege and marginalization (Hulko, 2009). Findings indicate the two case study teachers’ SJM goals were influenced by their own lived experiences and by the populations
they teach. Similarly, students’ takeaways of SJM differed by background, where students of privilege learned to empathize with others, gaining a more theoretical understanding of social justice as relevant to the lives of others. On the other hand, students of historically marginalized backgrounds responded to SJM activities with strong emotional reactions (e.g. anger, sadness) because the social issues explored in the activities were intimately related to their own lives.

These results suggest different supports are appropriate for different students for SJM to be successful. For students of historically marginalized backgrounds, the teacher’s sociopolitical consciousness is fundamental to his or her ability to develop meaningful SJM activities relevant and sensitive to students’ backgrounds. For students of privileged backgrounds, SJM work is supported with a school-wide social justice focus.
Chapter 1 Introduction

Introduction

Anecdotally, mathematics teachers across the nation, of both public and private schools, appear to be showing increased interest in a form of mathematics pedagogy commonly known as Social Justice Mathematics, or SJM, as evidenced by the 2013 release of the second edition of *Rethinking Mathematics* (Gutstein & Peterson, 2013; a book of SJM lessons), teachers’ attendance at conferences that address SJM (e.g. Creating Balance in an Unjust World, Free Minds Free People, Teachers 4 Social Justice). In addition, SJM organizations like The Algebra Project and Young People’s Project continue the work they started in 1982 and 1996 respectively (The Algebra Project, n.d.; The Young People’s Project, n.d.). Educators’ increasing interest in SJM has recently been recognized by the major mathematics education organizations as demonstrated by a Call for Collective Action to Develop Awareness: Equity and Social Justice in Mathematics Education, distributed in September 2016, by a group of ten organizations, including the National Council for Teachers of Mathematics, Association of Mathematics Teacher Educators, National Council of Supervisors of Mathematics, Journal of Urban Mathematics Education, and TODOS Mathematics for All (National Council of Teachers of Mathematics, n.d.).

Social Justice Mathematics is a mathematics-specific form of Social Justice Pedagogy (Frankenstein, 1983; Gutiérrez, 2002; Skovsmose, 1994), which aims to simultaneously teach mathematics content while developing *conscientização*
(Freire, 1970), or sociopolitical consciousness to “read and write the world with mathematics” (Gutstein, 2006). Despite a growing research base about the effectiveness of SJM, there is conflicting evidence about whether or not Social Justice Mathematics can accomplish either of these stated goals (Andersson, 2010; Brantlinger, 2007; Esmonde, 2014; Gutstein, 2006; Powell & Brantlinger, 2008; Turner, Gutiérrez, Simic-Muller, & Diez-Palomar, 2009). Furthermore, students’ reactions to Social Justice Pedagogy appear to differ substantially depending on students’ privilege or marginalization (e.g. Camagnian, 2009; Seider, 2008; Swalwell, 2013).

The present study explores how students’ backgrounds and lived experiences, considering their experiences with privilege and/or marginalization, influence their takeaways from SJM and their development of sociopolitical consciousness. This study also examines how teachers’ lived experiences, school contexts, and the student populations they work with shape their goals for SJM.

**Purpose of Study**

To explore how lived experiences with privilege and/or marginalization influence teachers’ SJM goals and students’ reactions to SJM, the present study uses a comparative case study method. This comparative case study investigates two middle school math classrooms whose teachers use SJM. One class was located in an elite private K-8 school with predominantly students of privileged backgrounds with a white teacher, and the other class was in a Title I public
middle school with predominantly students of historically marginalized backgrounds with a black teacher.

These two study sites offer opportunities to investigate how students’ and teachers’ backgrounds (e.g. race, class, where they live) influence how they make sense of SJM because of the differences of teachers’ and students’ backgrounds in the two school sites. At the time of data collection the elite private school enrolled predominantly affluent white students, but also enrolled approximately 20% students of color, and more than 20% of students received financial aid. The Title I school enrolled predominately students of color of low socioeconomic family backgrounds living in under-resourced neighborhoods. This study seeks to answer the following research questions.

1. How do teachers’ lived experiences and the student populations they work with influence their goals for SJM?
2. How do students’ backgrounds and lived experiences influence how they make sense of social justice mathematics?
3. What tensions and dilemmas arise when using SJM and how do teachers successfully navigate these challenges?

The present study addresses the need for mathematics education research to investigate issues related to race, class, and gender by explicitly investigating how different backgrounds shape how teachers and students make sense of SJM. Gutiérrez (2013) notes that in her review of JRME articles from 1999 to 2008 only 17 of 124 papers (not including book reviews), or roughly 14%, include issues of
race, class, gender, language, or equity (p. 22).

Not only are there few articles that explicitly address race, class and other identities, there are few that aim to analyze and report on students’ perspectives. Most of those that do are self-studies (Brantlinger, 2007, 2013, 2014; Gutstein, 2006; Yang, 2009), and only one study to date explores reactions of privileged students to SJM. Esmonde’s (2014) study of affluent students’ engagement with SJM found that students actually solidified their negative stereotypes of under-resourced neighborhoods. In addition, the results of K-12 students’ reactions to SJM are conflicting, where some find positive student results (Gutstein, 2006; Yang, 2009) and others find student resistance to SJM (Brantlinger, 2007).

Furthermore, previous studies do not closely examine how teachers’ and students’ different backgrounds (e.g. race, gender, socioeconomic status, type of school they attend) may influence their conceptions of SJM. This study intends to make sense of conflicting findings of previous studies and also explore how backgrounds of teachers and students may influence how they relate to SJM.

Learning about teachers’ SJM goals and how students perceive SJM, with explicit attention to teachers’ and students’ diverse backgrounds, helps the field understand that both teachers’ and students’ backgrounds matter when engaging in SJM. Studying and understanding these differences also helps make more targeted recommendations to support successful SJM. Not only do results suggest that backgrounds matter to teachers’ and students’ conceptualization of SJM, but results of the study also indicate that these cases are examples of successful SJM.
Overview of Chapters

I begin with Chapter 2 to discuss the conceptual framework that informs the study and define terms such as Social Justice Pedagogy, Social Justice Mathematics, marginalization, and privilege. I review the literature to describe previous related work and to highlight areas where research is needed. I describe how and why this study fills these holes in the literature and why the field will benefit from this study. Chapter 3 describes research methods and contextual information about the two school sites. Chapter 4 explores how teachers’ lived experiences and the student populations they work with influence their goals for SJM. Chapter 5 investigates how students’ backgrounds shape their takeaways, or development of sociopolitical consciousness. Chapter 6 focuses on how and why SJM was successful in both contexts, exploring five common tensions and dilemmas that the two case study teachers were able to overcome. The dissertation concludes with Chapter 7, which includes the overarching Discussion, Implications, Significance, Limitations, and suggestions for Future Research.
Chapter 2 Conceptual Framework

Social Justice Pedagogy and Social Justice Mathematics

Social Justice Pedagogy, or SJP, has been defined in a variety of ways and may also be referred to using other terminology such as teaching for social justice or critical pedagogy (e.g. Apple, Au & Gandlin, 2009; Chapman & Hobbel; 2010; Yang, 2009). SJP is a teaching approach that aims to develop students’ academic proficiency and students’ sociopolitical consciousness, or conscientização (Freire, 1970), to critically analyze and change the world (Apple, Au & Gandlin, 2009; Ayers, 2009; Cochran-Smith et al., 2009; Hackman, 2005; Picower, 2012). SJP centers the perspectives of marginalized groups, “where education is “rooted in the existential experiences of marginalized peoples; that it is centered in a critique of structural, economic, and racial oppression” (Duncan-Andrade & Morrell, 2008, p. 49). This study investigates Social Justice Mathematics, a form of SJP, in two classrooms.

Social Justice Mathematics and Marginalized Groups

Social Justice Mathematics (Gutstein, 2006) may also be referred to as critical mathematics (Gutiérrez, 2002) or Teaching Math for Social Justice (Bartell, 2013) and is a form of pedagogy conceptualized approximately 30 years ago based on the concepts of SJP (Frankenstein, 1983). Social Justice Mathematics has typically been defined with two main goals – that of increasing students sociopolitical consciousness and of increasing students’ proficiency in traditional or dominant mathematics.
Gutiérrez (2002) defines these dual goals using the terms *critical* and *dominant mathematics*. *Critical mathematics* goals include developing students’ sociopolitical consciousness to critically analyze social issues with mathematics. *Dominant mathematics* goals, on the other hand, address the mathematics assessed in high-stakes tests and favors the maintenance of the status quo (p. 150-151). The degree to which one is considered a member of the status quo or positioned as marginalized, privileged, or a complex combination of these, even contradictory combinations, may depend on space, time, and context (Reyes III, 2009).

Like Gutiérrez’s (2002) dual SJM goals of critical and dominant mathematics, Gutstein (2006) also describes SJM with Social Justice Pedagogical Goals and Mathematics Goals. Gutstein defines three Social Justice Pedagogical goals: “1) reading the world with mathematics 2) writing the world with mathematics, and 3) developing positive cultural and social identities” (p. 24). Mathematical Goals include “1) reading the mathematical world, 2) succeeding academically in the traditional sense, and 3) changing one’s orientation to mathematics” (p. 24). Bartell’s (2013) research on Teaching Math for Social Justice also refers to these dual goals of social justice goals and dominant mathematics goals.

SJM educators vary in how often they use SJM. SJM definitions by researchers do not offer recommendations for how often teachers should use SJM, or their recommendations have changed. In 2006, Gutstein for instance, wrote about his use of SJM projects 15-20% of his instructional time, and using a reform
based textbook (e.g. Mathematics in Context or Connected Mathematics Project) the remaining 80-85% of the time as a practitioner researcher (Gutstein, 2006, p. 41). In 2016, Gutstein described his own classroom where he used SJM to read and write the world through mathematics throughout the school year, the only study to date where SJM was used year-round, which differed from his work ten years’ prior where he used SJM 15-20% of the time. In this study I use Gutstein’s (2006) earlier characterization of SJM where he used it in his classroom 15-20% of the time.

For the purpose of this dissertation study, I also define SJM with the dual goals of critical mathematics (Gutiérrez, 2002), or Social Justice Pedagogical goals (Gutstein, 2006), and dominant mathematics, or Mathematical Goals. I also center the experiences of historically disenfranchised communities as defined by Gutiérrez (2002), “Critical mathematics… takes students’ cultural identities and builds mathematics around them in such ways that doing mathematics necessarily takes up social and political issues in society, especially highlighting the perspectives of marginalized groups” (p. 151). Like SJP’s centering of marginalized communities and critique of structural economic and racial oppression (Duncan-Andrade & Morrell, 2008), SJM includes critique of the structural nature of oppression.

**Marginalization, Privilege, Intersectionality, and Social Location**

Hulko (2009) uses the concept of social location to describe the dynamic, intersectional nature of identity, power and oppression. She defines social location
as “the relative amount of privilege and oppression that individuals possess on the basis of specific identity constructs, such as race, ethnicity, social class, gender, sexual orientation, age, disability, and faith” (p. 48). Hulko emphasizes that identities are intersectional (Crenshaw, 1994; McIntosh, 1988) and interlocking (Hill Collins, 2000) where strands of identities cannot be disentangled, and individuals must be viewed holistically. She emphasizes that social location describes an “externally imposed situation” where positive and negative qualities are imposed on individuals by those who may hold power to define others as “invalid” (p. 48).

Social location helps analyze how the multitude of students’ intersectional identities may influence how they are marginalized or privileged in certain contexts and how this may influence how they relate to SJM. For people of color in the United States, Solórzano and Villalpando (1998) define marginality for people of color as subordination specifically due to membership in race, gender, and class categories (p. 212). Students of color and/or poor students may also experience disadvantage by being assigned to under-resourced schools, that often lack basic resources (e.g. books) and supports such as programs for emergent multilingual learners, students with Individualized Education Plans, or gifted and talented students.

Opposite of marginalization, privilege has been defined as a set of advantages one group has over others, granted because of membership or perceived membership in (a) social category(ies) (e.g. race, class, gender, sexual
orientation, able-bodiedness etc.) (Howard, 2010, p. 79). Those who receive privileges are often unaware of the benefits they enjoy and may unconsciously act to preserve such benefits through denial (Freire, 1970; McIntosh, 1988) or by claiming to be marginalized rather than privileged (Choules, 2007; Norton & Summers, 2011). Even when one is conscious of privilege, oftentimes the benefits cannot be avoided (Swalwell, 2013, p. 6).

In education, class privilege may afford attendance at elite private schools with hefty price tags, or it may grant assignment to well-resourced public schools due to the wealth of the neighborhood where children live. Students of families without such economic resources send their children to neighborhood public schools, where school quality is often related to the socioeconomic status of its neighborhood (Figlio & Lucas, 2004; Holme, 2002; Kane, Riegg, & Staiger, 2006).

Students, who attend the two case study schools, a Title I public school and an elite private school, may have experiences of varying degrees of privilege and/or marginalization in different contexts. For instance, a white student from an affluent family may identify as LGBTQ\(^1\) and therefore experience marginalization (or privilege) in some contexts yet not in others or a mixture of both privilege and marginalization. These complex experiences with privilege and marginalization may influence how he or she may relate to social justice themes in an SJM project

\(^1\) Lesbian, Gay, Bisexual, Transgender, Queer

\(^2\) Statistics were rounded to rough numbers in an attempt to protect the anonymity of the city and district.

\(^3\) Superfund sites are among the most contaminated locations in the nation as designated by the Environmental Protection Agency.

\(^4\) I use the terms African American and black interchangeably. In this case, black means African American.
or activity. The present study seeks to take into consideration multiple identities, as these may influence students’ experiences with privilege and marginalization, thus influencing their reactions to SJM. For the purpose of this study, the terms privileged and marginalized are used, with the understanding that these are not absolute nor binary terms, and every person experiences some degree of both privilege and marginalization at different times in different contexts.

Literature

Social Justice Pedagogy with Privileged and Marginalized Students

Privileged Students. The research literature of social justice pedagogy with privileged students is limited, but scholars argue that SJP is important for students of privilege because they may grow up to hold positions of power and because social justice work calls for involvement of both the privileged and the oppressed (Curry-Stevens, 2007; Swalwell, 2013). Studies of white graduate pre-service teachers’ reactions to SJP reveal resistance, push back, and discomfort (Applebaum, 2008; Cochran-Smith et al., 2009; McDonald & Zeichner, 2009; Picower, 2012). Studies of reactions to SJP by K-12 students of privilege uncover similar findings of potential pitfalls, but with less resistance. Students of privilege may understand inequities in an abstract way distanced from their own lives (Swalwell, 2013), or students may feel guilt, fear, discomfort, and/or grief (Curry-Stevens, 2007).

Because privileged students do not have as many first hand experiences with oppression, their reactions to SJP may differ from students of historically
marginalized backgrounds. For instance, through pre- and post- survey analysis Seider (2008) found white privileged high school students’ support for educational equity declined after their enrollment in a “Literature and Justice” class, the opposite result intended by the course. Additional interview data indicated that upon learning of the circumstances of others (e.g. those living in poverty or homeless), students feared that they might become poor or homeless in the future. Seider argues that students blamed the poor for their circumstance to rationalize and preserve their conception of a ‘just world’ (p. 662).

Similarly, Esmonde’s (2014) case study of affluent Canadian students’ engagement with Social Justice Mathematics found that students’ harmful stereotypes of less-resourced neighborhoods were reinforced. Esmonde studied two seventh grade math classrooms taught by the same teacher engaged in a 40-minute World Wealth lesson adapted from Rethinking Mathematics (Gutstein & Peterson, 2013). She also studied a tenth grade math class taught by another teacher in a different school, where students compared resources available in nearby “high-poverty” neighborhoods to their own neighborhood through a four-day investigation. Students reinforced their own privilege and normalized their own privilege as the “normal” reference point.

Like Seider (2008) and Esmonde (2014), Swalwell’s (2013) case study of two social justice oriented social studies classrooms (one in an elite private school and the other in an affluent suburban public school), found that students of privilege conceived of inequity and oppression abstractly, as something that
happens “over there” to “them” (p. 90). She also discovered that the few students of color and the few from working or middle class backgrounds expressed perspectives more aligned with the goals of social justice pedagogy, where students recognized the power of systems of oppression and felt an empowered sense of agency to disrupt inequities at both structural and individual levels. She notes that the “weaker their ties to traditionally privileged racial and economic groups, the more likely it seemed that students were to express justice-oriented conceptions of citizenship that aligned with social justice pedagogy” (p. 105) where some students achieved an “activist ally” perspective supportive of social justice. However, she doesn’t dive deeper to examine these trends of how students’ backgrounds influenced their social justice stance. The present study aims to investigate students’ perspectives of SJM with elite private school students, some who were students of color and/or of low socioeconomic backgrounds.

**Students of Historically Marginalized Backgrounds.** Studies have found students of historically marginalized backgrounds feel empowered by Social Justice Pedagogy, as SJP intends (e.g Bigelow, 1998; Gutstein, 2006; Tan, 2009; Yang, 2009). Practitioner-researcher Camagnian (2009) found that seniors in his English class, of a Title I high school with 100% students of color, felt empowered by bonding as a group to identify collective struggles. Camagnian designed four curricular units where students wrote and performed a narrative, expository, research, and persuasive essays, as dictated by the district scope and sequence,
with topics chosen by students that related to their everyday lives. Students wrote about their personal experiences with gangs, violence, and family struggles. Camagnian helped students see connections between their personal struggles to understand the systemic nature of oppression. Camagnian investigated students’ feelings of empowerment through interview analysis. Students reflected explicitly on these connections from which they drew empowerment. One student explained, “In this class, it was the whole class. We were together. We were forming a bond. We were forming a unity and this unity formed, it just formed, a big fist that could just knock anything down…. It felt like we had power” (p. 505).

Similarly, a two-year history course that included Chicanx studies, critical race theory, and participatory action research in a Tuscon Title I high school helped students feel prepared for college and ready to make a contribution to their community (Cammarota & Romero, 2009). Likewise, in Yates and Youniss’s (1998) study of African American students in year-long social justice course, the authors explicitly relate students’ development of sociopolitical consciousness with their racial background, reporting that students discussed negative images of African Americans and their parents’ and grandparents’ adverse experiences as African Americans (pp. 503-504). While some may argue that Yates and Youniss studied privileged students because the site was a parochial school, it highlights the importance of racial identity and their experiences with marginalization. In addition, the yearly tuition was modest at $3,500, and the student body was 95%
African American (Youniss & Yates, 1997), bearing similarities to urban public schools.

Interestingly and in contrast to the findings just cited, studies have also found students of historically marginalized backgrounds to resist SJP (e.g. Applebaum, 2008), especially in mathematics (e.g. Brantlinger, 2007, 2014; Frankenstein, 1990; Wagner, 2007). This resistance with SJM may be more related to students’ dispositions toward mathematics than the use of SJP, where previous negative experiences with mathematics (Boaler, 2015; Lange & Meaney, 2011) may hinder willingness to engage in math class. Reluctance to participate in SJM activities may also be affected by the prevalence of gatekeeping exams in mathematics, where students prefer to focus on the math knowledge they need to pass such exams, rather than discuss social issues of their communities that they may know better than their teachers.

Social Justice Mathematics

Of the few studies that foreground students’ experiences with SJM, reactions from students vary, from students resisting SJM to those who express feeling empowered. Frankenstein (1990) reports that her college students, working class adults ages 30’s to 50’s with prior negative experiences in school, initially resist engaging in critical mathematics investigations. Frankenstein argues, “Some resistance comes from students having internalized the dominant society’s view that ‘the intellectual activity of those without power is always characterized as non-intellectual’ (Freire & Macedo, 1987)” (pp. 345-346). Student resistance in
critical mathematics may also be exhibited passively through silence or refusing to participate in class discussions (Wagner, 2007).

Likewise, Brantlinger (2007), encountered resistance to SJM through his instruction to students of historically marginalized backgrounds in a nine-week night school remedial math course in a Title I high school. Although Brantlinger found that SJM contexts engaged students who were not previously as engaged in his class, he also experienced push back. Brantlinger reports that by the end of the course many students felt more positively about critical mathematics, yet some students never fully approved of such an approach saying, “This is not math,” or we are “wasting time studying things that it doesn’t belong in this class” (p. 335-336).

On the other hand, Gutstein (2006) and Yang (2009) found that their students felt empowered, as intended by SJM. Their students were predominantly students of color, the majority of whom also qualified for free or reduced lunch. Gutstein (2006) analyzed students’ anonymous survey responses after two consecutive years of engaging in SJM with him as their teacher, where 21 of 26 students’ views about mathematics changed in a positive way. Gutstein reports that students responded that they learned to see math as being useful in real life situations, helpful to understand injustice, and learned that problems can be solved many ways (pp. 121-125). Similarly, Yang (2009) found his students to be highly engaged by their three-year involvement in a Youth Participatory Action Research project, which included SJM. Yang reports that students felt empowered by
learning of contributions of their ancestors and by feeling equipped with tools to advance oppressed people (p. 115).

These differences in students’ dispositions toward SJM are perhaps related to implementation of SJM. Brantlinger (2007) may have enacted SJM differently than intended (Lynch & Star, 2014; Remillard, 2005), misjudged his own implementation (Cohen, 1990), and/or missed elements of SJP, such as building caring relationships with students (Picower, 2012). Gutstein (2006) and Yang (2009) worked with students for two and three years respectively and were long-time members of the school communities. Gutstein worked in the school for 10 years, and Yang was a founding member of the school. Greater time with students may have allowed Brantlinger to build caring relationships with students and develop positive sociomathematical classroom norms (Yackel & Cobb, 1996) to support students’ mathematics learning.

Alternatively, these differences in outcomes may be because of students’ backgrounds. Brantlinger’s students were not allowed to attend the typical high school courses during the day due to behavioral reasons, and therefore enrolled in his night course. In addition, the course was a remedial math course. Students had previously failed the course and possibly held negative thoughts about mathematics as a subject. Students also faced multiple outside pressures as older students, all of whom were students of color, many of immigrant backgrounds, and many had children of their own.
Brantlinger (2007), Gutstein (2006), and Yang’s (2009) research are most informative to the present study because they investigated students’ perspectives, and they were K-12 students, whereas Frankenstein’s (1990) students were in college and much older. Powell (2009) has also written about students’ mathematics projects using SJM, but in a college class. In general, research about Social Justice Mathematics has focused primarily on teachers’ use of SJM, rather than students’ reactions to SJM. This literature indicates that teachers struggle to implement SJM in ways that both foreground its sociopolitical consciousness goals while also adhering to a high standard of mathematical rigor (Andersson, 2011; Bartell, 2013; Brantlinger, 2007, 2014; Gregson, 2013; Pais, Fernandes, Matos, & Alves, 2012; Turner et al., 2009).

Study of K-12 students’ perspectives in classrooms that use SJM is needed to investigate conflicting findings of students’ reactions to SJM (Brantlinger, 2007; Gutstein, 2006; Yang, 2009) and why SJP in mathematics may possibly be more difficult (than SJP in other subject areas) to garner student engagement. The present study focuses on experiences in middle school math classes because students’ interest and performance in mathematics often decline in the middle grades (Boe & Shin, 2005; Middleton & Spanias, 1999; National Commission on Excellence in Education, 1983; National Commission on Mathematics and Science Teaching for the 21st Century, 2000). The present study aims to further investigate differences in students’ reactions to SJM, possibly influenced by students’ varied backgrounds and experiences of privilege and marginalization.
Chapter 3 Methods

Research Design

Rationale for Methodology. To answer these research questions, I conducted a comparative case study using purposive sampling. A case study is “an exploration of a ‘bounded system’ or a case (or multiple cases) over time through detailed, in-depth data collection involving multiple sources of information rich in context” (Creswell, 1998, p. 61). A comparative case study using purposive sampling is appropriate to answer the research questions because the bounded systems to be studied are the two classrooms whose teachers use SJM. Purposive sampling is important for the present study because math teachers who use SJM consistently are hard to find. In addition, to explore differences by level of privilege or marginalization, the cases must include students of privileged and historically marginalized backgrounds, like the two case study sites, with both math classes taught by teachers who use SJM. Because students’ reactions to SJM are complex, multiple sources of information must be collected to answer the research questions about both groups of students.

Yin (1984) suggests six sources of information for case study data analysis: documentation, archival records, interviews, direct observations, participant observation, and physical artifacts (pp. 84-95). The present study collected the following data: SJM lesson handouts given to students describing SJM activities, publicly available records of student demographics, interview data with students and teachers, observation field notes, and student work.
Site selection and description. The two school sites were chosen because the two math teachers use SJM. I sought study participants who were already engaging in activities outside their schools to network and work with other social justice minded teachers. Prior to the study both teachers had been involved in social justice education events (e.g. workshops, teacher meetings, conferences) to support their efforts to infuse SJM in their math classes. I also sought teachers who were using mathematics to discuss social issues, rather than teachers who might be using equitable pedagogical practices (e.g. group work, developing students’ growth mindset) but without the explicit discussions of social issues with students. Initial visits to their schools and conversations with both teacher participants indicated their use of SJM with their students. Both teachers discussed how students explored social issues in their mathematics classes and their use of group work as a pedagogical practice. Both teachers also identified as educators who strive to use SJM.

While there is no study to date to count or identify SJM teachers, through my experience throughout the past 10 years with organizing the Creating Balance Conference on Mathematics Education and Social Justice, rarely does a teacher feel confident or proud of the SJM work in their own classroom. This made finding teacher participants quite challenging, especially finding a teacher in a private school and a teacher Title I public school. Teachers who engage in SJM often mention the challenges, their struggles, and their desire to both improve their SJM instruction and do it more often. This may be because of the need for help
creating SJM tasks, time to search for resources to create SJM tasks, and opportunities for training and coaching supports, targeted for SJM instruction. Conceivably, there may be teachers who engage in instructional practices that resemble SJM, through the use of Project Based Learning perhaps. However, this study aims to investigate teachers’ goals for SJM, which requires them to have an understanding of what SJM is and how it incorporates a critical political stance about students and their educational potential.

Middle school math classes were investigated because students’ interest in mathematics typically declines in the middle grades (Middleton & Spanias, 1999), and performance on international assessments drops in the middle grades in comparison to other industrialized nations (Boe & Shin, 2005). The elite private school worked with predominantly students of privileged backgrounds, and the Title I middle school worked with predominantly students of historically marginalized backgrounds. Both schools were located in Goldenview, a city in the Bay Area, California, where almost half of its residents identified as people of color and more than 40% of its residents spoke a language other than English at home (U.S. Census, 2015). All city, neighborhood, school, teacher, and student names are pseudonyms.

During the time of data collection for this study, 2016-2017, housing costs in Goldenview outpaced any other city in the nation. The median monthly rent in Goldenview was $4,400, and the median home value was $1.1 million dollars. Housing costs were so high that even an income of $105,000 was considered “low
income” in the Bay Area for a family of four by the United States Office of Housing and Urban Development, (de Guzman, 2017). To afford to live in the Bay Area on a minimum wage salary, one needed to work 4.7 full time jobs to afford a two-bedroom apartment (Arnold et al., 2014). These rising housing costs and rapid gentrification pushed many families out of the Bay Area to locations 50 miles away or more (Abramsky, 2016). Not surprisingly, at this time Goldenview also had the second highest homeless population in the United States (as measured by homeless residents per 100,000 residents) (Palomino, 2016).

Claremont Day School, an elite private K-8 school, was chosen as a case study site because the math teacher Mrs. Dodd used SJM in her classroom. The school had an Equity and Social Justice focus with “Multicultural, Equity, and Social Justice” Learning Standards, and sets aside “ESJ days,” or “Equity and Social Justice days” devoted to students’ investigation of social issues such as income inequality, gender identity, and cultural background differences. The annual tuition (for the 2015-2016 school year) was almost $30,000, and approximately twenty percent of students received tuition assistance. Claremont’s student body was approximately 70% white, 20% multiracial, and 10% Asian American, African American, Latinx, and Native American combined (NCES, 2014).

Claremont attracted “progressive families” as characterized by the principal, the sixth grade Humanities teacher, and Mrs. Dodd, the case study teacher who taught sixth grade math. The city of Goldenview itself was largely
progressive, where approximately 85% of voters were registered as Democrats and less than 10% of the city’s residents were registered as Republicans (Leip, 2016). Most Claremont families lived in Sunnyside, an affluent community where the median household income was $128,000 (Goldenview Health Improvement Partnership, 2016). Sunnyside residents were highly educated, with 76% holding a bachelor’s degree or higher, and only 1% without a high school diploma (Goldenview Health Improvement Partnership, 2016). The neighborhood had many busy restaurants and access to produce and other fresh food sources.

The case study teacher Mrs. Dodd, 30, was a white woman from Michigan. She taught sixth grade math, and she was in her ninth year of teaching. She previously taught Humanities in Title I charter schools in Michigan and Indiana. She designed two SJM projects during the 2016 fall term, one that explored the rising housing costs of Goldenview and the other that investigated inequities in neighborhood resources. She attended events to learn more about social justice issues, such as SJM workshops and social justice conferences (e.g. People of Color Conference for independent schools, Teachers 4 Social Justice, and Creating Balance in an Unjust World).

The second school site, Innovation Tech, was a STEM-focused Title I public middle school, serving grades six through eight. The student body of Innovation Tech was comprised of predominantly students of historically marginalized backgrounds. Roughly 40% of students were African American, 30% were Latinx, 15% Asian American, 5% Multiracial, 5% White, and 5%
Declined to state (Goldenview Unified School District, 2016). A little over 10% of the student population were emergent multilingual students, more commonly referred to as English Language Learners, and over 20% had Individualized Education Plans, or IEPs, and qualified for extra supports². The school was new, within its first few years in existence, and had endured high turnover of teachers and administrators and struggled with discipline and safety issues (Gaensler-Debbs, 2016). It was located in Stoneview, one of the most economically and environmentally depressed neighborhoods of the Goldenview. The Stoneview neighborhood was previously designated a Superfund site by the Environmental Protection Agency³ from toxic waste. The city dump, power plant, and sewer were all located in Stoneview. Stoneview residents suffered from asthma and cancer at higher rates than the rest of the city. Many families lived in a housing project in Stoneview, but this housing facility was currently being transformed to mixed income housing, which also pushed residents from their homes. Only 22% of residents in Stoneview had a bachelor’s degree, and roughly 30% did not have a high school diploma (Goldenview Health Improvement Partnership, 2016).

Almost 70 percent of youth in this neighborhood had been exposed to an Adverse Childhood Experience, or ACE, such as witnessing domestic violence, having an incarcerated parent, or a parent who suffers from mental illness,

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² Statistics were rounded to rough numbers in an attempt to protect the anonymity of the city and district.
³ Superfund sites are among the most contaminated locations in the nation as designated by the Environmental Protection Agency.
experiencing abuse or neglect, or parents go through a divorce (CDC, 2013). ACEs negatively influence children’s overall wellbeing and performance in school, where children exhibit low engagement in school and unproductive, sometimes harmful behavior. Data from the National Survey of Children’s Health indicate that more than 40% of students who have, experienced three or more ACEs demonstrate negative outward behaviors, such as bullying, arguing often, or being cruel to others (Moore et al., 2014). This data is included to describe the challenges faced by the community due to economic, environmental, educational, and occupational oppression, not to pathologize residents of Stoneview or students of Innovation Tech.

The sixth grade math teacher Ms. Charles, 32, was a black woman⁴ who was born and raised in Goldenview. She lived in Goldenview after leaving the area for college and for a few years of working in corporate America. She attended a prestigious historically black college and returned to Goldenview for her teacher education program and to begin her teaching career. She attended a teacher education program with a strong social justice focus, and she became a teacher to specifically to work with students of color. In the case study class, eight of the 22 students had IEPs. Therefore as mandated by state law, a special education teacher was assigned to co-teach with Ms. Charles every day. Ms. Charles explicitly aimed to empower students in her class through SJM lessons to learn about

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⁴ I use the terms African American and black interchangeably. In this case, black means African American although the term black generally also encompasses people who identify as Afro Latinx, West Indian, and other identities from the African diaspora.
relevant local social issues and to grant students access to the mathematics through the contexts she used in her SJM activities. She attended events to learn more about social justice in mathematics, such as the Creating Balance Conference on Mathematics Education and Social Justice. She was in her fourth year of teaching, but had been a teacher in other capacities (e.g. summer programs, substitute teaching) for 14 years.

These two teachers were chosen because they used SJM and their school settings (private and Title I) fit the contexts needed to answer the research questions. Further, I did not know the teachers well, which helps attend to issues of potential bias.

**Researcher Positionality**

As a former math teacher in Title I schools for 11 years who identifies as a person of color and co-founder of the Creating Balance in an Unjust World Conference on Mathematics Education and Social Justice, a nationwide (now biennial, formerly annual) conference started in 2007, I bring my perspective as a teacher and my experience in the field of Social Justice Mathematics to this research. I strongly identify as a fellow teacher to my participants and therefore consider myself a colleague, not an expert in this work. My teaching experience brings me to this dissertation topic due to the dilemmas and challenges I experienced when considering incorporating SJM into my own instruction.

As a classroom teacher for ten years at Vanguard High School, a Title I school in New York City, I struggled to introduce Social Justice Mathematics
topics to my students. I did not feel that it was appropriate for my students, almost all African American and Latinx and from low socioeconomic backgrounds, to investigate stop and frisk or college entrance statistics, and especially not with me as their teacher, an Asian American woman from California. While some students may feel empowered through investigating these statistics, I worried about stereotype threat hindering students’ achievement, and I also wanted to celebrate my students’ strengths and improve their mathematics achievement, not necessarily highlight negative statistics in their communities. My questions about how to engage in social justice mathematics effectively are what bring me to this dissertation topic. As a former teacher with close relationships with students, students’ voices are essential to my work and influenced my decision to include students’ perspectives of SJM for this dissertation study.

The two participating teachers know me through my organizing work with the Creating Balance conference, and therefore may be more open, honest, and trusting of me because of my experiences with Social Justice Mathematics. However, my eleven years’ teaching experience in Title I schools and my own K-12 Title I public school education, also presents potential bias, where I may favor or better understand the work of the Title I public school teacher over that of the teacher in the elite private school.

Throughout the data collection process I conferred with Mrs. Dodd on a weekly basis as requested by her. Mrs. Dodd agreed to participate in the study because of my experiences with SJM and the potential support I could offer her.
We met on a weekly basis where Mrs. Dodd asked my input on projects she was designing or in the midst of. For instance, she asked my opinion about whether or not to include data on the changing racial demographics of Goldenview, as discussed in Chapter 6: Tensions, Dilemmas, and Successes of SJM Instruction. I offered the same to Ms. Charles, but did not end up in a coaching or advisory role due to her time constraints with her multiple obligations at the school (e.g., as the leadership advisor, union representative, Complex Instruction lead). I primarily assumed a “hands off” role and only offered my opinions when asked.

To be mindful of my potential bias, due to my own experiences with attempting SJM with my high school students of color in a Title I public school, I included my comments and feelings throughout field notes denoted “OC” for observer comments (Bogdan & Biklen, 2003, p. 151). Inclusion of my comments, marked as observer comments, aims to separate my reactions from actual incidents I observed. I also wrote reflexive memos about my reactions, wonderings, fears, and breakthroughs (Paulus, Lester, & Dempster, 2013) to “untangle the personal from the theoretical” (Kleinsasser, 2000).

**Data Collection**

I collected multiple sources of data as recommended for case study analysis (Stake, 1995, pp. 107-116; Yin, 1984, pp. 84-95). I engaged in participant observation in both classrooms, three times per week for the duration of the fall term of the 2016-2017 school year, for a total of 80 classroom observations. Both teachers engaged in SJM activities for approximately 12 instructional days of the
fall term, similar to the percentage of instructional time SJM teacher and scholar Rico Gutstein (2006) devoted to SJM lessons with his middle school students in his earlier work. I wrote field notes during and after each observation, and I wrote analytic memos weekly, or after every three classroom observations, following Ely’s (1991) recommendation of memo writing.

I recruited 19 focus student participants, 10 from Claremont and nine from Innovation Tech, from diverse backgrounds. The focus students were selected by their response to the permission slip and letter sent home to families. The first 10 and first nine students to return permission slips from Claremont and Innovation Tech respectively were chosen as the focus students for the study.

Methodologically, the present study is informed by the work of Swalwell (2013), Turner et al. (2009), and Brantlinger (2007) who investigated students’ reactions to SJP using multiple data sources from focal students, such as interviews, student work, and observations. I interviewed focus students one-on-one two times throughout the term. These multiple interviews allowed for development of rapport and offered the ability to analyze potential change in students’ disposition and attitudes over time. The student interview protocol for the present study is informed by protocols used by Brantlinger (2007) and Gutstein (2006). I interviewed the two case study teachers three times throughout the semester. I also interviewed the sixth grade Humanities teacher and the principal of Claremont. Because I analyzed data as I collected it, I noticed the importance of school context in both Mrs. Dodd’s and her students’ conceptions of SJM, and
therefore engaged in these two additional interviews. (See Appendices A and B for the Student and Teacher Interview Protocols). Interviews totaled 38 student interviews and eight educator interviews. Multiple interviews allowed for relationship building with student and teacher participants (Seidman, 2006, p. 21). I also collected assignments and selected student work, focusing on SJM projects from focal students. Data was stored using student pseudonyms to protect students’ identity.

Data Analysis

All interviews were audio recorded and transcribed through a transcription service. Interviews, observation field notes, analytic memos, and collected assignments were coded using a grounded theory approach (Glaser & Strauss, 1967) through a constant comparison method. Constant comparison involves developing grounded theory from the start of data collection (Krathwohl, 1998, p. 260). First, I began analyzing data through open coding and recoding, focusing on field note data because interviews were not scheduled until later in the term. I developed pattern codes to group codes into a smaller set of emergent themes (Miles & Huberman, 1994, p. 69). Using the constant comparison method, I continuously analyzed new data as it was collected to compare to previously collected data and their associated codes and themes to support or refute developing theory. Weekly analytic memos helped to document emergent, conflicting, and revised themes. Lastly, I created profiles for each of the 19 focal students by creating a spreadsheet of notes from student work samples and
interview data. These 19 profiles helped engage in cross case comparison across
the two school sites (Stake, 1995), analyzing the 10 student profiles from
Claremont in relationship to the nine student profiles from Innovation Tech, to
investigate how students’ level of privilege or marginalization influence their
experience with and reaction to SJM.

Atlas.ti, qualitative data analysis software, helped triangulate data by
organizing multiple data sources and storing codes and memos. Documentation of
codes and analytic memos using Atlas.ti also helped attend to reliability,
indicating all steps taken in analysis to allow for potential replication of study by
another party with the same results.

Validity and Reliability

To address construct validity, I used multiple sources of evidence to
triangulate data. For example, to investigate how students relate to SJM, I
analyzed student interview data, interview data of their math teacher’s insights
about the student, observation data of the student, and selected samples of the
student’s work. In addition, I member checked with teacher participants (Stake,
1995, p. 115) and established a chain of evidence, by cross-referencing each
portion of the case study to methodological procedures and evidence (Yin, 1984,
p. 103). I address external validity by clearly explaining the context (e.g.
challenges of the school site, backgrounds of students) and providing the rationale
the selection of the two case study classrooms.
To attend to reliability, I documented all steps taken to produce a case study protocol to clearly describe how the case study was conducted. I also created a case study database, including all notes from my research journal, archived code descriptions and memos in Atlas.ti, transcripts, and other case study documents (Gibbert, Ruigrok, & Wicki, 2008). This documentation and organization facilitates possible replication of the study by other researchers.
Chapter 4 Teachers’ Goals for SJM

This chapter focuses on Research Question 1. How do teachers’ lived experiences and the student populations they work with influence their goals for SJM? Mrs. Dodd at Claremont Day School (private) and Ms. Charles at Innovation Tech (Title I school) both taught sixth grade math, but differences in their student populations and their own lived experiences influenced their different SJM goals for students. This chapter analyzes how the student populations and the two teachers’ different lived experiences influenced their SJM goals.

Ms. Charles worked with students of color in a highly under-resourced neighborhood in a Title I middle school, Innovation Tech. Ms. Charles’s personal experiences with marginalization as a black woman from Goldenview influenced her SJM goals of increasing students’ mastery of dominant mathematics and math confidence. Her shared experiences with students, most of whom were black or Latinx from Goldenview, influenced her goal of creating SJM lessons sensitive of and relevant to students’ lives.

Mrs. Dodd worked predominantly with students of privileged backgrounds in an elite private K-8 school, Claremont Day School. Her own P-16 educational experiences as a poor white student in private schools influenced her understanding of power and privilege. Because she worked with students of such privilege, her SJM goal was to develop students’ empathy for others foster their sense of responsibility to “make the world a better place.”
I first investigate how Ms. Charles’s student population and her own lived experiences influenced her SJM goals, and then do the same for Mrs. Dodd. The comparative case allows the opportunity to explore how differences in student populations and teachers’ lived experiences (due to race, where they grew up, their experiences in school) may shape teachers’ goals for SJM.

Results suggest that teachers’ and students’ backgrounds and lived experiences matter to varying degrees to how the case study teachers conceptualized goals for SJM. Ms. Charles’s lived experiences influenced her transformative goals of SJM, while Mrs. Dodd held theoretical goals of SJM. I refer to Ms. Charles’s goals of SJM as transformative because her SJM goals aimed to increase students’ mathematics achievement and understanding of social issues in order for them to be empowered to transform their own lives and improve their community. I refer to Mrs. Dodd’s goals of SJM as theoretical because her goals for students did not aim to concretely impact students’ own lives. Rather her SJM goals were for students to gain empathy for others, based on an abstract notion of injustice that happens to other people distanced from themselves and their own lives because students had not been exposed to as many experiences with marginalization.

**Ms. Charles’s Transformative SJM Goals**

I first explain the student population Ms. Charles worked with at Innovation Tech. Second, I investigate how her lived experiences with being doubted as a black woman influenced her SJM goals for students to a) gain mastery of the
dominant mathematics and b) increase their math confidence by offering access to the mathematics through relevant social contexts. Third, I discuss how her shared lived experiences with her students influenced her third SJM goal of c) respectfully co-constructing students’ understanding of social issues.

**Student Population of Innovation Tech**

Innovation Tech students may have experienced marginalization due to their racial/ethnic, socioeconomic, and neighborhood backgrounds as poor students of color living in Stoneview, one of the most economically and environmentally depressed areas of Goldenview, as described in Chapter 3. The vast majority of students at Innovation Tech were students of color, where about 40% were African American, 30% were Latinx, 15% Asian American, 5% Multiracial, 5% White, and 5% Declined to state (Goldenview Unified School District, 2016).\(^5\) Innovation Tech was a Title I public school.

**Ms. Charles’s Lived Experiences: Others doubting her proficiency with the dominant mathematics as a black woman**

Ms. Charles constantly considered how she was perceived due to her race and gender, and emphasized how important it is to be proficient in the mathematics as a black woman. She even reflected on her own struggles with internalized racism and sexism. Internalized racism refers to the acceptance by people of color, consciously or unconsciously, of a racial hierarchy where the values and beliefs of the dominant culture are prioritized over those of...

\(^5\) Statistics were rounded to rough numbers in an attempt to protect the anonymity of the city and district.
nondominant groups. Examples include people of color referencing straight hair as “good hair” or Western features as beautiful (Kohli, 2014). Similarly, internalized sexism refers to devaluing or distrusting women, and/or valuing men over women. Examples include women agreeing with statements such as, “When it comes down to it a lot of women are deceitful,” or “I prefer to listen to male radio announcers than female” (Szymanski & Steward, 2010, p. 230). Studies have found that internalized oppression of racism and sexism experienced by African American women cause them psychological distress (Szymanski & Steward, 2010).

Interview questions asking about Ms. Charles’s goals for students and follow up questions to her responses led to her reflections on internalization of insecurities about her mathematics ability influenced by her race and gender. For instance, when asked about her goals for students she responded that she hoped her students could “move up” to the other sixth grade teacher’s class.

One of my resolves is to see if kids can move up to [the other sixth grade teacher’s] class. I feel like there’s something about being a young, black woman teacher that some of the kids like think that they’re better than me, right? I look like people who just don’t teach math, do not occupy the math space. So you already think that I don’t know what I’m doing. Her use of the term “move up” indicates that she thought students would do better in the other teacher’s class, a black male teacher in his 60’s, or that his class was somehow considered to be more advanced, when in fact his class was also an un-tracked sixth grade math class like Ms. Charles’s class. When asked to explain
more what she meant, she questioned her own worthiness as a teacher at the school. “I’m in this space (her school). Do I deserve to be in this space? Do I deserve to occupy this space?”

She explained why she felt this way, describing that she “lost a kid.” A father transferred his son from her class to the other sixth grade math teacher’s class. “I try not to let that bother me or hurt my feelings but it does. This guy has never met me before and then has assumed that I’m a bad teacher, and I can’t support your kid.” She continued, “And then I start to internalize that because my credential is not in math it’s in multiple subjects.” She added that when she is behind the other teacher (in terms of keeping up with the pace of the district scope and sequence she is expected to follow) she asked herself, “Does that mean I’m not as good of a teacher? Am I not giving them all the content? All of these insecurities, they bubble up and they fester, and they're ugly, and they give me a headache.”

During this same interview, and after she discussed the above concerns, when asked about her teaching style she responded, “For me focusing on the content is crucial and essential and important because, especially with kids of color like we can’t be reliant on other people and we also can’t just be okay with being just mediocre.” She emphasized that her students, all but one of whom are students of color, will be held to a higher standard, just as she believes she is. She

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6 In California multiple subject credentials are typically intended for teaching at the elementary school level, but they certify teachers for positions up to the sixth grade, authorizing subject-specific teachers in middle schools with a multiple subject credential to teach at the sixth grade level.
therefore paid great attention to the dominant mathematics content because of what she believes society expects or believes about her and her students (of color).

When asked about how she creates SJM lessons, during the third interview, she again raised the issue of the likelihood of being doubted as a black woman more than someone who is white and/or male. When asked how she is able to create SJM activities she responded, “This is so anti growth mindset, but creativity is a thing I’ve always been good at. I’ve always been a very creative person.” She described how she used her creativity “to make up songs and dances for the kids to learn concepts” when she taught preschool prior to becoming a sixth grade math teacher. She emphasized that for her, because she felt strong in her creativity, she focused on the mathematics content, and that the content was especially important for her as a black woman.

Sometimes I struggle with the content, and so for me because I know how to do the creative process, I focus on the content because being a black woman in this very white male world, I don’t want to get up there [to the front of the class] and sound like I don’t know what I’m talking about.

When I feel secure in the content I feel the freedom to be more creative in the process [of developing SJM lessons].

These sentiments indicate Ms. Charles’s consciousness of stereotypes with a desire to disprove negative perceptions of black women.

Ms. Charles also reflected that she often finds herself apologizing for being assertive because of stereotypes of black women being aggressive. When asked
about her role as a teacher she explained how she is similar yet different than a *warm demander*. Teachers who are *warm demanders* hold high expectations for students, with authoritative classroom management strategies, and communicate with students in culturally familiar ways (Ware, 2006). She responded to the question about her role as a teacher,

> My role is like a nurturer, a facilitator, a totalitarian but you hear the term warm demander. I think I’m more like a hot momma [laughs]. Warm demander works well for certain people, but I’m just my personality. And I’m a little aggressive, and this is one of the things that I find myself always apologizing for. I love our librarian. She’s a Japanese American woman and she’s always like, “Stop apologizing for being assertive and making decisions and being strong because if you were a white man we would be celebrating you for it.” And consciously I know that. I do, but the world is not checking for my people. And when I mean my people I mean educated black women.

Ms. Charles expressed acute awareness of stereotypes of black women, and explained her struggles to not internalize these negative messages. Critical race scholar Rita Kohli (2014) describes that many teachers of color experience internalized racism throughout their schooling experiences and that unpacking these experiences may help prevent teachers from reifying these messages of racial hierarchy with their students.
While Ms. Charles explicitly discussed struggles with internalized racism, she also framed her own experience as benefitting from privileges, such as “coming from a two-parent household,” with “college-educated parents who never lived in the projects,” and her attendance at well-regarded schools, both a prestigious public high school, with a test-based admissions criteria, and a well-known historically black college. She brought up how she perceived of these privileges, when answering the question of how she became a teacher. She explained that her graduate school experiences afforded her opportunities to unpack her experiences with privilege and marginalization. During this interview she continued explaining her perceptions of her own privilege wondering, “Why is it that I’m able to make it and survive and not everybody else?” She even used the language of feeling “guilt” about the privileges she’s had.

She explained, “I come from a privileged space because I have a lot of black and brown kids in my classroom. I also come from a privileged space because my principal doesn’t really come into my classroom.” Ms. Charles viewed her work, as a woman of color working with students of color, as a privilege. And the lack of oversight from her principal allowed her autonomy to create SJM lessons in lieu of the district lessons. However, because she was aware that as students of color their mathematics proficiency may be doubted just as she experiences, she worked to ensure that her students will be successful with the mathematics topics deemed important by the district’s scope and sequence. She aimed for students to a) gain mastery of the dominant mathematics and b) increase
their math confidence by accessing the mathematics through relevant social contexts. She also aimed to c) respectfully co-constructing students’ understanding of social issues. Next I discuss these three goals, one at a time.

**SJM Goal: Gain mastery of the dominant mathematics**

When asked what her goals are for her students Ms. Charles responded,

My number one goal is giving them the tools to be more math confident.

My secondary goal is to present an opportunity for them to have mastery of the math content. And the reason that mastery is my second goal is because if they get the tools they can gain mastery. If I have all the tools I need to build a house you don’t have to give me a house because I can build my own house.

When asked about advice she would give others who want to engage in SJM, she responded that she would tell teachers to “always start with the math” and “don’t try to make it as amazing as possible.” She warned against focusing too much on the social justice aspect of an SJM lesson at the risk of losing rigor in mathematics instruction.

You’re going to lose a lot because instead of you focusing on what you’re supposed to be focusing on – which is the math – you’re going to be trying to teach the kids about the Black Panther movement, which is great, but what does that have to do with teaching, for instance, absolute value and fractions?
Ms. Charles suggested that if a math teacher is interested in discussing social justice issues with students without mathematics content that they should start a lunch or after school club because “math class is not the space for you to go on a tirade especially if you’re working with a marginalized group that’s the pivot of oppression. You’re only dis-servicing them more by not giving them access to rigorous mathematics.”

Ms. Charles spoke passionately about the importance of rigorous mathematics instruction. Ms. Charles described her goals for students, “I am so determined for my kids to become math scholars. And this is what I tell them, ‘I need for you guys to be able to go into seventh grade with an arsenal of skills to be successful.’” She worked toward this goal of students’ mastery of the dominant mathematics by increasing their confidence in mathematics.

Ms. Charles’s SJM activities were mostly one-day lessons created in lieu of the district lesson plan in order to follow the district’s scope and sequence of the dominant mathematics. See Table 1 for a list of SJM activities and the math content they addressed. For example, to teach students rate, ratio, and proportion, she created an SJM activity called “Eating in my Community” that examined the proportion of corner stores to homes in both Stoneview and coincidentally in the Sunnyside neighborhood where most Claremont families live because it is known as an affluent community. Students used rate, ratio, and proportion to predict how many corner stores would be present amongst different numbers of homes. To teach percentages and fractions she created an activity called “Bills, bills, bills”
where students divided a paycheck to cover living expenses (e.g. rent, food, medical, transportation, technology) using a visual representation of percentages of a hundreds table with a grid of 10 by 10, or 100 squares.

Table 1. Mrs. Charles’s SJM Activities

<table>
<thead>
<tr>
<th>SJM Activity Title</th>
<th>Math Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Tweets</td>
<td>Signed numbers</td>
</tr>
<tr>
<td>Coroner Store: Food Deserts</td>
<td>Signed numbers</td>
</tr>
<tr>
<td>Rich Hood Poor Hood</td>
<td>Coordinate plane</td>
</tr>
<tr>
<td>Rich Hood Poor Hood Part 2: The Good, Bad, and Ugly</td>
<td>Coordinate plane</td>
</tr>
<tr>
<td>Where Money Makes All the Difference</td>
<td>Conversions</td>
</tr>
<tr>
<td>Bills, bills, bills</td>
<td>Fractions</td>
</tr>
<tr>
<td>No money more problems</td>
<td>Fractions</td>
</tr>
<tr>
<td>What quality of life can minimum wage workers afford?</td>
<td>Fractions</td>
</tr>
<tr>
<td>Eating in my community</td>
<td>Rate, Ratio, Proportion</td>
</tr>
</tbody>
</table>

SJM Goal: Increasing students’ math confidence through access to the mathematics through relevant social justice contexts

Ms. Charles explicitly mentioned that her primary goal was for students to become more confident in mathematics. She described math confidence as having “math oomph” and how providing contexts with social issues related to students’ own lived experiences helps grant students access to the mathematics. “I want to create a space where kids are able to talk about what they know and what they've experienced in life and pair that up with a mathematical concept so that they could make a connection.” She continued, “More importantly, when it’s time for them to recall, they have multiple ways to recall the mathematics.”

When asked for clarification about what “math oomph” is, Ms. Charles described “math oomph” as students’ confidence and status as a math learner, which she also referred to as “math swag.” “Swag” is a phrase that means “stylish
confidence” and derives from the word *swagger*, according to Merriam-Webster. She explained how even at the young age of 11 years old students come to middle school with feelings towards mathematics influenced by their K-5 experiences.

“At this age, kids have decided in their brain that they’re good in math or bad in math.” She continued with discussion of “math oomph” and “math swag.” “Kids who are good in math come in with this ‘math swag,’ and they dominate conversations, even if their math is right or wrong. Kids who don’t feel successful, they don’t think they have that ‘math oomph.’” Ms. Charles explained her belief that some students “need a little bit of more scaffolding that allows them space to jump in to the math thinking.”

She explained that students who do not have this confidence, “math oomph” or “math swag,” need an entry point to the content, using an analogy of playing Double Dutch.

It’s kind of like playing Double Dutch. When you’re Double Dutching and you’re waiting. You’re waiting for that perfect moment to jump in so that you can survive. Well, if you’re scared of the ropes, if you’re scared of the rhythm, then you’re just going to sit there and bob your head for the whole entire time. You’re never going to actually jump. And so I’m trying to help students find their rhythm or beat that they can feel successful and jump in and develop the math that they need to develop.

Ms. Charles worked to build students’ math confidence by situating the mathematics content in contexts that investigated real-life social justice issues.
relevant to students’ lives, such as discussing the need for a living wage instead of a minimum wage or investigating the availability of healthy foods in one’s neighborhood. These contexts allowed students to enter the mathematics or as Ms. Charles phrases it, to jump in to the Double Dutch ropes. She believed that students have more access to the mathematics when the content is connected to a context related to students’ lived experiences. Students who might struggle with the mathematics can participate in the activity through discussions about the context of the relevant social issue.

She elaborated about why this development of students’ math confidence is important even for students who may already have positive attitudes towards mathematics. “I have some pretty academically astute kids who are on top of their math. I push back on them.” She wanted them to have the tools to ask questions and persevere through challenges. She shared what she often tells her students. “It’s important that you struggle and see things differently so that when you have challenges, you have that rigor that you need to be successful around the math. If not then you’re just going to find yourself giving up easy or not reaching your full potential.”

Ms. Charles aimed to increase students’ “math oomph” or “math swag” by granting students access to the dominant mathematics through relevant social contexts. She looked for social contexts that students could relate to so that they could participate in class discussions even when they did not feel confident in the mathematics part of the SJM task. She was able to create SJM activities relevant to
students’ lives because of her shared lived experiences with them as Goldenview residents of color.

**SJM Goal: Co-constructing critical mathematics understanding**

When asked what SJM meant to her and her students during the first interview Ms. Charles emphasized her belief that social justice educators should not “indoctrinate students with our ideology” because “that’s the same thing that oppressors do.” She stressed that it’s important to be careful of the “one-sided narrative, that singleton truth.” She clarified, “It’s not to say that it’s not true, but we also have to remember that people’s experiences run the gamut.” She reflected and cautioned, “Sometimes we get so caught up in our beliefs that you’ve got to be like, wait a minute, I’m doing the same thing that I’m telling them to look out for.”

She believed that sociopolitical consciousness is co-constructed in the classroom, predominantly by offering students information and allowing them to engage in critical analysis and come to their own conclusions.

She emphasized that critical conversations are not about politics. Ms. Charles shared a story about a teacher who worried about a student who was a Donald Trump supporter and wasn’t sure how to engage in conversations about social justice in that class. Ms. Charles responded (to me in the interview not to the teacher),

So what? Don’t make this about politics, or Trump. Make this about issues that we can talk about. When you start attacking their beliefs, then you’re not able to have a conversation. I don’t want to talk about what political
party you support. Let’s talk about minimum wage jobs, let’s talk about the facts and the figures, and allow them to make their own connections. You may not change their minds. That’s fine. But they are able to have these critical conversations in the classroom, that’s what’s important. And you get to get the math in.

Ms. Charles strongly believed that critical conversations should focus on issues, and on mathematics, and that the goal is not to change students’ opinions.

She even discussed how she scaffolds and prepares students to engage in critical conversations. When asked what social justice meant to her and her students she explained that she is “introducing them to this mindset and this thinking” she aims to give students an “entry pathway that is more low-risk and then eventually we can build it up.” She stressed that offering students these low-risk opportunities to engage is “better than just coming out of the gate and being like, ‘We’re going to talk about something that’s really messed up in your community, and go!’” She raised this issue of making sure that SJM educators do not “indoctrinate” students in all three interviews, and she often discussed this in conversations with me after class.

Ms. Charles described examples of how she manages her own beliefs to allow for students to come to their own conclusions. “I try to frame it to be like, ‘What do you think? What do you think should happen? How will you think that will work?’ And I think that’s very helpful in supporting the kids in what they’re thinking.” By asking open-ended unbiased questions rather than making
statements about her own beliefs, she gave students space to come to their own conclusions about issues in their community.

For instance, this was seen in her pedagogical moves during the “Rich ‘Hood Poor ‘Hood” activity as well as discussed explicitly during her interviews. She explained her intention in creating the title “Rich ‘Hood Poor ‘Hood” rather than using words “good” or “bad” (for a title such as “Good Neighborhood Bad Neighborhood”) for an SJM activity exploring inequities in neighborhood resources.

I was purposeful with the title because I wanted students to come to their own conclusion that there is no such thing as a good or bad neighborhood. These are results of systematic oppression, lack of access to resources. Good things happen in poorer spaces, and bad things happen in richer spaces. I think there is power in those titles.

In the “Rich ‘Hood Poor ‘Hood” activity students were asked, “When you think of ‘good neighborhoods’ or ‘bad neighborhoods’ what words or phrases come to mind? What images do you see or think of?” Students investigated the availability of resources in “Neighborhood 1” and “Neighborhood 2,” where the location of each resource (e.g. hospital, school, tree) was represented by an ordered pair for the coordinate plane. Ms. Charles consistently questioned students’ generalizations about both so-called “good” and “bad” neighborhoods. In class when engaging in conversations with students during this activity, she did not emphasize one opinion more than another. When students made
generalizations about affluent neighborhoods (e.g. “they are lonely and upset”), she asked if they stereotyped. Likewise when students made generalizations about an under-resourced neighborhood (a student called Neighborhood 2 “the ghetto neighborhood”) she asked, “How do you know it’s a ghetto neighborhood?” Not only did she question their stereotypes of both “good” and “bad” neighborhoods, she did not attempt to steer students toward thinking that the situation was necessarily unfair. In fact students did not even bring up the fact that it was unfair that Neighborhood 1 had more resources than Neighborhood 2.

Rather, Ms. Charles transitioned students to thinking about what resources are needed for all communities by moving on to Part 2 of “Rich ‘Hood Poor ‘Hood.” Part 2 focused on designing a neighborhood layout with resources that all community members would need while practicing their use of the coordinate plane. The activity first asked students to consider the following questions, which she instructed them to answer with their groups. “What do we need in a neighborhood for it to benefit ALL members in the community? Why are those things important to all community members regardless of how much money they make? What did you notice about the communities that have the less desirable neighborhood?” She allowed students to come to their own conclusions and maintain their opinions about the various neighborhoods and their resources. The only area where she made an attempt to guide their thinking about community assets was to encourage them not to stereotype about any neighborhood, their own or other people’s neighborhoods. As just described, when students expressed their
opinions, Ms. Charles offered questions, such as “What did you notice?” or “How do you know this?” but did not make statements about what she wished students to arrive at.

Ms. Charles was careful not to overly influence students’ political views and opinions. SJM and social justice pedagogy have been accused of “brainwashing” students (e.g. Dover, 2013; Hess, 2004). SJM scholars have discussed this dilemma of how much the teacher should share of his or her viewpoints and what perspectives should be presented to students with the actual SJM tasks without clear conclusions or recommendations (Gregson, 2013; Gutstein, 2006; Turner et al., 2009). As described in the example above Ms. Charles actively worked to withhold her own opinions, honor students’ viewpoints, and present information for students to draw their own conclusions, to co-construct critical mathematics understanding with her students.

**Ms. Charles’s Shared Lived Experiences: Respect for Students’ Backgrounds**

Ms. Charles was conscious to make sure that students did not feel ashamed or embarrassed about where they were from, when engaging in an SJM activity that discussed missing resources from their community or school (e.g. lack of green space). She understood the delicate balance of drawing on students’ backgrounds and lived experiences while also being sensitive to their feelings about where they were from. She explained how she is mindful of this when designing SJM activities.
I don’t want there to be any shame or any sense of ‘less than’ when engaging with these lessons. That’s one of those big caution signs, when discussing inequities and engaging students in rigorous conversations, I don’t want kids to feel any less than [others] because of where they are from. That’s super important in the work.

Because of her shared experiences with students and their families she was able to create SJM tasks that were relevant and sensitive to students’ lives, so they did not feel “less than.” As a black woman born and raised and currently living in Goldenview, Ms. Charles had shared lived experiences with her students, all of whom but one were students of color, and most were African American and Latinx. Like her students, she attended Goldenview public schools for her K-12 educational career. As a single mom in Goldenview she was personally impacted by the exorbitant costs of housing, the highest in the country.

During one of the SJM activities where they investigated inequities in community resources she shared a story of her father’s friend who had a severe back injury, but the ambulance refused to come to his home claiming that the neighborhood was too dangerous. Instead, they told him to move, by walking and crawling, to a location the ambulance was willing to drive to. This movement with his injured spine later caused his death. Ms. Charles told me after class that this actually happened in Stoneview, the neighborhood where the school is located and where many students live. However, she intentionally avoided telling them that it happened in their neighborhood because she did not want them to feel bad about
their community or feel ashamed of where they live. Many students referred to the importance of healthcare with this story as an example in their written work.

Ms. Charles’s shared experiences helped her navigate the delicate balance of creating SJM tasks that related to students’ lives, giving them opportunities to discuss injustices, without making students feel bad about their circumstances. Ms. Charles shared her fear of SJM being used by educators without sociopolitical consciousness or knowledge of students’ communities.

My fear is that it (SJM) will be corporatized where Pearson will package this and make problems about Jerome living in the projects and his mom is smoking weed, where stories of marginalized people don’t include the depth, beauty, and complexity of the issues we are dealing with in this world. This transformative thing will become the biggest form of oppression for kids.

Ms. Charles was careful to engage in discussions about social inequities in ways that did not frame students’ neighborhoods in deficit ways. She was sensitive to students’ feelings about where they were from, and she honored students’ perspectives and viewpoints. She aimed to present information about social issues to students to invite them to come to their own conclusions.

**Summary of Ms. Charles’s Transformative SJM Goals**

Ms. Charles’s student population and her lived experiences as a black woman influenced her SJM goals of ensuring students’ mastery of the dominant mathematics by increasing their math confidence by accessing the mathematics
through meaningful social contexts. Ms. Charles was always aware and conscious of how she was perceived, where her mastery of the content is important because of scrutiny she faced as a black woman in “this very white male world.” Because of these experiences as a woman of color she wanted to ensure that her students of color also gain a strong grasp of the mathematics. She aimed to teach students the dominant mathematics by creating SJM activities that offered students access to the task through contexts relevant to their own lives. Ms. Charles’s ability to create these relevant tasks was supported by her shared lived experiences with students and her knowledge of and sensitivity to their living situations.

Applying the SJM framework of the dual goals of critical and dominant mathematics (Gutiérrez, 2002) or what Gutstein (2006) refers to as Social Justice Pedagogical goals and Mathematics goals, Ms. Charles’s SJM goals placed more emphasis on the dominant mathematics. She emphasized the importance of students learning the mathematics content consistently in interviews and in informal discussions after class. Ms. Charles also wanted her students to increase their sociopolitical consciousness and expressed the importance of allowing students to come to their own conclusions.

**Mrs. Dodd’s Theoretical SJM Goals**

Mrs. Dodd taught students of privilege, and she herself had experiences of both privilege and marginalization. These experiences influenced her SJM goal of students recognizing their privilege and developing empathy for those less privileged than themselves. Multicultural education scholar Diane Goodman
(2000) argues that fostering empathy, in concert with tapping into moral and spiritual values and self interest, may motivate people from privileged groups to support social justice. She defines empathy as “being able to identify with the situation and feelings of another person…. requiring both the capacity to share in the emotional life of another, as well as the ability to imagine the way the world looks from another’s vantage point” (pp. 1062-1063). She mentions research indicating that empathy is a “natural human inclination” (Kohn, 1990, p. 1063). Exposure to the stories and experiences of those who are marginalized in conjunction with learning about the systemic nature of oppression that leads to such marginalization can help foster empathy that may then help an individual to support social justice goals. Mrs. Dodd and her colleagues often appealed to empathy in an effort to foster students’ support of and commitment to social justice.

**Student Population of Claremont Day School**

Students at Claremont were approximately 70% white, 20% multiracial, and 10% Asian American, Latinx, African American, and Native American (NCES, 2014). Annual tuition was almost $30,000, with more than 20% of students receiving financial aid. Most students who attended Claremont lived in the Sunnyside neighborhood, an affluent community where the median household income was $128,000 in comparison to the overall city’s median household income of $84,000 (Goldenview Health Improvement Partnership, 2016).
The school was committed to equity and social justice in its curricular programming, and also engaged in “Equity and Social Justice” days where the whole school explored issues such as ethnic/racial identity in the lower grades and gender identity and sexual orientation in the upper grades. Students of Claremont may have had experiences of economic privilege because of their family’s financial backgrounds, and others may have experienced white privilege as well. Because many students came from privileged backgrounds, Mrs. Dodd aimed to support students’ recognition of their privilege and their ability to empathize with others. Her SJM goals were also shaped by her lived experiences as a white person who grew up poor and attended private schools.

**Lived experiences: Economic disadvantage and white privilege**

Like Ms. Charles, Ms. Dodd’s SJM goals were shaped by her personal experiences with privilege and marginalization. When asked how she became interested in issues of equity and social justice, she responded,

> I think I’ve always been interested in equity and social justice. My mom is super passionate about matters of equity. She’s always into politics, and thinking about poor people. My family is kind of poor, but we’ve had a lot of privileges as well being a white family, a middle class family. We’re just lower middle class.

She continued, describing that she “straddles the line of poverty and privilege” as a woman from a lower socioeconomic status but with white privilege. She understood her white privilege and the advantages it afforded her. She explained,
I know if I wasn’t white, my experiences in life probably would be pretty different.” She was from a family of lower socioeconomic status in Michigan and attended private Christian schools for her P-16 educational experiences. Her family paid for her education through an extended payment plan negotiated with the school, and her family recently finished these payments, 12 years after her high school graduation.

She explained that her schooling experience helped her recognize that some were more privileged than her and that she has more privilege than others. “As a poor person in a private school, I was always aware of other people’s privilege and where I fell in society, which I know was better than a lot of people but significantly less privileged than others.” Her school engaged in service learning where they volunteered outside the country in Mexico and Panama, which stressed to her the privilege that she has compared to others.

She characterized her mother as “a talker” who influenced many of her political views. Her mother would discuss social issues such as “financial corruption” and “people in power taking advantage of others.” She explained that she was exposed to political issues through her parents’ debates between her “very liberal” mother and “very conservative” father. As she got older, she and her mother shared their “mutual outrage against corruption” and opinions about other societal issues. She also took courses in college that opened her eyes to inequities in society and led her toward her desire to address social issues through education. She reflected on this college learning experience, “The more I got into it, the more
passionate I became about the reality that to have an equitable society, we need to have good education systems.”

Ms. Dodd did not express experiences with marginalization due to race/ethnicity as Ms. Charles did in interviews. However, she did mention privileges she was afforded as a white person. With regard to gender, she did not mention experiences of marginalization as a woman, although she often complained about gendered colors for baby clothes. Mrs. Dodd was pregnant during data collection for this study. She preferred gender neutral colors for her own baby, and chose not to find out the sex of her child until she delivered.

**Influence of the School Context**

The comparative case allows investigation of differences in teachers’ lived experiences that shape their goals for SJM. For Ms. Charles her lived experiences as a black woman and her students’ backgrounds, as poor students of color, influenced her SJM goals. For Mrs. Dodd, on the other hand, her SJM goals may have been shaped more by students’ backgrounds and her school setting than her own experiences. Claremont held school-wide “Equity and Social Justice” days, engaged with the community (e.g. community garden, charitable clothing drives, Pride parade), and teachers were expected to develop curriculum that teach students about oppression and social justice.

Claremont as a whole focused on students’ understanding of their privilege and their ability to empathize with others. Claremont had eight “Multicultural, Equity, and Social Justice” learning standards for students, three of which focused
on developing students’ ability to empathize – “Build community through empathy,” “Value diversity in their lives, seek out opportunities to learn from others, and appreciate cultural perspectives,” and “Demonstrate self-awareness in action: De-center themselves as standards of normality.” Not only were there social justice learning standards for students, but there were also social justice standards used to evaluate teacher performance. The rubric that administrators used to evaluate teachers on a yearly basis included explicit social justice goals, where teachers were expected to attend to social justice pedagogy in their lesson planning and instruction.

As I realized the importance of school culture at Claremont, I interviewed the principal to learn more about the whole-school focus on social justice. When asked about the origins of the school’s equity and social justice focus, the principal of Claremont described her sixteen years of experience,

Claremont has always articulated itself as a progressive school. When I came in 2001 [as a classroom teacher initially] the principles of progressive education were how it defined its philosophy. As a progressive school there is a social justice element of that pedagogy. Progressive schools contemplate that the purpose of school is to advance the democracy, to advance citizens’ engagement, and seize education as bringing momentum to that purpose of democracy. Obviously principles of equity and social justice are democratic principles. Whether that was happening explicitly with the children was hard to say [in 2001]. But now it’s very explicit. Part
of it is that we believe it’s the right thing to do. Kids here have a lot of privilege, and with privilege comes a lot of responsibility. And so we believe it is your job to understand your privileges and responsibility and to use your power for good.

She described how professional development for teachers at Claremont focus on equity pedagogy. When asked about professional development opportunities for teachers she explained, “Equity pedagogy is good pedagogy. So you’ll see a lot of overlaps with cooperative learning pedagogy and identity safe practices.” She described teachers’ engagement with Claude Steele’s work on stereotype threat through reading *Whistling Vivaldi*, coupled with learning about Dorothy Steele’s work on identity safe practices. She also mentioned inviting facilitators from Facing History to Claremont to lead training for teachers. Facing History is a nonprofit professional development organization whose mission is “to engage students of diverse backgrounds in an examination of racism, prejudice, and anti-Semitism in order to promote the development of a more humane and informed citizenry” (Facing History and Ourselves, n.d.). Facing History offers curricular materials as well as workshops for teachers to reinforce equitable pedagogical practices. In addition to these school-wide professional development opportunities, teachers’ individual professional development desires were funded, including costs for registration, travel and lodging, and substitute teacher coverage, to attend social justice related conferences and workshops (e.g. Teachers 4 Social Justice, Creating Balance in an Unjust World).
The principal mentioned students’ privilege and responsibility several times throughout the interview. She also discussed the importance of Claremont modeling how to be agents of change through the school’s participation in the LGBTQ Pride Parade and financial support of a shared community garden and pediatric cancer treatment center.

These kids have a lot of privilege, for some of them it’s economic and educational, and for others it’s just educational privilege. We can see more and more in the world how that privilege rewards people with opportunity, and it’s absolutely my expectation that kids take their opportunities to make this world more equitable, more just, more fair, more kind, more happy. We try to make this space model that.

Because of this whole-school focus on equity and social justice, Claremont student participants in this study were also exposed to social justice themed lessons in their Humanities class. Students learned about resistance to the $3.8 billion dollar construction of the North Dakota Access Pipeline, through their study of ancient river valley civilizations. They explored essential questions such as, “Who has control of the water, who has access, and why do some people have more control than others?” and “Why do 95% of people work for 5% of the people?” These essential questions helped students connect issues of power and privilege from historical events to contemporary social issues. Their Humanities teacher also expressed her commitment to social justice pedagogy in the interview I conducted with her.
Mrs. Dodd, like the faculty as a whole at Claremont, worked to attend to social justice education with her students. The influence of school context, specifically Claremont’s commitment to social justice pedagogy, may in fact have had great influence over Mrs. Dodd’s social justice pedagogical goals.

**SJM Goal: Support students’ development of empathy for others**

Mrs. Dodd wanted her students to understand their privilege due to their parents’ economic status, (for some students their white privilege), and also their educational privilege. Mrs. Dodd focused on developing students’ ability to empathize with others throughout SJM projects. Mrs. Dodd clearly stated this goal in our first interview. When asked what her SJM goals were for her students she responded,

Since I teach a lot of privileged students at a private school, my goal is for them to recognize their privilege and for them to seek ways to develop empathy for people who have different experiences than them and then to seek ways to make the world a better place. So if they can be contributing to society or writing letters that help to increase affordable housing, which some of the kids when we were doing that [SJM] project said, “We should be writing the mayor,” and “What’s the mayor doing about this?” I’m thinking about adding that [writing a letter to the mayor] to Tuesday or Wednesday or at least make it an option for one of the homework assignments. I want my kids, most of all, to develop empathy so that when opportunities arise for them in life, they will be able to stand with people
rather than stand on the other side opposed to people who are experiencing things differently.

She explained that she wants to “make time for the things that are important” so that students see mathematics “as a tool for understanding the world” rather than focusing on “their personal achievements in math.” She offered students a greater perspective about the importance of school mathematics. She explained, “We’re emphasizing what math can help them do in the world and how they can help the world through math.” Mrs. Dodd described her perspective and students’ perspective. “To me, it’s about priorities, and I think to them, it’s showing them a priority is [their] understanding of social issues in relation to the math that we’re learning. I hope that it’s setting priorities for all of us.” She explained that she hopes students’ investigation of social justice issues in math class helps them “start to see the connection between their skills and their ability to make change, or to be passionate about change even if they don’t know how to make change. Caring about change happening is good.” Because her students were from privileged backgrounds, their conception of social justice was more abstract or more theoretical, where they hoped to help other people rather than transform their own lives.

When asked what are some tensions or dilemmas that she faced when using SJM, Mrs. Dodd discussed how she managed discussions of “controversial topics” by continually fostering students’ empathy by beginning with investigations of things that “we all have in common.” She continued, “There are challenges for
everyone living in Goldenview, and we can learn about our city through data and learning about the experiences of people.” She focused on experiences and struggles that they all had in common for the SJM projects. She explained, “It’s pretty non-controversial for the kids and it feels non-threatening because I’m inviting their experiences too. Everyone has an experience and everyone has challenges.” She believed that the SJM activities were relevant to local issues in Goldenview. She described that for students it’s “cool to understand more about why it’s so expensive or why they see protesters outside or why they hear things on the news about evictions because they all have personal experiences to tie into it.”

In her instruction, her SJM goal of developing students’ empathy was seen in her SJM projects. To start from something “we all have in common” she designed an SJM project to learn more about Goldenview, where all students lived, that she titled “Reading the Math of Our City.” This SJM project was an eight-day investigation of the rising costs of housing in their city. This was a relevant setting for students because the school was situated in Goldenview, and students lived in this city. Goldenview had the highest housing costs and some of the highest homelessness rates in the nation at the time of this study.

During this project students analyzed trends across 50 years of U.S. Census data of the city of Goldenview’s median rent, home value, number of residents, and median monthly income. Students calculated if it was possible to afford housing in Goldenview at the current minimum wage rate. They used measures of
central tendency to investigate trends, questioning what is different about the mean and median, and which was a better indicator of circumstances of typical residents.

One of the activities she designed for this project was a simulation called “Block City” where students experienced what power, privilege, and disadvantage feel like. Students were randomly given different numbers of blocks, ranging from two to 27 blocks. Five blocks were needed to sit down in a chair, otherwise students had to stand. The blocks were representative of money or rent to “afford a seat” in the class. Students expressed passionate feelings of fairness or unfairness when asked about this activity during interviews. (I was not present in class on this day, but students expressed their reactions to the activity in the one-on-one interviews I conducted.)

Throughout the “Reading the Math of Our City” project, Mrs. Dodd included opportunities for students to learn the stories of Goldenview residents, especially residents who were very different from them. Students read articles and watched short documentaries online to learn about the personal stories of Goldenview residents who were homeless, being pushed from their homes, and even Tech industry executives moving into the neighborhood. At the end of the second day of the project, she said to students, “Picture someone who is nine years old, three feet, 11 inches tall. Do you know this person?” Students responded almost unanimously with an emphatic, “No!” Mrs. Dodd emphasized with them, “Data can give us a picture, but it’s not an accurate picture of people’s experiences. Data can’t show us individual stories and experiences.”
During this project Mrs. Dodd designed a Mosaic Tile assignment where students were invited to profile a resident of Goldenview by sharing a picture, quotation, number, and symbol. Students explored websites that Mrs. Dodd suggested to them to learn more about the lives of residents who were homeless or being pushed from their homes. The websites included articles as well as brief documentary video clips, approximately five minutes long, of residents talking about their housing situations. These videos were very professionally crafted with humanizing accounts of Goldenview residents’ personal narratives. Students were also asked to browse three websites of nonprofit organizations working to help people of their city by supporting residents’ challenges of food, shelter, or healthcare.

Students created artistic displays of their Mosaic Tiles, and Mrs. Dodd had students write “artist statements” about why they chose the person they chose to profile. Mrs. Dodd also gave students the option of profiling a family member if they felt more connected to a family member instead of someone they learned about through their online investigation. Most students chose to profile a homeless resident or someone unable to remain in their apartment due to the rising costs of housing in Goldenview. These artistic tiles were displayed on the walls outside her classroom, and students engaged in discussions in class about the various residents profiled by their Mosaic Tiles.

Summary of Mrs. Dodd’s Theoretical Goals
I refer to Mrs. Dodd’s SJM goal of developing empathy for others as theoretical because it did not directly impact the quality of Claremont students’ own lives. This goal focused on students’ understanding of the lives of people who existed to students in abstract, theoretical ways because they were not people they met in real life, were related to, or interacted with in their real lives. When asked what the most successful part the “Reading the Math of Our City” project was, she responded that she was pleased with “students’ takeaways at the end” from their end-of-project reflections and Mosaic Tiles. “They really showed me what they’re capable of in their understanding of people’s experiences.” She discussed how the school’s social justice focus helped facilitate their development of empathic responses, noting that students at Claremont are “conditioned to be more empathetic and social justice minded that helped them be engaged in math when it really applied to our city and our world.” Just like Mrs. Dodd noticed, students’ expressions of empathy for others are evident in their interview responses. Analysis of interview data indicates Claremont students’ empathy for others, discussed in Chapter 5.

Referring to the SJM framework with dual goals of critical and dominant mathematics (Gutiérrez, 2002) or Social Justice Pedagogical goals and Mathematics goals (Gutstein, 2006), unlike Ms. Charles, Mrs. Dodd did not focus on the dominant mathematics. Rather her conceptualization of critical mathematics or Social Justice Pedagogical goals focused on developing students’ empathy for others. This differs from previous definitions of SJM, such as Rico Gutstein’s
(2006) Social Justice Pedagogical Goals of “1) reading the world with mathematics 2) writing the world with mathematics, and 3) developing positive cultural and social identities.” But developing empathy may be an appropriate Social Justice Pedagogical goal for students of privileged backgrounds. In fact, developing empathy for others may help students of relatively privileged experiences move toward becoming an “activist ally” (Swalwell, 2013).

Swalwell’s (2013) research on privileged students and Social Justice Pedagogy found that privileged students responded to social justice history in four different modes, one of which she calls the “activist ally.” The “activist ally” is the mode of thinking Swalwell hopes Social Justice Pedagogy will help privileged students attain. The student who is an activist ally has a sophisticated understanding of injustice, feels complicit in the inequitable systems of oppression that leads them to mobilize with marginalized groups. Swalwell (2013) draws on O’Connell’s (2009) concept of political compassion, where “storytelling, deep and humble listening, engaging all of our senses in understanding one another’s situations, dialogues about common concerns, and brainstorming about ways to create alternatives to the way things are” (O’Connell, 2009, p. 177, as cited in Swalwell, 2013, p. 155) results in the transformation of marginalized people, privileged people, and structures and institutions. Mrs. Dodd shared personal stories of homeless residents with her students through the “Reading the Math of our City” project through storytelling and engaging students in deep listening, which may help students gain political compassion to become activist allies.
Mrs. Dodd likely did not focus on the dominant mathematics because of her students’ educational privilege and access to resources. The admissions process for Claremont included evaluation of students’ academic proficiency, suggesting that students entered Claremont with strong skills. Additionally, the school did not officially serve students with IEPs who qualify for support services. The principal clarified that they remained committed to serving every student admitted, and some students shared with me their learning differences during interviews. These students sought outside services for evaluation of their learning difference as well as for ongoing academic supports. Students’ families had the financial means to afford these outside services. Because students’ academic needs were so well supported, Mrs. Dodd may have felt that focusing on the dominant mathematics was not as crucial.

Mrs. Dodd’s interest in social justice is similar to the white activists in Mark Warren’s (2010) study where “seminal experiences” influenced their commitment to social justice work. He characterizes white activists’ seminal experiences as “profound moral shocks… accompanied by powerful emotions, typically anger or outrage at injustice. These experiences make whites aware for the first time, the reality of racism” (p. 27). Mrs. Dodd’s experiences in a college course on contemporary issues sparked her passion for working toward an equitable society through education. She also shared “mutual outrage against corruption” with her mother.
Mrs. Dodd’s interest in social justice may have also been influenced by her membership in a social justice oriented school and by her relationships with her colleagues. Research on white activists has also found that personal and professional relationships influence white activists commitment to social justice. McAdam’s (1988) retroactive survey and interview study of the 1964 Freedom Summer volunteers’ efforts to register black voters during the Civil Rights movement found that white volunteers’ prior involvement and/or membership with civil rights organizations as well “strong social links” or friendships with others involved in the movement (p. 64). Many Freedom Summer volunteers continued to engage in activism after their voter registration work in the summer of 1964, where the hostile environment resulted in the death of four volunteers and repeated bombing, attacks, and arrests. The social justice focused climate of Claremont and working amongst colleagues also engaging in social justice pedagogy may have furthered Mrs. Dodd’s commitment to SJM.

Strong social links have also been found important to teachers of color engaging in social justice work (Kohli & Pizarro, 2016). I argue that at the time of the present study, Mrs. Dodd was beginning to build these relationships to both increase her sociopolitical consciousness and to support her ability to create SJM activities by attending monthly Radical STEM Educators meetings and social justice conferences (e.g. T4SJ, Creating Balance). Similarly, Ms. Charles attended social justice educator meetings, many of which were recently formed
organizations and some of which were specifically for teachers of color, one of which catered to black teachers’ needs.

**Comparison of Ms. Charles’s Transformative SJM Goals and Mrs. Dodd’s Theoretical SJM goals**

The comparative case of Ms. Charles and Mrs. Dodd helps understand how teachers’ SJM goals may be shaped by their lived experiences, the backgrounds of students they work with (e.g. socioeconomic background), and/or their school contexts. Ms. Charles held transformative goals of SJM to affect students’ real lives, whereas Mrs. Dodd conceived of SJM goals on a theoretical level, with the goal of students gaining empathy for people of less privilege, not closely connected to their own lives.

Differences in the two case study teachers’ transformative versus theoretical SJM goals and differences in their own background experiences raise questions of what targeted supports may help their engagement with SJM, and how these supports may differ based on the background of the teacher and his or her students. Results from the present study, of Ms. Charles’s experiences as a black woman, suggest that personal experiences with marginalization may increase sociopolitical consciousness and support teachers’ work with SJM. This is not to suggest that teachers who want to engage in SJM must be a member of an oppressed group or must have experiences with marginalization. Mrs. Dodd’s SJM work, for instance, was shaped both by her experiences with economic marginalization, her college experiences, her conversations with her mother, and
by her school’s focus on social justice pedagogy. In fact, her school context at Claremont supported her own development by offering opportunities to learn about social justice pedagogy with her colleagues as decided upon by the principal and through the school’s financial support of the SJM learning opportunities she pursued on her own (e.g. attending SJM conferences and events).

These differences suggest targeted ways to differentially support diverse teachers engagement with SJM. Teachers’ varying lived experiences with marginalization may shape how they view the world and how they conceptualize SJM. Supports that explicitly take into consideration the backgrounds and lived experiences of teachers may offer more targeted supports for teachers of backgrounds that may be marginalized. For instance, the annual Institute for Teachers of Color Committed to Racial Justice offers teachers and teacher educators of color opportunities to reflect on how their ethnic/racial backgrounds influence their work with students (Institute for Teachers of Color, n.d.). Other supports may take students’ backgrounds into consideration to offer teachers’ suggestions for SJM specific to their student population. A school-wide social justice commitment may further support both teachers’ and students’ engagement in SJM. The following Chapter 5 “Students’ Takeaways” focuses on how students’ backgrounds, lived experiences, and school contexts influence how they make sense of SJM.
Chapter 5 Students’ Takeaways

This chapter focuses on Research Question 2: How do students’ backgrounds and lived experiences influence how they make sense of social justice mathematics? To describe students’ takeaways I analyzed classroom observation field notes, student work, and interview transcripts from 10 focus students from Claremont Day School and nine focus students from Innovation Tech. Each focus student participated in two semi-structured individual interviews, and work samples were copied from SJM lessons and projects. Data analysis yielded three themes of students’ takeaways of SJM. This chapter discusses the three themes and how students’ backgrounds and lived experiences influenced their development of sociopolitical consciousness.

Results Overview

For students without lived experiences related to social issues of poverty, like most students from Claremont, they expressed empathy for those less fortunate than themselves. For those with experiences and/or personal connections to such challenges, like the students from Innovation Tech, they expressed emotions of anger and sadness. Privilege and marginalization are not binary concepts. Social location (Hulko, 2009) is helpful for the analysis of the present study because it includes a variety of identity constructs and considers the intersectional, fluid, and context-dependent nature of privilege and marginalization. Not all students at Claremont experienced privilege 100% of the
time, and not all students at Innovation Tech experienced marginalization 100% of
the time.

Students’ backgrounds and lived experiences influenced their takeaways, or
their development of sociopolitical consciousness. First, students expressed
heartfelt responses to the social issues discussed in the SJM activities. For students
who were unfamiliar with the experiences addressed in the activity, such as
homelessness or losing one’s home, they expressed empathy for others. For those
who were familiar with such challenges, for instance of struggling to pay rent,
they had strong emotional reactions, such as anger, sadness, worry, and frustration.

Second, students at both schools resisted negative stereotypes, countering
the idea that neighborhoods can or should be characterized as “good” or “bad.”
However, while students consistently asserted, “It’s not okay to use the words
good and bad to describe neighborhoods,” those without experiences in so-called
“bad” neighborhoods expressed stereotypical views of such communities. On the
other hand, students living in under-resourced communities, from both schools,
did not characterize their community negatively; they described their
neighborhoods as “quiet and peaceful,” and if they mentioned a troublesome
incident (e.g. a shooting near their home) they used phrases like, “We have good
days and bad days.”

Third, students overall were more engaged in the SJM projects and
considered them “fun” and “cool.” Behavioral engagement refers to students’
participation in class, such as contributing to class discussions and asking
questions (Fredricks, Blumenfeld, & Paris, 2004). I focus on behavioral engagement, rather than cognitive or emotional engagement because previous research on behavioral engagement use classroom observation measures that look for students’ participation in whole class and small group discussions as indicators of engagement (e.g. Stipek, 2002). Field note data indicate increased behavioral engagement through participation in whole class discussions, aligning with definitions of behavioral engagement.

Table 2 below offers background information about the focus students. The focus students were the first 10 and first nine students to return permission slips from Claremont and Innovation Tech respectively.

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<td><strong>Innovation Tech Students</strong></td>
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Heartfelt Responses

Students’ Backgrounds and Lived Experiences

Students’ heartfelt responses were heavily influenced by their backgrounds and lived experiences. Students with personal experiences and real-life connections to social issues investigated through SJM tasks reacted to these contexts with sadness, anger, and frustration. On the other hand, students of privileged backgrounds who expressed empathy toward those less fortunate, did not have personal experiences with housing struggles, therefore they viewed the circumstances of others in an abstract way distanced from their own experiences.

These findings are consistent with Swalwell’s (2013) case study of two social justice oriented social studies classrooms in affluent high schools, where she found that students of privilege conceived of inequity and oppression abstractly, as something that happens “over there” to “them” or connected the circumstances of those less privileged as the result of their own shortcomings rather than as a result of systematic oppression (p. 90). While Claremont students readily and consistently expressed empathic viewpoints, during class, in their written work, and in interviews, they understood the circumstances of others in an abstract way because they did not have personal experiences related to the experiences of homeless residents or those being pushed from their homes.

Despite this abstract notion of social justice, Claremont students’ expressions of empathy toward others less privileged than themselves is
promising, as this is the first study to show that SJM can achieve this outcome with students of privileged backgrounds. Previous research on SJM has found it to backfire, resulting in students’ reinforcement of negative stereotypes as found by Esmonde (2014), the only study of SJM with affluent students at the time of conducting the present study. In addition to Claremont students’ ability to feel empathy toward others, Octavia, a Claremont student who shared that her family members were also enduring housing struggles, understood the social issues discussed through the SJM projects with greater emotional proximity than her classmates. These issues connected to her personally rather than feeling empathy for someone else or in an abstract sense like her classmates. Students at Innovation Tech also experienced SJM activities in this way, as discussed later in this chapter.

**Expressions of Empathy from Students at Claremont**

Student interview data analysis indicates that nine of the 10 focus students from Claremont readily expressed empathy for those less privileged than themselves. Interview transcripts, student work samples, and observation field notes were coded with “empathy” using Goodman’s (2000) definition, when students expressed putting themselves in the shoes of someone less privileged, reaching out (e.g. to say hello or donate money) to someone in need (e.g. resident who may be homeless), and/or feeling sad or bad when learning unfortunate or challenging circumstances of others.

Mrs. Dodd’s goal for her students was for them to practice empathy and compassion for those less privileged than themselves in order to make the world a
better place. As discussed in Chapter 4 she aimed for students to “recognize their privilege and for them to seek ways to develop deep empathies for people… who have different experiences than them and to seek ways to make the world a better place.” Student interview data, student work samples, and observation field note data indicate that this goal was accomplished with the majority of her students.  

**Empathy for those less privileged.** Kyra, who has attended Claremont since kindergarten and is half South Asian American and half white, expressed empathy for others in class, her written work, and interviews. She often expressed how unfair she thought it was for residents who are homeless in Goldenview to be constantly harassed by the police to move their tents or how difficult it is for them to gain steady employment and housing. She reflected on what she’s learning in Mrs. Dodd’s class about social issues in her city.

Well, it makes me feel kind of bad because you know there are so many people who are struggling, and they don’t have what they need, and that’s sad to me because I can imagine what that might be like, but I can’t really relate you know, I’m privileged. I have homes and a great school and everything and food, but some people don’t have these things, and I can’t really relate, but you know it feels bad that not everyone is treated the same whether it’s the color of their skin and how much money they have or where they live.

Kyra splits her time between her mother’s home in Sunnyside, where most Claremont families live, and in another less-resourced neighborhood with her
father. Later in this chapter I share how she resisted negative stereotypes in how she framed her father’s neighborhood.

Like Kyra, Charles, a white student from the affluent Sunnyside neighborhood who has been attending Claremont since kindergarten, also expressed empathy for those residents who may be homeless by putting himself in their shoes. He shared his understanding of what residents who are homeless might feel like by referring to the “Block City” simulation conducted in class. On the first day of the “Reading the Math of our City” project Mrs. Dodd engaged students in a simulation where students were randomly given different numbers of blocks, ranging from two to 27 blocks. Five blocks were needed to sit down in a chair, otherwise students had to stand. The blocks were representative of money or rent to “afford a seat” in the class. Charles reflected on how not being able to afford a seat connected to the lives of those who are homeless. “I think that standing up it’s kind of like you see people on the streets, and it might be embarrassing for them sleeping on the sidewalk because they don’t have a home.”

He even questioned the concept of money and suggested a bartering or trade system. He asked, “Why did people invent money? What about trade?” He explained a different system and questioned the concept of money. “The Native Americans they could build stuff. Then they could trade, and that was their form of money. But now with money, some people have gotten really, really fortunate and some people haven’t.” Charles’s statements not only indicate an understanding of what others might be going through, but he also showed
awareness of larger systems and structures, e.g. capitalism, that may influence inequities in society.

Similar to Charles’s questioning of structural inequities, Scott, a white student from a neighborhood with an annual median income even higher than Sunnyside and a long-time Claremont student, explicitly discussed issues of fairness and privilege. He shared his feelings around what life is like for residents who are homeless, often living in tents on the streets of Goldenview. He said, “I feel like the government and the police aren’t fair to them, like sometimes they make them move but that’s their home. So I don’t think that’s fair, and I think that’s really a big problem.” Scott’s response suggests his understanding of structural issues related to power and privilege. As mentioned, the families of Claremont and the city of Goldenview hold very progressive viewpoints. On the day after the 2016 Presidential election, many students expressed their frustration, disbelief, sadness, and despair over the outcome. I asked Scott to restate his thoughts during the interview.

I know some people have been saying, “Oh we’re gonna die!” and I don’t think that they should say that because there are some people who won’t be affected directly. There are some people who will be, and some people who are less privileged and that will be affected from it. So I feel like instead of us worrying about us, who won’t be affected, we should worry about other people who will be affected.
Scott’s understanding of his own privilege and the desire to consider other’s lives before his own is rather remarkable. Mrs. Dodd also highlighted this comment to me after class because she was so struck by his level of understanding of privilege and empathy for others.

**Family Influence.** Students at Claremont bring to bear what they have learned in various contexts, at school and at home, to their development of sociopolitical consciousness. Because the school itself focuses on social justice and attracts progressive families who support social justice education with their children, many students were receptive to the SJM projects that Mrs. Dodd developed for them. Charles drew on what he had learned in his Humanities class to question inequities with our economic system, and Scott brought to class his understanding of privilege based on conversations at home. When asked where his perspective came from, Scott shared that he often eavesdrops on his grandfather’s conversations with his mother.

Zadie, whose father is Chief Executive Officer of a Jewish civil rights nonprofit organization, also mentioned that she learns from her parents. She explained to me her idea of a nonprofit organization she wants to found to connect youth to volunteer opportunities. When asked where her perspectives came from, she explained her father’s occupation, that her mother is an author, and her grandfather is a judge. As a family they often engaged in conversations about societal issues at home. “I’m really, really grateful for that because a lot of parents don’t want to tell their kids about the hard stuff about different people’s
communities. So I felt at an early age I got exposed to what’s going in the world and what we can do to help.”

**Empathy in progress.** While nine of the 10 focus students expressed strong feelings of empathy for others, one student did not readily express empathic viewpoints like her classmates in her interviews. Instead she raised questions she was still thinking about. During one of her interviews Jade, a white student who attended K-5 public schools previous to her enrollment at Claremont, expressed her belief that it is unfair for residents in housing projects to remain living there. When asked if she thinks the housing situation, of high rents and many being forced from their homes in Goldenview, is fair or unfair, she responded,

I live close to a project, but what happens is they want to renovate so that it’s nicer, but no one wants to leave. Projects are intended to have people with families or living on their own to be able to have a place where they don’t have to pay as much, figure out what they’re doing and go into the world and get a job, get a good house and everything. But what happens is, they get a job, they’re completely fine, but they just stay because they’re fine where they are, they like the community and stuff, when other people need to be there. So it’s a little hard for other people, and a lot of people are really sketchy I guess you could say. We’ve heard gunshots.

Jade questioned why residents of projects do not leave, without fully understanding the prohibitive housing costs in Goldenview, the highest in the entire country. Mrs. Dodd picked up on this, and added an activity to the “Reading
the Math of Our City” project where they analyzed the minimum wage in comparison to the costs of housing.

Similar to what she expressed in interviews, her student work also indicated her view that some residents, without much money to afford stable housing, create inconveniences for others. Jade’s Mosaic Tile profiled a day care teacher in Goldenview, whom she watched a video of from the website exploration assigned by Mrs. Dodd for the “Reading the Math of our City” project. In the video the day care teacher explained that teachers could not take the children outside because there were needles and garbage from homeless residents living in tents. Jade’s written statement discussed struggles of homelessness. “My tile represents the many people in Goldenview that suffer from having to move everywhere and they are never wanted. However, both sides of the story suffer. Normal citizens have trouble walking the streets because of the drugs and pollution.” The Mosaic Tile assignment invited students to profile a resident from one of the web resources they investigated, and represent this person with a picture, numerical fact, quote, and symbol. Most students chose to profile a resident of Goldenview who was homeless or being pushed from their home because they felt empathetic and compassionate toward their unfortunate circumstance.

Jade’s statement suggests that she viewed those with the privilege of having a home as “normal” and those in unfortunate circumstances as not normal, similar to the findings of Esmonde’s (2014) and Seider’s (2008) studies of SJM and social justice history, respectively, where affluent students asserted their own privilege as
the “normal” reference point. These inconveniences for “normal” people were mentioned in her interviews as well. However, later in the term when asked explicitly how to help others in her written work, she expressed empathic and helpful ways to take action. When answering the question Mrs. Dodd posed on the handout, “What could citizens of a city do to help distribute resources more equitably within a community?” Jade wrote, “The citizens of a city could donate to their local shelter, food bank, churches, or temples to distribute resources more equitably.” This assignment occurred later in the term after engagement with the “Reading the Math of Our City” project, possibly allowing more time for Jade to consider and take up empathic viewpoints.

Jade may have expressed less understanding of others’ circumstances for a number of reasons. First, she had only been exposed to Claremont’s emphasis on empathy, equity, and social justice for a few months since she had only been at Claremont since the beginning of that school year. As the term progressed she began to be able to express more empathic viewpoints in her written work. Second, she lived close to a housing project and therefore may experience tensions between rich and poor communities living in close proximity to each other. In addition, she may possibly have heard negative perceptions about housing projects from family members or others in her community.

Despite Jade’s less understanding attitude, overall, Claremont students expressed empathy for others in interviews and their student work. Most Claremont students expressed empathy by acknowledging their own privilege and
then feeling sad or bad or being able to take the perspective of those with circumstances less fortunate than themselves. Additionally, two Claremont students’ expressions of empathy were influenced by their own personal experiences with struggle.

**Personal experiences with struggle.** Two Claremont students, Oscar and Octavia, expressed empathy differently than feeling bad for those less privileged because of their own personal experiences with struggle. Oscar’s ability to understand the unfortunate circumstances of others was influenced by his negative social experiences at school and his deep understanding of what it feels like to be labeled. He resisted labeling others’ gender, ethnicity, or sexual orientation, and his empathy toward others is evident in his explanation. He explained, “You shouldn’t put names on people that might not even be true.” He explained at length why it’s wrong to assign labels to people based on presumed sexual orientation, gender, or ethnic/racial identities. When asked how he came to this perspective, he explained his own experiences with being called names by others. “I don’t like calling people names, and I have been called names so I know how it feels.”

Octavia, a Latina student who attended public schools before Claremont, also had personal experiences that influenced how she expressed empathy for others. She drew on knowledge of her family members’ housing experiences to understand the struggles of those being pushed from their homes. When discussing the videos they watched about homelessness and gentrification, she said it was
“really hard to watch people going through the struggle.” When asked why it was so hard to watch she explained, “Because I have family members who are also struggling with that, and it’s really sad to watch people going through the struggle when you’re going to these nice schools and you wish that people could have the same opportunities.” Throughout her student work and interviews, Octavia’s feelings connected to her own family’s experiences rather than an abstract notion of someone less fortunate than herself. The other Claremont students’ expressions of empathy were toward individuals they had never met nor interacted with, simply people they had watched a video about or read about or someone they could imagine as less privileged than themselves.

This abstract understanding of struggle has also been found by previous studies of affluent students and social justice pedagogy (e.g. Swalwell, 2013). For Oscar and Octavia their personal experiences with struggle influenced their conceptions of empathy. These sentiments connect to the feelings expressed by the students of Innovation Tech, also discussed in this chapter, where students with personal experiences with struggles experienced emotional reactions to discussions of social issues because these difficult situations hit home, rather than being abstract theoretical situations as they were for many Claremont students.

**Implications of developing empathy with affluent students.** The degree to which Claremont students expressed empathy is encouraging to the field of SJM. The only previous study to date of SJM with affluent students found that students tended to “reinforce stereotypes about economically marginalized
people—from the need for police to deal with high crime rates in high-poverty communities (while ignoring the crime committed by residents of suburban or affluent communities, not to mention crimes committed by governments or corporations)” (Esmonde, 2014, p. 386). Esmonde also found that SJM “can validate nonsensical results” (p. 386), like one student who described his neighborhood “as a ‘pretty sad place’ because it was surrounded by private lakes and private golf courses” (p. 383). The student believed that the poor neighborhoods were more exciting with better resources because some of the poor neighborhoods were in high-density areas where there were many stores and restaurants.

Students’ ability to form empathic viewpoints at Claremont was facilitated by the whole-school social justice focus and by the pre-existing sociopolitical viewpoints of Claremont families within a very progressively minded city. The two independent schools in Esmonde’s study did not have a social justice focus. Esmonde conducted her study in one teacher’s seventh grade math class (two sections) in one school and another teacher’s 10th grade math class in the other school. One school was founded on feminist principles and the other focused on its International Baccalaureate program. One teacher engaged in SJM activities a couple times a month, and had been doing so for a number of years, while the other teacher was engaging in SJM for the first time.

Even in the research literature of social justice pedagogy broadly speaking in other subject areas, its success with students of privilege is sparse. Seider
(2008) found social justice pedagogy in a high school literature class to backfire. He found that white privileged students’ support for educational equity declined after their enrollment in a “Literature and Justice” class because upon learning of the circumstances of others students feared that they might become poor or homeless in the future. To justify their own privilege, students blamed the poor for their circumstances to preserve their conception of a ‘just world’ (p. 662). The findings indicating Claremont students’ empathic viewpoints are encouraging to the field of SJM and SJP.

**Emotional Reactions from Students at Innovation Tech**

**Personal experiences with struggle.** At Innovation Tech, students’ reactions were more emotional than reactions of the students at Claremont. Claremont students empathized with people from the videos they had never met in real life nor had any relationship with. Innovation Tech students expressed sadness, anger, and frustration when learning about the struggles of others through the SJM projects, similar to Oscar and Octavia from Claremont. They also expressed how unfair they believed the situations were. Students’ reactions were more emotional, and they felt the unfairness of situations so readily because the scenarios were familiar to their own life experiences. Eight of the nine focus students of Innovation Tech expressed some type of emotional reaction to the SJM social issues discussed in class (e.g. food deserts, single moms struggling to make ends meet, minimum wage jobs) in their interviews.
For instance, when Ms. Charles showed the video about a single mom struggling to cover her living expenses paycheck to paycheck, to set up an activity about dividing a paycheck using fractions, students expressed strong emotional reactions. Because many students also had single mothers they intimately related to the mother profiled in the video. Students even asked Ms. Charles about her experiences as a single mom and how she was able to afford her rent and bills.

Ms. Charles instructed students to answer four questions during the video and then engaged students in a whole class discussion around their reactions. One student remarked, “How do you manage that? It’s not the woman’s fault. Her mom and her grandma they don’t help her out.” Another added that he feels “sad and worried.” When Ms. Charles asked what he meant, he followed up with, “How are they doing now? I believe this video was made in what year? I don’t know if their life got better or worse.” A third added, “I feel sad and angry because she works 40 hours a week and she still is not able to provide food. I’m mad at the people she’s working for that they aren’t giving her enough money.” Another student concurred, “I feel sad because she doesn’t deserve to be treated like that.”

Two students mentioned their own moms, one claiming, “My mom is a single mom, and she makes lots of money,” and the other commented, “My mom was a single mom, and my dad was killed. My mom is getting married to my baby brother’s dad (rolls eyes).” These students who were very participatory during the class discussion were not focus students, but student work collected and copied
from focus students and individual interviews with focus students indicated similar emotional responses (e.g. sadness, anger).

All focus students’ work from Innovation Tech indicated emotional responses after watching the mother in the video in their written work. (One focus student did not turn in her paper that day.) Students used phrases like, “I feel bad for her,” or “I feel sorry for her.” Lexi, an African American student from Stoneview, wrote, “The feelings I have are sad and worried. I’m mad. She should be given a raise. That's so mean she needs a better job.” When asked about this activity in the interview Kristine, a Latina student who barely spoke in class, explained, “I think that was sad, but I also got mad because the government or someone else of her family should help her with her kids and with money and food because she said the kids eat a lot.”

However, students’ emotional responses in their written work may be explained by the questions asked of students on the handout. Students were explicitly asked how they felt about the mother’s situation. Because the two case study teachers created their own SJM lessons and did not use the same activities, it is more challenging to compare differences in students’ responses between the two school sites. Nevertheless, reactions of Innovation Tech students, both their comments in class, their written work, and interview responses indicate strong emotional reactions. Some students made explicit connections to their own lives (e.g. “My mom is a single mom, but she makes lots of money.”) Perhaps students at Claremont would also have had emotional reactions to this video, but they
would not likely have made explicit personal connections to such circumstances and potential struggles associated with being a single mother (e.g. making enough money to afford rent).

Often when Ms. Charles showed students similar videos about circumstances familiar to them (e.g. about affording rent, working multiple jobs), the YouTube website automatically and immediately started playing a related video right after. Students were often so interested in these videos that they requested to also watch the next video. By offering students relevant contexts from which to draw on and make connections to the mathematics, Ms. Charles garnered greater interest through the SJM lessons. This was of particular importance because many in her class were students with IEPs and/or with negative relationships to mathematics.

The contexts Ms. Charles used for SJM lessons helped increase relevance for students, as demonstrated by students’ emotional reactions. One student in particular had very passionate responses to activities, which she described as “tears of anger.” Kaden, the only white student in the class, lived in an area of the city that was being highly gentrified. It was the same neighborhood that students discussed in Mrs. Dodd’s class, when they watched videos that profiled both residents being pushed from their homes and the incoming residents, largely from the Tech industry, who are driving up the costs of housing. During Kaden’s interview, when asked about an SJM activity about food deserts in low-income communities, she expressed how upset it made her that some neighborhoods had
access to fresh foods and others had mostly corner stores with only processed, frozen foods. Kaden analyzed the availability of fresh foods versus processed foods in her own neighborhood.

That also makes me upset because it makes no sense that the government would allow this to happen in certain areas, because half of my neighborhood is corner stores. Like they have McDonald’s over there, they have junk foods over there. And then in the other half you can get fresh pupusas and enchiladas. And it makes no sense because half of my neighborhood you can get fresh ingredients that are ordered right from the farm or something and the other half has chemical-filled chicken and Hot Cheetos and sodas and everything like that. It is upsetting as well because this isn’t on paper. It’s actually happening. This person could be real and this neighborhood could be real and you don’t know where to find any of the stuff because the neighborhood is just filled with corner stores and junk food.

Kaden’s understanding of gentrification was quite sophisticated, influenced by the fact that she lives in a rapidly gentrifying neighborhood and sees first hand the differences in available foods, some of which only offered unhealthy foods such as chemical-filled chicken and Hot Cheetos. She wanted fresh foods in her neighborhood, but also she did not want the corner stores removed from her neighborhood. In fact, she spoke out strongly against the closing of local businesses and was highly upset about the loss of stores and restaurants due to new businesses that catered to the incoming Tech workers. She preferred that the
corner stores started to sell healthy foods like the shop owner in the newspaper article they read in Ms. Charles’s class for a follow up SJM lesson about incentives in Goldenview for corner store owners to carry produce.

When asked how she became aware of these things she explained that she noticed that many neighbors moved out, and her favorite restaurant and other establishments in her neighborhood went out of business. She explained how her favorite restaurant closed down and how angry she became. “It upsets me because that store that used to be there was one of the best places where you can find food in my area. I was actually really upset that I started getting tears of anger.” She felt frustrated by the incoming residents who were “taking away the culture of the neighborhood” and that she also felt lucky because her family owned their home and would not be forced out.

Kaden’s personal experiences greatly influenced how she made sense of SJM lessons. She even commented about how important it is that the SJM lessons were “what’s happening in the real world… not like Hogwarts.” Hogwarts is the name of the school where the popular fictional book character Harry Potter learns wizardry. Kaden emphasized the importance of SJM lessons being “related to people’s lives,” rather than imaginary ones because students could relate to these contexts. In Ms. Charles’s class not only did students relate to these contexts, they felt passionately about these issues and offered suggestions for taking action.

Students from Innovation Tech also expressed how important the activities were to their own lives, in order to “help my mom pay rent” or for “others outside my
neighborhood to learn about our struggles to help us.” Students from both schools not only expressed heartfelt reactions, but they also resisted negative stereotypes.

**Resistance of Negative Stereotypes**

All 19 focus students expressed some type of challenge, refusal, or alternative to a negative stereotype. Most of these sentiments centered on stereotypes of neighborhoods through the SJM activities Mrs. Dodd and Ms. Charles created for students. Both teachers created SJM activities that investigated resources in a “good” neighborhood and a “bad” neighborhood. Students were asked to consider if it’s okay to refer to neighborhoods as “good” or “bad.” Students from both schools asserted that it’s not okay to label neighborhoods in this way, but students differed somewhat in how strongly and why they refuted these labels.

Students from both schools argued that the words “good” and “bad” should not be used to describe neighborhoods. For instance, Claremont student Scott explained, “The neighborhood could be really poor but it doesn’t mean that people’s mindset is poor. They could be happy and welcoming… and that’s most important in my opinion.” Zadie, also at Claremont, offered a similar statement, “I don’t think it matters whether it’s a poor or rich community because it doesn’t really have to do with the community like bringing people together and how people act with each other.”

Lily, from Innovation Tech argued, “I think all neighborhoods are okay, it just depends on what they have out there. No neighborhoods are good or bad
because every neighborhood is good except like some neighborhoods have playgrounds and others don’t.” Liza, also from Innovation Tech, suggested, “I think that in a bad neighborhood, there could be good things that happen. In a good neighborhood, there can be some bad things that happen too. So I think it’s fairly equal to call them both just normal.”

Students differed in their responses based on their personal lived experiences. Students from both schools who had experiences living in neighborhoods not considered “good” refused to call their neighborhood “bad” or frame it in a negative light. They used phrases like “not the safest,” or, “We have good days and bad days.”

**Students’ Backgrounds and Lived Experiences: “My neighborhood’s not bad”**

Students’ lived experiences significantly influenced how they reacted to considerations of labels such as “good” or “bad” neighborhoods. For example, Claremont student Kyra’s description of a neighborhood she lived in for part of the week with her father indicates her resistance to labeling it “bad.” The neighborhood where her father lived was not as wealthy as the community in which her mother lived, Sunnyside, where most families from Claremont lived, and where she spent the other half of the week. Her father’s neighborhood was the same community that Kaden lived in, a rapidly gentrifying neighborhood of Goldenview. Her description of her father’s neighborhood is very nuanced.
The community is really nice, and I think that there are some things that might be kind of unsafe. It’s not the most trusted area I guess. It’s safe, but it’s not exactly the safest. And then there’s a little bit of litter, and I would like it to be prettier, but I think it’s really nice right now especially the community and how we’re always there to help each other. Because she lived in this community, she resisted calling it a “bad” or “challenged” or “violent” neighborhood. Instead she acknowledged that it’s “not the safest” but highlighted the positive aspects of the neighborhood, still calling it safe and that she loved the community and how residents always helped each other.

Innovation Tech students also firmly resisted negative stereotypes about their neighborhoods. One student described his neighborhood as “peaceful and normal” during class. His teammate challenged him with her opinion, “To me, all neighborhoods are ratchet, even the good ones.” “Ratchet” is a current form of the term “ghetto” or “hood,” according to UrbanDictionary.com taken from the word “wretched,” meaning unhappy, ill, bad, or unpleasant. He then exclaimed to his group, “I don’t live in the ghetto!” The student who claimed, “All neighborhoods are ratchet,” was the only student who assigned a negative connotation to their own neighborhood. Students described their neighborhoods as “peaceful,” “quiet,” or “normal,” both in class and during their one-on-one interviews.

Students were asked to write down what words or phrases came to mind when they think of “good” or “bad neighborhoods in a two column table. In the
“bad neighborhood” column students were so resistant to writing anything negative that Ms. Charles reminded them that the question asked how the neighborhoods are characterized by others, not their own experiences or opinions.

“I’m not asking you about your experiences – it’s what do you hear about these neighborhoods. What do you hear about ‘good’ neighborhoods and ‘bad’ neighborhoods?”

Innovation Tech student Daisy, described her neighborhood as “very peaceful but recently there was a shooting by the park so it’s kind of in between [“good” and “bad”]. We have good days and bad days.” Many students offered similar responses, which also resemble Claremont student Kyra’s characterization of her father’s neighborhood. Similar to Daisy’s response, Innovation Tech student Kristine said it’s not fair to call neighborhoods “good” or “bad” because, “Sometimes bad things happen in good neighborhoods, and sometimes good things happen in bad neighborhoods.” She described her own neighborhood, calling it “quiet,” but that last week “something bad happened.” There was a shooting two blocks from her home.

Innovation Tech student Lexi also resisted negative stereotypes explaining, “There’s no such thing. All neighborhoods are the same, except some neighborhoods have less things than the other.” Ophelia, from Innovation Tech, even argued that visiting actual neighborhoods might change people’s minds by learning what the neighborhood is truly like. She said, “They say it’s a bad neighborhood but when you go there, it’s a good neighborhood.” Innovation Tech
student Matthew explicitly acknowledged stereotypes that others may hold of “bad” neighborhoods.

They’re using stereotypes to determine what categories the neighborhood is…. In bad neighborhoods they would think there are lots of crimes, lots of bad people, lots of rundown houses, lots of homeless people, and lots of corner stores and other bad stuffs. But what I think about this neighborhood [Stoneview] even though people say it’s bad, I think it’s like a good neighborhood where people are still safe and can still learn and get good jobs.

Not only did students insist that their neighborhoods were good, they emphasized what qualities of neighborhoods are most important. They argued that being kind and friendly are most important and that everyone deserves hospitals, grocery stores for access to healthy foods, and good schools.

**Personal experience required**

At Claremont, some students offered alternative phrases such as “financially, environmentally privileged” or “less privileged.” Others wanted to use phrases they believed were more specific, such as “violent, happy, or welcoming” instead of “good” or “bad.” However, Octavia pushed back on this idea, arguing, “You can’t label it unless you live there.” She explained that her teammates wanted to use “violent, nonviolent, kind, unkind, generous, selfish, nice, and not nice people” as alternatives to the words “good” and “bad” neighborhoods, so she just “went along with it.” But Octavia fundamentally
disagreed with the idea of opposites. She explained that if one neighborhood is violent it doesn't mean that the other is not violent.

Octavia offered a multidimensional perspective of neighborhood qualities, where neighborhoods are complex. A neighborhood might experience violent incidents yet also be populated with generous residents. Octavia was visibly frustrated when explaining her disagreement with her group during our interview. She repeated several times throughout her explanation, “You can’t label it unless you live there.” Octavia was the student who attended public schools for K-5th grades before attending Claremont and mentioned that she had family members experiencing the struggles of the rising costs of housing in Goldenview.

Both Claremont and Innovation Tech students consistently asserted that it’s not acceptable to use words like “good” or “bad” to describe neighborhoods. They also emphasized what qualities of neighborhoods are most important. They argued that being kind and friendly are most important and that everyone deserves access to community assets, such as community gardens, playgrounds, and schools.

**Implications of students’ resistance of negative stereotypes**

Claremont students’ resistance of negative stereotypes are promising results because they demonstrate the ability of SJM to reach the intended goal of developing students’ sociopolitical consciousness with students who do not have lived experiences in less-resourced neighborhoods. These results suggest that SJM can work with students of privileged backgrounds without experiences in under-resourced neighborhoods, whereas Esmonde’s (2014) study found it to backfire
where affluent students solidified their negative stereotypes of less-resourced neighborhoods. Discussion of why SJM may have been successful in this sense with Claremont students is discussed in the Recommendations at the end of this chapter. Not only did students at both schools resist negative stereotypes, but they also were more engaged and interested in the SJM activities.

**Student Enjoyment of SJM Activities**

Students from both schools expressed interest and enjoyment of the SJM activities. Students described the SJM projects as “fun,” “cool,” and “interesting.” Mrs. Dodd shared that in her end-of-term one-on-one meetings with students, they most frequently mentioned the “Reading the Math of Our City” project as their most-memorable math activity of the term.

**“Fun” or “Cool”**

All 19 focus students from both schools expressed their enjoyment of SJM projects and activities in their interviews. Many students called their class “fun” or “cool” because of their opportunities to engage in the SJM projects that tied mathematics learning to the real world. In addition, all 19 focus students of both schools passed their math class in the fall term, suggesting that their engagement may possibly have helped facilitate their success in math class.

**Claremont Students.** For instance, when asked what’s her favorite thing about math class, Kyra explained that it’s the “things that we learn and how we learn about more of the problems around the world, and also the way Mrs. Dodd teaches us about that.” Kyra consistently referred to her math class with Mrs.
Dodd as “fun” and “cool.” She said that the SJM projects were “a really cool way to introduce the real world to us while still figuring everything out.” Maisie, who had attended Claremont since kindergarten, said that the SJM projects with real world scenarios helped her learn math and that “it makes more sense” to her this way.

Likewise, Jade called the SJM projects “really cool” and “really interesting.” She said, “I learned so much more about why people are complaining about the economy.” Ziggy also described SJM projects as “super cool” and also enjoyed the opportunity to hear perspectives from her classmates. When asked about the SJM projects she said, “I thought that was cool because you get to think about the problems. You get to really think about the world, and you get to see the different changes.”

**Innovation Tech Students.** Just like the students from Claremont, Innovation Tech students also characterized SJM projects as “fun.” Vanessa described her math class as “learning about my community but it’s like math too so it’s fun.” Kristine explained that the SJM activities were more fun because, “we got to make our town or city and we would add hospitals, libraries, and schools,” referring to the activity where students compared “good” and “bad” neighborhoods and then mapped out their own equitable neighborhood with resources for all residents. When asked about the SJM activities, Liza responded, “I think it was pretty fun and educational at the same time, and I like that she used the real world, where we’re living here, to give us a lesson in math.” Liza
contrasted her class with Ms. Charles to her classes before. “Before, a long time ago, well in fifth grade, I never noticed that the math can relate to real world until Ms. Charles started bringing it up and using it as an every day process lesson.”

**SJM is better because it’s not textbook math.** Like Liza, many students contrasted their previous schooling experiences with their current class with Ms. Charles. Students believed that their math learning in their previous classes was “boring, just doing textbooks,” as Vanessa described. Daisy also made this contrast to emphasize why she believed her class with Ms. Charles was more fun. Daisy described her classes before as “straight up math” with “problems using numbers,” whereas her class with Ms. Charles “teaches us about the world and it helps us use math and compare it to real-life problems.” Vanessa even said that when learning out of a textbook she “doesn’t want to do it.” Matthew described Ms. Charles’s class as more interesting than simply working out of a textbook like he did in his previous class. “Whenever we did math in our class in fifth grade, all we were just given was a book, and the teacher would tell us what page we’re doing, and we would just do it by ourselves in our desks.”

Students from Claremont also mentioned learning out of textbooks in their previous schooling experiences as boring. These comments came from the three students who had attended public schools for their K-5 education. When asked about how their class with Mrs. Dodd was different than learning math in their previous school or classes, they said that their previous math class was “mostly worksheets” or that there were “many distractions” in class. Ben’s favorite thing
about Mrs. Dodd’s class was that, “it’s not really just reading out of book and it’s not just looking on computer and reading about stuff.”

For Mrs. Dodd’s class, students’ enjoyment of SJM activities were related to their interest in learning about social issues, not just because they enjoyed reform-oriented practices like group work. Mrs. Dodd used reform-oriented pedagogy (e.g. group work, students discovering patterns on their own, whole class discussions to tie ideas together) on a regular basis, so students’ comments about their enjoyment of SJM activities were more related to the specific social contexts than reform based pedagogy. Hiebert et al. (1996) propose that reform-oriented instruction involves students grappling with mathematics rather than receiving didactic instruction. The teacher’s role is to create sociomathematical norms (Yackel & Cobb, 1996) where students problematize mathematics, listen to and collaborate with each other, rather than lecture or model problem solving for students. When asked about what her classroom looks like Mrs. Dodd’s description aligns with definitions of reform-oriented instruction.

You’ll see kids talking at their tables. You’re always going to see me talking to groups and bringing the class together for whole group discussions to make sure everyone understands certain things. You’ll hear hopefully a lot of different students’ voices contributing to these conversations because we’re trying to get a lot of input from a variety of perspectives.
This is an accurate description of a typical class. On a typical day, students began by working on the Warm Up, a brief activity that students engaged in with their team. Students worked well in their groups. They asked each other questions, shared their thinking, and their conversations remained on topic. Mrs. Dodd would call the class together to summarize and engage in discussions to probe students’ thinking. When she engaged in whole class discussions she often offered students multiple opportunities for a “turn and talk.” She instructed them to turn and talk with a partner or with their group for 60 seconds and then would call them back to the whole class conversation. She used College Preparatory Mathematics, or CPM, as her main curricular source, a curriculum that aims to use reform pedagogical practices (Kysh, 1995). Because she engaged in reform-oriented practices on a regular basis, students’ sentiments regarding their enjoyment of SJM activities were likely related to the features of the SJM activities, such as addressing social issues in Goldenview.

In Ms. Charles’s class, she too aimed to use reform-oriented practices. She was trained by her district specifically in Complex Instruction pedagogical practices, a specific type of group work where students use team roles and engage in shared accountability (Boaler & Staples, 2008). She was also the Complex Instruction lead for her school. However, the district curriculum she was expected to follow was created by a teacher team that cobbled together lessons from various resources, some of which did and did not facilitate group work and student discovery (e.g. College Preparatory Mathematics, Georgia Department of
Education). The district created workbooks of these materials, and when Ms. Charles used these workbooks, students may have felt that they were simply doing “textbook” mathematics, especially for the lessons that were more didactic and procedural, namely the Georgia Department of Education materials. It is therefore feasible that Innovation Tech students enjoyed the SJM activities because they were not out of the district workbook. However, interview data discussed above indicate students’ genuine enjoyment of SJM activities that offered them opportunities to explore real-life issues relevant to their own lives.

Students’ enjoyment of SJM activities and other non-textbook activities may also be influenced by a) their interest in learning the opinions of others and b) their belief that what they learned through the SJM activities (e.g. about the minimum wage and struggles of Goldenview residents) was important to their own lives. Claremont students expressed their appreciation of learning the viewpoints of their classmates, whereas Innovation Tech students expressed a greater importance of learning about social issues through SJM.

**Enjoy learning the opinions of others**

For Claremont students, when describing why SJM activities were “fun” or “cool” they also explained that they enjoyed learning about others’ opinions. Ziggy, explained why she thinks that SJM activities are “cool.” “I think that everyone had different opinions so it was cool to see that.” Like Ziggy many Claremont students mentioned that they enjoyed learning of their classmates’ opinions through the SJM projects.
For instance, Brad explained how it was “fun” to engage in the “Reading the Math of Our City” project, where he was able to learn about others’ opinions, and investigate his own opinions, while considering what life must be like for those who are homeless.

It was very eye opening about different people and how they saw homelessness or housing. And it was really fun because I got to see my opinions. I got to think over my opinions and how they would change about homelessness. But I also got to see other people’s opinions and how other people thought about homelessness or what questions, what they didn’t know, and what their clarification about homelessness, and what they really wanted to know about.

These activities offered opportunities for students to reflect on their thinking. Brad explained how he took the time to consider his own opinions and how they changed over time. Brad even reflected about his own growth in how he thought about other people.

I used to judge a neighborhood on how, “Oh there’s a lot of violence in the neighborhood, or there’s drugs, or it’s polluted,” and I think now I judge it on how well the neighbors know each other, how well they get along, and how well they can fix problems in the neighborhood.

**Learning about social issues through SJM is important to my own life**

Innovation Tech students expressed a benefit of SJM activities that goes beyond their academic goals. They explained how learning about these social
issues would help them in their life outside of school and in the future to help themselves and their community. This aligns with Ms. Charles’s intentions for her transformative SJM goals to change students’ real lives. Kristine for instance enjoyed learning about her community “because then we’ll know more about our community and we’ll know what the problems are and solutions we could solve the problems with.” Vanessa also discussed how she appreciates learning about “good stuff and bad stuff in my neighborhood so I can know so it makes me look at the world different.” Likewise Daisy described that the SJM activities “helps me see the world better and open my eyes about the world a lot more.”

Kaden, who felt very passionately about countering the rapid gentrification of her community, strongly believed in the importance of learning about social issues because of their relevance to her own life. She explained, “I think that this is a really important subject for me because I really want to stop these new coffee shops, businesses in our neighborhood. I’ve actually run around putting around signs but people have started to take them down.” Kaden made her own signs that read, “Help our neighborhood,” and posted them in her community. She believed that it was important to be aware of what was happening in her community to be empowered and have agency to take action. “I think it’s important for us to learn about things that are unfair and how things can be fair.”

Because these social issues impacted students’ lives they felt very connected to the SJM activities. For Kaden she wanted to take action to address gentrification in her community. For others, the social issues were relevant on a
more personal level. Matthew for instance explained that SJM activities were useful to him because he could help his mom to pay the rent by “adding stuff up.” At one point during the interview Matthew shared his family’s struggles with homelessness, where he and his two siblings lived in their mother’s car when they were “in between homes.” Matthew did not use the language of saying that his family was “homeless” at times, and he broke down in tears when explaining his family situation, initiated by discussion of an SJM activity about paying bills.

Lexi highlighted the importance of SJM activities to help her community. “If more and more people learn about it [lack of access to healthy food] maybe they’ll try to help Stoneview.” She believed that others might contribute to their community by learning more about the struggles of Stoneview residents.

**Implications of student engagement in SJM**

Overall, students from both schools expressed excitement and interest in the SJM projects, and this was evident in their behavior during class as well. They often wanted to continue discussions of the project after the class period had ended, and there were some days that Mrs. Dodd allowed these discussions flow into the period allotted for teaching science (in her double block math/science class). Likewise, Ms. Charles’s students often wanted to continue watching videos that profiled individuals struggling to make ends meet. Ms. Charles believed that having these familiar social contexts gave students some “math oomph” to help support students’ ability to engage in conversations about the mathematics.

Zadie from Claremont summed up how SJM helps engage a student who has
negative experiences and feelings toward mathematics. She explained, “I feel I need even more of a disguised math, like what we have right now kind of tricking you into doing it, like having fun projects or cool presentations.” Creating relevant SJM projects connected to the real world may help garner greater interest for students, and especially for students who have previous negative experiences with mathematics.

SJM may also help increase students’ willingness and effort in math class. Matthew from Innovation Tech explained his enjoyment of SJM activities from Ms. Charles’s class enthusiastically, “Math class would teach you about the real life in math. They would mix it together into one big thing and make it better. It would be one of the best classes that you’ll be ever be in.” Students from both schools believed that SJM activities were “fun” or “cool,” another reason that SJM may be useful for teachers to use in their classrooms.

Recommendations for Students of Privileged and Historically Marginalized Backgrounds

In conclusion, results from the present study are promising for students of various backgrounds with a range of lived experiences with relative privilege and marginalization. Results suggest students’ lived experiences with privilege and marginalization were influenced by a variety of identity characteristics, such as ethnic/racial background, gender, family socioeconomic status, etc. which are intersectional, fluid, and context dependent. Students at both school sites connected with the SJM activities, albeit in different ways because of their lived
experiences. Claremont students felt empathy for those less privileged, and
Innovation Tech students expressed strong emotional reactions because of their
familiarity with the circumstances explored in the SJM activities. Students of both
schools resisted negative stereotypes.

Recommendations for SJM pedagogy, catered to the background
experiences of individual students, is important specifically to mathematics
instruction because mathematics is typically thought of as apolitical. However, all
education is political (e.g. Gutiérrez, 2002; Larnell, Jett, & Bullock, 2016).
Mathematics instruction in particular can be a dehumanizing experience for
students of historically marginalized backgrounds, where students learn to “do
mathematics” as subordinates to the subject rather than as creators of mathematics
(Gutiérrez, 2017). Social justice pedagogy in the field of mathematics, rather than
social studies for instance, is also the subject area with more dilemmas and less
teachers actually engaging in it (e.g. Bartell, 2013; Gregson, 2013; Kokka, 2015).

Social justice pedagogy specific to mathematics education is of
considerable importance because of the weight assigned to mathematics
understanding in our society and because of the gate-keeping nature of
mathematics standardized testing. Students are either granted or denied access to
higher educational and career opportunities based on their performance in
mathematics classes and exams (Brantlinger, 2013). Most importantly,
mathematics offers a powerful tool to critically analyze the world in order to
change it and make it a better place (Gutstein, 2006).
The present study suggests students’ backgrounds and lived experiences matter; they do in fact influence how they make sense of SJM and their development of sociopolitical consciousness. For students who have experiences with marginalization, they may have strong emotional reactions. Therefore, their teacher’s sociopolitical consciousness of students’ experiences and the community in which they live are crucial to implementation of SJM. For students with experiences of privilege, a whole school focus may help foster their empathy for others to spark a desire to work toward social justice. The recommendations in this chapter for SJM with students of different backgrounds may seem like binary recommendations. However, privilege and marginalization are ever changing and context dependent, and each individual student is unique. These recommendations should be taken into consideration along with a host of other factors of each individual student. I hope that the results and recommendations from this study help better understand how students of diverse backgrounds can collectively work toward equity and social justice.
Chapter 6: Tensions, Dilemmas, and Successes of SJM Instruction

This chapter addresses the third research question of this study: What tensions and dilemmas arise when using SJM and how do teachers successfully navigate these challenges? I discuss five common dilemmas presented in the literature and explore how and why the case study teachers successfully managed such challenges.

Dominant versus critical mathematics goals

Mathematics learning goals and social justice goals often end up unintentionally at odds with each other, often due to time constraints (Esmonde, 2014; Turner et al., 2009). For instance, Gregson’s (2013) year long case study of one eighth grade math teacher’s use of SJM with predominantly students of marginalized backgrounds found that the teacher encountered a “crunch time” dilemma (p. 190), where she wanted to engage students in SJM work and prepare them for the standardized test required at the end of the school year, but she ran out of time. She also worried that the SJM projects she created weren’t “mathy enough” (p. 186). Similarly, Bartell’s (2013) study of eight practicing secondary math teachers new to designing SJM activities found that participants, when faced with the pressures of standardized testing, focused on the dominant mathematics they felt necessary to prepare students for standardized exams more than on the social justice goals of improving students’ sociopolitical consciousness.

Mrs. Dodd and Ms. Charles were able to navigate this dilemma for a few of reasons. First, they taught sixth grade math, and this grade level of mathematics is
less subject to standardized testing and exit exams. Second, they both had curricular autonomy. Mrs. Dodd had complete freedom; she even designed her own scope and sequence. Ms. Charles did not have oversight from her principal, although worked with a district math coach who expected her to follow the district scope and sequence but also supported her development of SJM activities. He collaborated with her to design SJM activities, and he even secured two release days for her to write SJM lessons with district math specialists. Third, they were both innovative and creative curriculum developers, able to design SJM activities that both addressed the dominant mathematics while developing students’ sociopolitical consciousness. Teachers’ ability to design SJM curriculum that incorporates dominant and critical mathematics goals warrants future study, and is discussed in this next section.

**Time, sociopolitical consciousness, and expertise required to design SJM activities**

Not only do constraints of time in class cause dilemmas for SJM instruction as just discussed, but the time required outside of class to plan and design SJM activities creates challenges for teachers (Bartell, 2013; Gregson, 2013). Teachers must also have the expertise to design SJM activities, both the ability to create math lessons and the sociopolitical consciousness to design SJM lessons set in meaningful, local, relevant contexts for students.

Ms. Charles acknowledged that it doesn’t take her long to create an SJM lesson. When asked how she has been able to design SJM activities, she explained,
“Creativity is a thing I’ve always been good at.” She described the songs and dances she would make up when teaching preschool and kindergarten aged children. She also discussed how her racial and gender identities influenced her lesson development as discussed in Chapter 4. In designing SJM activities she focused on the mathematics content. She spent time perusing resources online and saving them for when an idea sparks in her mind for an SJM activity. She admitted that her creativity allowed her to develop SJM lessons fairly quickly and even more so if she was working with her district math coach. “I would like to say that it’s this laborious process for me, but it’s really not. It’s 45 minutes of me focusing, and if [math coach’s name] is with me typing it can be done in 25 to 30 minutes.” This is not typical for math teachers to be able to develop SJM activities in this amount of time. Bartell (2013) and Gregson (2013) found that teachers spent considerable time designing SJM activities. This curriculum development strength of Ms. Charles, and of Mrs. Dodd, is one reason the present study serves as successful case studies of SJM instruction. Mrs. Dodd offers are more typical scenario of SJM curriculum development.

Mrs. Dodd discussed the time required to research and develop SJM projects as a challenge. When asked about challenges of SJM, this is what she mentioned. She explained how long she had already spent designing an SJM project at the time of the interview, “It’s been a month or more, we’ve been talking about this project and we were brainstorming all these ideas and then after getting feedback on it, I felt like it actually wasn’t going to work at this time.” Not
only did she spend considerable time testing out ideas, soliciting feedback from others, and revising her plans, she also spent time researching web resources, data sets, and math lessons to draw from. She discussed how long it takes to just search for and examine resources. “I want all those resources, but sifting through them takes so much time, right?” Once she selected the most helpful resources to her SJM project design, she pondered various other considerations as well. She explained,

I was working on all the documentation of the projects for the kids and each lesson and really hammering it down to “What do I want them to know, there’s so much. What are we going to focus on?”

Mrs. Dodd also discussed her excitement about using the SJM projects for the following school year. She viewed the time invested in designing the projects as worthwhile and meaningful. Because she chose contexts that would likely still be relevant the following school year, she discussed her ability to use the projects again. This may not be the case if a teacher creates an SJM activity around local organizing efforts for a community issue that is time-specific, such as stopping construction of a commercial shopping center, or related to an election, like they investigated in their Humanities class at Claremont.

While both teachers had the time and expertise to develop SJM curricular materials, this presents the unanswered question of: What is the curriculum for SJM? How do teachers gain the expertise, time, and sociopolitical consciousness to design SJM activities? What is the quality of such teacher-developed tasks?
Elsewhere (Kokka, 2015) I explore these questions, suggesting that teachers should solicit input from students on the issues that are important to them, as done in the after school program created and studied by Turner et al. (2009). I also suggest collaboration of teachers, researchers, and professional development providers. In fact, Mrs. Dodd requested my feedback in the development of her SJM projects. I also often sent her and Ms. Charles web-based resources I thought they might find useful. Both teachers also participated in the Social Justice STEM Educators group where Mrs. Dodd shared lesson ideas and received suggestions from social justice oriented math teachers, using a tuning protocol.

“Controversial” topics and “over-influencing” students

SJM and social justice pedagogy generally has been accused of introducing “controversial” topics to the math class (e.g. Dover, 2013; Hess, 2004). Teacher participants in Bartell’s (2013) study explicitly avoided topics they felt would be “too controversial,” such as discussions of race and racism, openly discussing their discomfort. Mrs. Dodd also felt that discussions of race might be tricky in the classroom given the few students of color that she did not want to make feel uncomfortable. For the “Reading the Math of Our City” project on the rising costs of housing she wanted to discuss the changing racial demographic makeup of Goldenview, but decided against it. She explained her consideration of students’ feelings and her thought process.

For this particular project I’m avoiding the race data for Goldenview. How has Goldenview changed over time? The populations and the demographics
have shifted significantly. The white population has gone done from 70% to 40%. And the black population has gone up and then down, and it’s at an all time low now, and there are such really interesting things about why that is. The Asian population continues to rise and Hispanic population continues to rise. I have a lot of Asian and Hispanic kids, and I don’t want them to be viewed as the cause of problems, like, “Of course Goldenview is getting so crowded because all these Asian people keep moving here,” or something like that. That would be terrible. So leaving that data out for now as we’re doing line plots, we’ll just look at the financial and economic situation for everybody, things that unite and don’t divide us as a class at this point.

Mrs. Dodd consistently thought about how to engage in SJM with few students of color. When I first met her at Rico Gutstein’s workshop, this is the question she raised. How should SJM be used in a predominantly white school, to be able to discuss social issues without making the few students of color feel uncomfortable? In the interview, she clarified that she plans to discuss controversial topics such as race, in the middle or end of the school year. She wanted to first establish a safe environment. She felt that the beginning of the school year was not the best time to discuss these potentially controversial topics because students did not know each other well yet. She mentioned her desire to discuss police brutality with students when they were ready, both mathematically ready to use proportional relationships, decimals, and percentages and ready in terms of their sociopolitical
consciousness and emotional development for the safety of the classroom environment.

To create a safe space and prepare students to discuss controversial topics later in the school year she mentioned that she starts with topics “we all have in common.” She described her thinking,

I think in the beginning of the year, I want to focus on something that we all have in common, right? There are challenges for everyone living in Goldenview, and there’s learning about our city through data and learning about the experiences of people in our city. I don’t want to say it’s tension-free, but it’s pretty non-controversial for the kids and it feels non-threatening because I’m inviting their experiences too and everyone has an experience, and everyone has challenges.

This is the same tactic that Ms. Charles used in her classroom. Even though students at Innovation Tech may have more personal lived experiences related to the social issues discussed through the SJM projects, Ms. Charles started with “low risk opportunities” for students who “emotionally may not be ready” to discuss the social issues related to SJM. Ms. Charles explained, “I’m introducing them to this mindset and this thinking, so if I can give them an entry pathway that is more low-risk and then eventually we can build it up.”

Ms. Charles and Mrs. Dodd offer informative examples to the field of how to scaffold students’ engagement in potentially controversial topics, such as discussing shifting ethnic/racial demographics, police brutality, or “stop and frisk”
trends. Both teachers aimed to first create a safe space and introduce students to “low risk opportunities” by focusing on “non-threatening” topics that “we all have in common,” where “everyone has an experience and everyone has challenges.”

Ms. Charles also serves as an instructive example of how to manage the dilemma of “over-influencing” students (Gutstein, 2006, p. 140). Chapter 4 discusses how Ms. Charles aimed to co-construct sociopolitical consciousness with students. Ms. Charles expressed her strong belief that social justice educators should not “indoctrinate students with our ideology.” She offered examples of how she managed her own beliefs to allow for students to come to their own conclusions. “I try to frame it to be like, ‘What do you think? What do you think should happen? How will you think that will work?’ And I think that’s very helpful in supporting the kids in what they’re thinking.” By asking open-ended unbiased questions rather than making statements about her own beliefs she was able to give students the space to come to their own opinions about issues in their community.

**Students’ existing sociopolitical consciousness and opinions about discussing social issues in math class**

Students’ sociopolitical consciousness and lived experiences may also influence how they respond to SJM activities. For instance, because the students in Esmonde’s (2014) study were from affluent backgrounds, they did not have personal experiences in the high-poverty neighborhoods they investigated through a project about community resources. Esmonde describes how students drew on
their own (sparse) background knowledge asserting that the high-poverty neighborhood they were studying “has a high crime rate,” reinforcing their negative stereotypes.

Claremont students also described less resourced neighborhoods negatively as “violent” or “dirty,” However, Mrs. Dodd helped students understand why some people were homeless or being pushed from their homes by creating an activity that investigated the minimum wage, where the mathematics clearly shows that even working 24 hours a day 365 days a year doesn’t earn enough for housing in Goldenview. The activity asked students:

According to some reports, a person would need to make at least $161,000 per year to afford buying a home in Goldenview. If an individual were making the minimum wage ($15.50 per hour), how many hours would they have to work each day to afford a home in Goldenview?

Solving this problem, students realized that even if someone worked 365 days in a year, they would have to work for 28 hours a day, which is clearly impossible, in order to make $161,000. Mrs. Dodd also had students analyze fictitious but realistic profiles of residents and asked students to respond to the question, “Which residents are ‘stuck’?” Mrs. Dodd wanted students to understand the low rate of the minimum wage, the extremely high costs of housing, and the costs of moving to a new apartment (e.g. first and last month’s rent as a deposit, moving costs, and the extraordinary increase in rent one would face if leaving a rent controlled apartment acquired years ago to move into an apartment at the current
rental rates). Mrs. Dodd created activities in the middle of the project when she realized that students did not understand why some Goldenview residents struggled to secure stable housing. These adjustments with additional activities to address students’ misconceptions likely explain why students in Mrs. Dodd’s class did not arrive at what Esmonde (2014) characterized as “nonsensical” or “harmful” conclusions in her study of SJM with affluent students.

Mrs. Dodd was able to address students’ misunderstandings of sociopolitical issues by creating new SJM activities as needed, even in the middle of a project, when students began to draw conclusions that may have reinforced negative stereotypes. Teachers’ ability to formatively assess students’ understandings, both mathematically and in terms of their development of sociopolitical consciousness, and adjust midstream may be one way to successfully manage this challenge of students’ sparse background knowledge that may lead them to confirm negative stereotypes.

**Student Independence and Disruptions in class**

Similar to the critical versus dominant mathematics tension, research on SJM has also found that teachers struggle to manage what Gregson (2013) refers to as the tension between students’ “independence and interdependence.” The teacher in her case study complained about students’ effort and focus in her open enrollment, untracked class, commenting, “Wow, their work ethic is far removed from what is necessary if you are really trying to pursue anything other than ‘I’ll get by.’ And some of them really aren’t getting by, who surely could be” (p. 191).
The teacher wanted students to be independent learners to co-construct knowledge as SJM intends. However, she struggled with students being off task and engaging in arguments not related to the mathematics or the context of the activity.

Gutstein also experienced general classroom management challenges like the case study teacher in Gregson’s (2013) study. Gutstein (2006) explains that his “general” track class, which he taught himself, was often disrupted by a few “problem students,” making his class “hard to teach” (p. 157). Other teachers assigned seatwork to disruptive students, but seatwork with lower cognitive demand without critical analysis of social issues and co-construction of knowledge with students does not align with the principles of SJM. Gutstein chose not to assign seatwork and instead talked with students outside class, visited their homes, used detentions, and at times removed them from class.

These dilemmas were seen in Ms. Charles’s class where students interrupted class, at times visibly frustrating Ms. Charles. As discussed in Chapter 3, the school suffered from unstable leadership and high teacher turnover. Local papers reported school safety concerns with an overall lack of structure (Gaensler-Debs, 2016). It is important to note that students did not create these challenges. These challenges may have been the result of unstable leadership, inconsistent school policies and structures, high teacher turnover, and challenges due to environmental and economic oppression. These challenges were influenced by the structural inequities within the education system, environment, and employment opportunities that negatively influenced residents of the Stoneview neighborhood.
Ms. Charles explicitly mentioned how negative press (e.g. school safety concerns) about a school with predominantly black and brown students was especially harmful given existing stereotypes about black and brown youth. She discussed these challenges thoughtfully and always in conjunction with considerations of the structural nature of oppression that influenced students’ lives and the climate of the school.

Ms. Charles attempted to address such classroom management challenges a number of ways. She pulled students aside and spoke to them one-on-one both in class and after class. She also engaged her class in a Community Circle to invite students to reflect on their behavior in class and to build community amongst each other. At one point after class she asked me for advice, and I suggested that she return to the routines she had at the beginning of the school year, where students started the day with a Warm Up, and each student had his or her own Warm Up notebook. I also suggested assigning seats and being consistent with the assigned seats rather than assigning students to seats as they entered the room. She listened to my suggestions, and decided against it, stating, “Yea but that’s so militant.” I am intrigued by Ms. Charles’s perspective about creating a truly co-constructed space with students where the teacher does not assign seats, dictate classroom norms, or regulate when and if students can use the bathroom.

These dilemmas are indicators of challenges faced by many schools, not necessarily related to SJM. However, continued use of SJM may help improve students’ focus in class as suggested by students’ increased engagement with SJM
activities, discussed in Chapter 5. Teachers who want to use SJM must still manage the typical challenges of teaching in general. SJM may offer both solutions to such challenges as well as additional dilemmas of time needed to create SJM activities and ensure creation of a safe space for sensitive discussions.
Chapter 7 Discussion and Implications

The present study aims to fill gaps in the literature regarding the ability and conditions required to reach the goals of SJM – to simultaneously teach mathematics content while developing conscientização, or sociopolitical consciousness, (Freire, 1970). This study makes sense of conflicting findings of previous studies where some find SJM successful (e.g. Gutstein, 2006; Yang, 2009) and others find it unsuccessful in reaching the goal of increasing students’ sociopolitical consciousness (e.g. Brantlinger, 2007; Esmonde, 2014). The comparative cases offer opportunities to investigate how backgrounds, lived experiences, and social location influence conceptualization of SJM because of the diversity of students’ and teachers’ backgrounds in the two school sites.

The study focuses on the following research questions:

1. How do teachers’ lived experiences and the student populations they work with influence their goals for SJM?

2. How do students’ backgrounds and lived experiences influence how they make sense of social justice mathematics?

3. What tensions and dilemmas arise when using SJM and how do teachers successfully navigate these challenges?

The present study also addresses the need for mathematics education research to investigate issues related to race, class, and gender (Gutiérrez, 2013). Moreover this study is one of few that investigate full-time teachers’ math classes rather than teachers working in an after school program (e.g. Turner et al., 2009)
or a part time K-12 teacher (e.g. Gutstein, 2006). This dissertation is also not a self-study, or practitioner-researcher study, where the teacher and researcher are the same person. Bartell (2013), Gregson (2013), and Esmonde (2014) are the only such studies to date that investigate full-time teachers’ work with SJM that are not self studies.

Results from Chapters 4 and 5 indicate that backgrounds of teachers and students matter to SJM. Teachers’ lived experiences shaped their transformative and/or theoretical SJM goals, as discussed in Chapter 4. Chapter 5 indicates that different supports are needed for different student populations to facilitate successful engagement in SJM. For students of historically marginalized backgrounds, the teachers’ sociopolitical consciousness is imperative to the success of SJM, whereas for students of privileged backgrounds, implementation within a climate with school-wide social justice pedagogical practices supports students’ ability to build empathy toward others. Results discussed in Chapter 6 also explore how and why the two case study teachers were able to overcome common challenges of SJM.

**Teachers’ Sociopolitical Consciousness**

The research literature indicates that students of historically marginalized backgrounds succeed academically and feel empowered when using SJM (Gutstein, 2006; Yang, 2009), however other literature indicates student resistance to discussion of social issues in math class (Brantlinger, 2007). The present study makes sense of these conflicting findings by analyzing students’ (of historically
marginalized backgrounds) takeaways and by considering how and why Ms. Charles was able to avoid or overcome common tensions and dilemmas of SJM.

Brantlinger’s study (2007) of his own teaching in a Chicago public school remedial night math course, indicates student resistance where students felt, “This is not math,” or “We are wasting time studying things that it doesn’t belong in this class” (p. 335-336). Some students were not permitted to take courses during the day due to disciplinary reasons, some were parents, all had failed math previously, all were students of color, most were immigrants or from immigrant families, and 90% of students of the school qualified for free or reduced lunch. Brantlinger reflects on his self-study of his teaching and considers how his background as a white middle class teacher, a drastically different background than his students, may have influenced students’ reactions. As a white male he may have not had the life experiences of marginalization that his students, Ms. Charles, and Innovation Tech students have had. Findings from the present study suggest that Ms. Charles’s background, lived experiences, and sociopolitical consciousness as a black woman from Goldenview facilitated her ability to create SJM tasks relevant to students’ lives, respectful of their backgrounds, and that connected to their interests and concerns. As a woman of color born and raised and currently living in Goldenview her sociopolitical consciousness helped her design SJM activities relevant to and respectful of students’ lives. For instance, she created SJM activities about single mothers, rich and poor neighborhoods, and about challenges of affording rent and other living expenses in Goldenview, the city with the
highest housing costs in the nation. Students responded positively to these SJM activities. Her experiences as a black woman informed her ability to create SJM activities that related to their lives in a respectful manner. Ms. Charles was explicit in making sure that investigation of struggles (e.g. to pay rent) explored through the SJM activities did not make students feel “less than” others or ashamed of where they are from. Her familiarity with students’ neighborhoods allowed her to reference specific corner and grocery stores when engaging in class discussions about food deserts with students.

Her shared experiences with students also offered her intimate knowledge of neighborhoods so that she was able to make adjustments to her teaching in the moment. For instance, as they engaged in a class discussion about disparities in neighborhood resources a student mentioned trick or treating. Ms. Charles immediately picked up on this idea and asked students if they go trick or treating in different neighborhoods to get “better candy.” This connection resonated with students, and they excitedly shared the neighborhoods they travel to on Halloween. Ms. Charles’s shared knowledge with students allowed her to design and adjust SJM lessons to connect with students’ lived experiences to increase engagement and offer entry to the tasks. Not only did her sociopolitical knowledge of students’ communities and experiences help her create relevant SJM activities, but students also viewed her as a member of their community. She was a black woman and single mother, which many students in her class could relate to. Students even asked about her experiences as a single mother during the SJM
activity where she showed a video about a single mom to set the context for an activity about using fractions and percentages to divide a paycheck for living expenses. Because of her experiences with marginalization and her knowledge of the lack of educational opportunities for poor students of color, Ms. Charles emphasized the importance of rigorous dominant mathematics instruction. She explained that the math should be prioritized over social contexts when creating SJM tasks, particularly for students of historically marginalized backgrounds who have often been denied experiences with strong mathematics instruction.

Another tension or pitfall found in Brantlinger’s (2013) study is that his students expressed “hegemonic perspectives” more strongly than critical perspectives when engaging in SJM tasks (p. 19). For instance, an African American male student argued, “They [i.e., students of color] cause too much damn trouble, that’s why they can’t have recess,” when engaging in an SJM activity that focused on analyzing data on demographic makeup of schools in comparison with recess time. The data students investigated for the activity showed that the higher percentages of students of color in a school were associated with less time for recess. Brantlinger reports that there weren’t any students who countered this student’s viewpoint with a critical perspective critiquing structures of racism and institutional practices. Because he did not want to silence his student, Brantlinger did not share a critical perspective about inequitable and oppressive school structures. These reactions from students align with Frankenstein’s (1990) findings of her SJM work with older college students as
mentioned previously, where she argues that student resistance is due to their internalization “the dominant society's view that ‘the intellectual activity of those without power is always characterized as non-intellectual’ (Freire & Macedo, 1987)” (pp. 345-346).

Like Brantlinger, Ms. Charles had experiences with students expressing sentiments indicating hegemonic perspectives. She noticed and addressed these viewpoints with her students throughout the school year. When asked what social justice means to her and her students, Ms. Charles reflected about critical conversations she engaged in with her students from the school she taught at previous to Innovation Tech. She intended to explain how systemic oppression limits opportunities for women and people of color, by explaining that Gregor Mendell had the luxury of time to conduct experiments about genetics. She explained to her students, “You know, you see all these people in these history books that make these great discoveries and all of them are white. I want you to know that it’s not because they were smarter. It’s just because a lot of them came from privilege, and they had time.” She emphasized Mendell’s privilege, “Who has time to play with peas?”

She explained that her honors class of mostly white and Asian American students saw the influence of privilege on scientific discoveries, however, her “gender” class of mostly black and Latinx students expressed hegemonic viewpoints. She explained,
Well, my gen ed class was like, ‘No, Ms. Charles. They just knew!’ And I was just like that was so ingrained, and that was in the beginning of the year. We had to knock some things out by the end of the year. But it was so ingrained in them that they’re like, ‘Nah, they just knew what to do.’ No, he didn’t know what to do. He just had time. If we all had as much time to tinker and play then there will be a lot more discoveries.

She shared how taken aback she felt by these hegemonic comments, but that she saw “development of their humanity as critical thinkers as the year progressed.” Ms. Charles responded to these hegemonic perspectives by continuing to develop students’ sociopolitical consciousness over time. She conceptualized social justice goals for students as long-term goals and worked to develop students’ critical consciousness and positive cultural identities throughout the school year.

These results should be interpreted cautiously to avoid the conclusion that only teachers of color from the community can teach students of color. Scholars of Culturally Relevant Pedagogy (e.g. Ladson-Billings, 1995) and ethnic studies (e.g. Sleeter, 2011) offer instructive examples of white teachers engaging their respective pedagogical approaches with (poor) students of color, and the literature indicates its success and feasibility. Teachers with the sociopolitical consciousness to understand students’ backgrounds, lived experiences, challenges of their home lives, and struggles with internalized racism, sexism, homophobia, transphobia, etc. can certainly successfully engage in SJM with students of historically marginalized backgrounds. Mrs. Dodd offers an example of a white teacher’s
successful use of SJM, although her students are not predominantly students of color. A question for future research, discussed below, is how do teachers gain the sociopolitical consciousness to successfully and respectfully engage in SJM?

Also worth further investigation is how mathematics educators can include discussions of the structural nature of oppression. Ms. Charles’s mentioned her discussions with students about Gregor Mendell’s genetics discoveries and the privileges he was afforded to have time to “play with peas” in the school she taught in previously. However, during the time of data collection for the present study, she did not engage her sixth graders at Innovation Tech with these in-depth conversations of structural oppression on a regular basis. Likewise, Mrs. Dodd focused on students’ recognition of their own privilege, but did not explore structural oppression nor discuss the strengths, resistance, and triumphs of marginalized communities.

**Learning about Structural Oppression**

To support the SJM goal of learning about the structural nature of oppression, students of all backgrounds should learn about systemic oppression - which offers power and privilege to some and marginalization of others. Students should have opportunities to learn the struggles, resistance, and successes of marginalized peoples.

Focusing on oppression based on race, ethnicity, and skin color, research on ethnic studies has demonstrated positive findings about student growth for both students of color and white students (e.g. Dee & Penner, 2017; Sleeter, 2011). For
students of relatively marginalized backgrounds, specifically students of color, opportunities to learn about their own histories and herstories can foster “positive cultural identities,” as Gutstein (2006) includes in his definition of Teaching for Social Justice Mathematics. Some research has even shown that engagement in ethnic studies can improve attendance, grade point average, and course completion for students of color (Dee & Penner, 2017).

For students of relatively privileged backgrounds, specifically white students, this would help them understand their own privilege and extend beyond simply feeling empathy for others. It helps students understand that the circumstances of those who are less privileged are not the results of personal shortcomings, but rather are a consequence of structural oppression. Ethnic studies research has found that explicit discussion of racism, rather than simply including representation of people of color, improves white students’ perspective taking, and sense of commonality with students of different ethnic/racial backgrounds. Interaction with students of backgrounds different than their own also helps facilitate students’ racial understanding, especially for white students (Sleeter, 2011). Understanding systemic oppression and learning about the strengths of diverse communities can help build mutual respect to work in solidarity toward social justice with students and teachers of all backgrounds.

**Hope and Healing**

Students from both schools responded to SJM with heartfelt responses, indicating that attention to hope and healing may benefit them. Hope and healing
may be of particular importance for students who may experience challenges from living in economically depressed communities like Stoneview.

Stoneview, where Innovation Tech is located and where 60% of students lived, was a community where many residents had experienced traumatic events. A survey administered by a local community organization (not named to preserve the anonymity of the city and neighborhood) in 2011 found that 100% of youth surveyed knew someone who has been shot; 83% knew someone who had been killed; and 53% had seen someone get shot (Ginwright, 2016). The Centers on Disease Control (2013) also found that 70 percent of youth in Stoneview had been exposed to an Adverse Childhood Experience, such as witnessing domestic violence, having an incarcerated parent who suffers from mental illness, experiencing abuse or neglect. I include this information not to frame Stoneview from a deficit perspective but to explain the reality of the neighborhood’s challenges shaped by structural and environmental factors (e.g. poverty, toxic waste).

Trauma has been found to negatively impact students’ cognitive development from the consistent and heightened levels of cortisol that enter the body (Carrion, Weems, & Reis, 2007). Posttraumatic stress is associated with a range of negative effects including anxiety, aggression, depression, difficulty paying attention, and lower achievement (Ortiz et al., 2008). Exposure to such traumatic events may also decrease students’ ability to hope. Paulo Freire (1994) argues for the necessity of hope in Pedagogy of Hope. “Hopelessness paralyzes us,
immobilizes us. We succumb to fatalism, and then it becomes impossible to muster the strength we absolutely need for a fierce struggle that will recreate the world” (p. 8). Freire calls on “progressive educators” to “unveil opportunities for hope, no matter what the obstacles may be” (p. 9).

Innovation Tech student Matthew, who broke down in tears during the interview when sharing about his mother’s struggles and his intermittent homelessness, would have greatly benefitted from explicit opportunities to heal. (Ms. Charles connected him with the school counselors immediately after I informed her of his situation.) Attention to hope and healing are not only for students of historically marginalized backgrounds living in under-resourced communities. Students like Oscar, who expressed how hurt he was by being called names at school, may also benefit from the opportunity to heal and be hopeful about his academic, personal, and professional goals.

Ginwright (2016) offers healing justice framework that focuses on healing communities and individuals while acknowledging the effects of systemic oppression. Radical healing, which Ginwright has written about in previous works, is the process toward achieving healing justice. Radical healing is collective in nature and analyzes structural factors, such as poverty and racism, to prevent youth of color from internalizing harmful messages and blaming themselves for suffering traumatic events. This healing justice framework may complement SJM activities to offer students’ opportunities to heal and develop hope.
Significance: Why SJM?

SJM is an increasingly popular strategy with public and private school teachers to develop students’ sociopolitical consciousness while teaching mathematics content. Previous research (e.g. Gutstein, 2006; Yang, 2009) has demonstrated its ability to reach these goals, and the present study also demonstrates successes with SJM while making sense of conflicting findings, where some found SJM to backfire, both with students of historically marginalized backgrounds and privileged backgrounds (Brantlinger, 2007, 2013; Esmonde, 2014).

The present study demonstrates that SJM can be a powerful tool for students to develop empathy for others, to gain access to the mathematics through real-life, relevant, local contexts, and to increase engagement in math class. Students of diverse backgrounds and lived experiences at both the private school and Title I public school showed their understanding of social issues through participation in the SJM tasks.

Students’ development of sociopolitical consciousness is a worthwhile goal in and of itself. Infusing this goal with mathematics learning goals empowers students to be lifelong critical thinkers. Findings from the present study indicate that not only can math be used as a tool to investigate social issues, but the social issues themselves can be a “hook” to garner student engagement. In both classrooms, all 19 focus students, expressed their enjoyment and/or interest in SJM activities, as discussed in Chapter 5. These are important and promising
findings because the middle grades are typically when students’ interest in mathematics declines (Middleton & Spanias, 1999), and the age when American students’ math scores drop on national and international assessments (Boe & Shin, 2005; National Commission on Excellence in Education, 1983; National Commission on Mathematics and Science Teaching for the 21st Century, 2000).

The present study is the first to show that SJM can achieve its intended goals with students of privileged backgrounds, where a school-wide social justice focus supports SJM. It is also one of few non-self-studies (other than Bartell, 2013 and Gregson, 2013) with historically marginalized students that helps makes sense of conflicting previous findings of SJM (Brantlinger, 2007, 2013; Gutstein, 2006; Yang, 2009). Results from the present study highlight the importance of the teachers’ sociopolitical consciousness for using SJM with students of nondominant and historically marginalized backgrounds. Ms. Charles’s background, lived experiences, and sociopolitical consciousness helped her create SJM lessons sensitive to students’ backgrounds to engage in SJM in a respectful manner that also increased their interest and confidence in mathematics.

**Limitations**

While results are promising about the ability of SJM to develop students’ sociopolitical consciousness with students of diverse backgrounds and lived experiences, there are limitations to the present study. First, I did not collect student achievement data, as there was not a district or state exam given during the time of data collection, and at Claremont they did not administer exams nor give
grades. I did not administer my own pre- and post-assessment either. However, all 19 focus students, 10 from Claremont and nine from Innovation Tech, passed their math class in the fall term, great news suggesting possible positive academic outcomes with SJM but requiring more explicit investigation.

Second, students may have felt pressure to speak positively about the math activities their teachers developed or their experiences in math class. I stressed that their responses were confidential, and that they could skip questions, or end the interview at any time. Yet because I was an adult who they saw in their teacher’s classroom, they may have wanted to paint their teacher in a positive light.

Third, there were only two classrooms and two teachers in this case study. Fourth, as former math teacher of color in Title I schools for 11 years and co-founder of the Creating Balance in an Unjust World Conference on Mathematics Education and Social Justice, I may have bias in my selection of study sites and interpretation of the data. Lastly, I did not capture audio or video data of student groups or of whole class discussions. I relied on my field notes to capture students’ comments and reactions. Inclusion of audio or video data may help offer more in-depth analysis for a future study.

**Future Research**

Results from this study suggest that the teachers’ sociopolitical consciousness is crucial to the success of SJM. However, this study leaves some unanswered questions. First, findings indicate the importance of teachers’ sociopolitical consciousness especially when working with students of
marginalized backgrounds. Ms. Charles had a shared background and lived experiences to her students. How might a teacher with a different background and lived experiences to his or her students (e.g. a white teacher working with students of color) gain the sociopolitical consciousness necessary to create meaningful, sensitive, respectful, and rigorous SJM activities? Findings also suggest that a school-wide social justice focus may support teachers’ and students’ engagement with SJM. What might SJM look like with privileged students in a different school context, with a different overall school climate and with families of different political leanings?

If it is possible for teachers to increase their sociopolitical consciousness, can teachers also develop the ability to design their own curriculum like Mrs. Dodd and Ms. Charles did? And is it necessary for teachers to do this in order for SJM activities to be relevant to students’ local experiences? These questions all address the second overarching question of scalability. Is SJM scalable? Is it possible to bring SJM to many students across the country? What institutional supports and partnerships (with organizations, parents, etc.) are necessary? This study shows that students from dominant backgrounds from places of privilege may also benefit just like nondominant students, making the scalability question relevant to all students, but it raises questions of how curricular materials are developed and how teachers are trained and/or supported.

Third, how can teachers foster hope and healing with SJM? Is there time in the day to engage in such activities, and how will they complement the dominant
and critical mathematics goals? Perhaps partnerships with scholar Shawn Ginwright and his radical healing work or with other organizations, such as the East Bay Meditation Center who hosts workshops such as “Trauma and Transformation: A Journey into Compassion, Healing, and Wisdom,” may help link SJM activities with attention to hope and healing. What actions might students and teachers take with SJM activities to foster hope and healing?

Lastly, the field may benefit from explicitly studying achievement of students when using SJM with pre- and post- assessments. These assessments may also include performance assessment measures and/or evaluation of students’ sociopolitical consciousness, through an interview protocol, focus group, or surveys like those used in Brantlinger (2007) and Gutstein’s (2006) work. In addition, study of the cognitive demand of SJM tasks may help the field improve learning opportunities for students when using SJM. How do we evaluate the cognitive demand of tasks while also assessing its ability to develop students’ sociopolitical consciousness? How can teachers learn to create cognitively demanding SJM tasks? These unanswered questions suggest future studies to contribute to the literature on SJM.

Closing

The present study indicates that SJM may offer opportunities to simultaneously develop students’ mathematics understanding and sociopolitical consciousness, for students of all backgrounds. SJM is one promising strategy that may help to disrupt the current and persistent opportunity gap in mathematics
education, for teachers and students of diverse backgrounds to work in solidarity toward social justice in schools and in society.
References


Goldenview Health Improvement Partnership. (2016). 2016 Median Household Income. Website link not provided to protect anonymity of the school and city.


Appendix A: Student Interview Protocol (revised August 10, 2016)

Interview 1: Focused Life History (October/November 2016)
This interview focuses on gathering data to answer this research question RQ 1: How do the backgrounds of students and the contexts in which they are learning influence how they make sense of social justice mathematics?

“Thanks for meeting with me. For this interview I’m interested in getting to know a little bit more about you, both who you are as a person and who you are as a student. I have some interview questions that you and I will talk about, and then I have a short survey that you will fill out after, okay? Remember that you can choose to skip questions if you don’t want to answer them. You can also choose to end the interview if you feel uncomfortable and prefer to stop the interview, that’s totally fine! May I audio tape the interview?”

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<thead>
<tr>
<th>Question</th>
<th>Data I aim to gather from this question</th>
<th>Checkboxes</th>
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</thead>
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<tr>
<td>1. Pretend there is a student who has never been here, this student is also 11 years old. How would you describe this school to this student who has never been here before?</td>
<td>Making sense of school (does s/he like school in general or not)</td>
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<td>2. What do you like best about school? What do you not like as much or would want to change about school? <em>Probe:</em> That’s interesting, what else about math class do you like?</td>
<td>Making sense of school (does s/he like school in general or not)</td>
<td></td>
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<tr>
<td>3. How would you describe this math class to someone who has never been here before?</td>
<td>Math identity (does s/he like math in general or not)</td>
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<tr>
<td>4. What do you like best about math class? What do you not like as much or would want to change about math class? <em>Probe:</em> That’s interesting, what else about math class do you like?</td>
<td>Making sense of school (does s/he like school in general or not)</td>
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<td>5. In your opinion, is there anything in real life (or life outside of school) that math is related to?</td>
<td>Students’ sense of SJM</td>
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NOTE: Need to make this a question where the student does not feel pressured.
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<th>Question</th>
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<td>6. Do you feel that your math class is different than math class from before? If yes, how so? Since I am new to your school and I was not in your class last year, can you describe for me the differences?</td>
<td>relationship building, pedagogical practices (group work, student presentations, student leadership/ownership), SJM projects [RQ 1]</td>
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<tr>
<td><strong>Probe</strong>: relationship building, pedagogical practices (group work, student presentations, student leadership/ownership), SJM projects</td>
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<td>7. What is your relationship like with &lt;Teacher’s name&gt;? Does Ms. &lt;Teacher’s Last Name&gt; make an effort to connect to you as an individual? How so? Is that similar or different than your other teachers?</td>
<td>Part of SJP (Picower, 2012)</td>
</tr>
<tr>
<td>8. Let’s look at this activity [have a copy of the student’s work work from the activity] What did you think about it? Was it fair? What do you think &lt;Teacher’s name&gt; wanted you to get out of it? What did you take away from the activity? a) What would you say to someone not in the class what you were asked to do? b) What did you learn from this activity? c) What do you think your teacher wanted to learn? d) Did it relate to your life outside school or the real world? [Have you had other math assignments that relate to your life outside school or the real world?] d) How did you feel about it? Did you like it? Was it fun? Did it relate to your life outside school? Did it relate to how you see the world?</td>
<td>RQ 1 Conceptions of SJM</td>
</tr>
<tr>
<td>Picture yourself as an eighteen- or nineteen-year-old after you have graduated high school. What are your goals after high school? Career/College goals? Do you see yourself involved in</td>
<td>Getting to know the student</td>
</tr>
</tbody>
</table>
math after high school?

<table>
<thead>
<tr>
<th>What school did you go to before this one?</th>
<th>SES measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. What neighborhood do you live in [and how would you describe it to someone who has never been there before?]</td>
<td>SES measure by knowing what neighborhood they live in</td>
</tr>
<tr>
<td>How old are you?</td>
<td>Demographics</td>
</tr>
<tr>
<td>What are you interested in outside of school? [sports, music, hobbies]</td>
<td>Getting to know the student</td>
</tr>
</tbody>
</table>

**Likert Scale Survey Questions [informed by Brantlinger’s (2007) interview protocol]**

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
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</thead>
<tbody>
<tr>
<td>1. “I like school.”</td>
<td></td>
<td></td>
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<tr>
<td>2. “Education is important.”</td>
<td></td>
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<tr>
<td>3. “I like math class.”</td>
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<td></td>
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<tr>
<td>4. “Math is important.”</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5. “Math is useful.”</td>
<td></td>
<td></td>
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<tr>
<td>6. “I see math in the world around me.”</td>
<td></td>
<td></td>
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<tr>
<td>7. “My math class with Ms. &lt;&gt; makes me see the world differently.”</td>
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<td></td>
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<tr>
<td>8. “I look forward to coming to school.”</td>
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<tr>
<td>9. “I would rather stay home than come to school.”</td>
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</tr>
<tr>
<td>10. “I look forward to coming to math class.”</td>
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<tr>
<td>11. “I would rather skip math class.”</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12. “Math class is better when I see how I can use it in real life.”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. “I like the activities we do in math class that are about my community and the world around me.”</td>
<td></td>
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</tr>
</tbody>
</table>

**Interview 2: The Details of Experience/Reflecting on the Meaning (November/December 2016)**

This interview focuses on RQ 1: How do the backgrounds of students and the contexts in which they are learning influence how they make sense of social justice mathematics?

<table>
<thead>
<tr>
<th>Question</th>
<th>Data I aim to gather from this question</th>
<th>Checkbox</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How would you describe what a typical day is like in math class to someone who has never been here</td>
<td>Making sense of math</td>
<td></td>
</tr>
</tbody>
</table>
**before?**

_Probe:_ What would a visitor see when s/he comes to math class? What are you doing? What are your classmates doing? What is your teacher doing?

2. In your opinion, is there anything in real life (or life outside of school) that math is related to?

<table>
<thead>
<tr>
<th>Students’ sense of SJM</th>
</tr>
</thead>
<tbody>
<tr>
<td>relationship building, pedagogical practices (group work, student presentations, student leadership/ownership), SJM projects [RQ 1]</td>
</tr>
</tbody>
</table>

3. Do you feel that your math class is different than math class from before? If yes, how so? Since I am new to your school and I was not in your class last year, can you describe for me the differences?

_Probe:_ relationship building, pedagogical practices (group work, student presentations, student leadership/ownership), SJM projects

| relationship building, pedagogical practices (group work, student presentations, student leadership/ownership), SJM projects [RQ 1] |

4. Does Ms. <Teacher’s Last Name> make an effort to connect to you as an individual? How so? Is that similar or different than your other teachers?

_Probe:_ What does she do? How would you describe it to someone who has never been to this class?

| Part of SJP (Picower, 2012) |

5. Let’s look at this activity [have a copy of the student’s work work from the activity]

a) What would you say to someone not in the class what you were asked to do?

b) What did you learn from this activity?

c) What do you think your teacher wanted to learn?

d) Did it relate to your life outside school or the real world? [Have you had other math assignments that relate to your life outside school or the real world?]

d) How did you feel about it? Did you like it? Was it fun? Did it relate to your life outside school? Did it relate to how you see the world?

<table>
<thead>
<tr>
<th>RQ 1 Conceptions of SJM</th>
</tr>
</thead>
</table>
6. When do you feel most successful or good about math class?  
7. Tell me what you dislike the most or what is most challenging about math class?  
8. How is someone smart at math?  
9. How does math relate to your life outside of school?  
10. How might math relate to other people outside of school?  
11. For what reasons do we study math?  
12. Has your math class influenced or changed the way you view the world? What makes you say that? Can you explain a little more what you mean please?

<table>
<thead>
<tr>
<th>Math identity</th>
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</thead>
<tbody>
<tr>
<td>Math identity</td>
</tr>
<tr>
<td>Conceptions of math</td>
</tr>
<tr>
<td>Conceptions of SJM</td>
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<tr>
<td>Conceptions of SJM</td>
</tr>
<tr>
<td>Conceptions of math and SJM</td>
</tr>
<tr>
<td>Conceptions of SJM</td>
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</tbody>
</table>

**Likert Scale Survey Questions [informed by Brantlinger’s (2007) interview protocol]**

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Somewhat Disagree</th>
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<th>Agree</th>
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<tbody>
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<tr>
<td>“I like the activities we do in math class that are about my community and the world around me.”</td>
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</tbody>
</table>
Appendix B: Teacher Interview Protocol (revised August 10, 2016)

1. **Interview 1 Focused Life History** (August/September 2016)

This interview focuses on gathering data to answer these two questions:

*RQ 2: How do the backgrounds of the teachers and the contexts (includes to a small extent the students) in which they work influence how they make sense of SJM and what they do in their teaching?*

*RQ 3: What are the tensions and dilemmas that arise when teachers of different backgrounds and in different contexts teach SJM?*

<table>
<thead>
<tr>
<th>Question</th>
<th>Data that I aim to get with this question</th>
<th>Checkbox</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. How did you get into teaching?</strong> Why is it that you became a teacher?</td>
<td>personal experience and background potentially related to why she became interested in SJM [RQ2]</td>
<td></td>
</tr>
<tr>
<td><strong>2. Pretend you are talking with a new teacher who is just learning about SJM…</strong></td>
<td>teachers’ making sense of SJM [RQ2]</td>
<td></td>
</tr>
<tr>
<td>a) How would you describe to someone new to SJM what SJM is? b) How would you describe what the goals (generically not specific to the teacher’s own goals) of SJM are (to someone new to SJM)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3. a) What does SJM mean to you and your students? b) What would you say your goals are for social justice math</strong> are in your classroom?</td>
<td>teachers’ making sense of SJM [RQ2]</td>
<td></td>
</tr>
</tbody>
</table>

*NOTE: Need to preface this to make a SAFE SPACE. Mention that everyone struggles with SJM and that the purpose of this study is to investigate what the*
**dilemmas are, but first before discussing dilemmas we will discuss goals.**

*Probe:* How do you navigate your multiple goals (e.g. “dominant” math goals of grades and math learning and “critical” math goals of students gaining sociopolitical consciousness)

<table>
<thead>
<tr>
<th>4. As a former math teacher also with my own struggles with SJM I know how challenging this work is. I wanted to talk a little about the <strong>tensions and dilemmas that you are facing</strong> when using SJM.</th>
</tr>
</thead>
<tbody>
<tr>
<td>teacher’s perspective of the tensions/dilemmas [RQ 3]</td>
</tr>
</tbody>
</table>

*Probe:* Is there a particular challenge and particular success you could tell me about? What happened? How did you feel?

<table>
<thead>
<tr>
<th>4. Now let’s switch gears to thinking about your <strong>students.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>teachers’ making sense of SJM [RQ2]</td>
</tr>
</tbody>
</table>

a) How would you describe to someone else who is new to SJM, the **benefits of SJM for your students?** [RQ 2]

<table>
<thead>
<tr>
<th>b) As we have talked about, there are both goals and tensions with SJM, what do you <strong>most hope that your students learn?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>teachers’ making sense of SJM [RQ2] tensions [RQ 3]</td>
</tr>
</tbody>
</table>

Making sense and **what they do in their teaching** [RQ 2]

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<thead>
<tr>
<th>c) How do you think <strong>students experience</strong> social justice math?</th>
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</thead>
</table>

<table>
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<tr>
<th>5. Tell me <strong>what I will see in your classroom</strong> this semester? What will I see, hear, notice when I walk in? What will students be doing? What will you be doing?</th>
</tr>
</thead>
<tbody>
<tr>
<td>what they do in their teaching [RQ 2]</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>6. What <strong>advice</strong> would you give to someone interested in incorporating SJM in their classroom? [RQ 3]</th>
</tr>
</thead>
<tbody>
<tr>
<td>what they do in their teaching [RQ 2]</td>
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</table>

<table>
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<tr>
<th>7. Anything else you’d like to add?</th>
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<table>
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<tr>
<th>8. Demographic Questions:</th>
</tr>
</thead>
</table>
a) How long have you been teaching? What other school(s) did you teach in before this one?

b) How do you identify your ethnic/racial background?

c) Did you grow up in this community? Did you grow up in a similar community as your students? What city did you grow up in? [RQ 2]

d) How would you describe your K-12 and college education? (Public, private, Title I schools, low/high socioeconomic status families)? Did you go to public or private schools for K-12? What about college?

e) How old are you?

Additional elicitation questions (as needed):
- What makes you say that?
- Can you tell me a little more about that?
- Do you have anything you’d like to add about…..?
- Can you tell me a little more about…? Can you describe for me more about…?
- How would you describe…. Can you describe for me….
- What would you say…..

Interview 2: The Details of Experience (October/November 2016) (focus on an a. SJM activity or pedagogical practice and b. incident)

Prior to this interview I will either ask teacher to bring a SJM activity or pedagogical practice that they want to discuss, or I will select one of interest or select a couple and ask the teacher to choose which one they want to discuss (I hope to use the same SJM activity in the interviews with the students.) I do the same in discussing an incident that occurred in class. Either I will either ask teacher to come to the interview with an incident in class that they want to discuss (hopefully related to the SJM activity), or I will select one of interest or select a couple and ask the teacher to choose which one they want to discuss.

This interview focuses on gathering data to answer these two questions:
RQ 2: How do the backgrounds of the teachers and the contexts (includes to a small extent the students) in which they work influence how they make sense of SJM and what they do in their teaching?
RQ 3: What are the tensions and dilemmas that arise when teachers of different backgrounds and in different contexts teach SJM?

<table>
<thead>
<tr>
<th>Question</th>
<th>Data that I aim to get with this question</th>
<th>Checkbox</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>
1. How are you doing today?  
   rapport building and to let the teacher mention anything on their mind

<table>
<thead>
<tr>
<th>So today I wanted to be able to talk with you about an SJM math activity or pedagogical practice [either show the activity or mention the pedagogical practice I chose to discuss or ask them which one they brought to discuss].</th>
</tr>
</thead>
<tbody>
<tr>
<td>what they do in their teaching [RQ 2]</td>
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</tbody>
</table>

2. How would you **describe** this (SJM) activity or this pedagogical practice to **someone who is not a math teacher and not familiar with SJM**?  

<table>
<thead>
<tr>
<th>3. What would you say was the most <strong>successful part of this activity</strong>?</th>
</tr>
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<tbody>
<tr>
<td>making sense of SJM [RQ 2]</td>
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</tbody>
</table>

3. What would you say was the most **successful part of this activity**?  

<table>
<thead>
<tr>
<th>4. We talked about <strong>tensions and dilemmas</strong> of SJM before, were there any that arose with this activity? <strong>NOTE: Need to preface this to make a SAFE SPACE. Mention that everyone struggles with SJM and that the purpose of this study is to investigate what the dilemmas are, but first before discussing dilemmas we will discuss goals.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>tensions and dilemmas [RQ 3]</td>
</tr>
</tbody>
</table>

5. a) What do you think your **students** got out of it? What were the **benefits** to them?  

<table>
<thead>
<tr>
<th>b) What do you think they <strong>thought of it</strong>?</th>
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</thead>
<tbody>
<tr>
<td>making sense of SJM [RQ 2]</td>
</tr>
<tr>
<td>How students make sense of SJM [RQ 1]</td>
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</tbody>
</table>
6. Now let’s do the same thing thinking about an **incident from class** related to SJM – to an SJM activity or an SJM pedagogical practice (an “aha” moment, a struggle, something surprising, perplexing, an interaction between students)

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>a) What happened?</td>
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<tr>
<td>b) Why did you choose this one to discuss?</td>
<td></td>
</tr>
<tr>
<td>c) Are there <strong>dilemmas</strong> that it highlights? Or <strong>successes/benefits</strong> of SJM?</td>
<td></td>
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<tr>
<td>d) What do you think your students got out of it? What were the <strong>benefits</strong> to them?</td>
<td></td>
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<tr>
<td>e) What do you think <strong>they thought</strong> of it?</td>
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</table>

7. How would you describe your **teaching style**? What pedagogical practices are most important to you? **Probe**: What do you want your **students** to be doing in your class?

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<tbody>
<tr>
<td>What is <strong>your role</strong> as the teacher? <strong>Probe</strong>: What are your <strong>goals</strong>, and what goals do you have for your <strong>students</strong>?</td>
<td></td>
</tr>
</tbody>
</table>

8. Let’s think about the **focal students** (show list), can you briefly describe for me **how each of them are doing**? **[Go down list of 8-10 focal students. Follow up with questions about students’ perceptions of social justice in math if time.]** [RQ 1]

9. Anything **interesting coming up** that I should be on the lookout for? (if time)

10. Anything else you’d like to add?

**Additional elicitation questions (as needed):**

- What makes you say that?
- Can you tell me a little more about that?
• Do you have anything you’d like to add about…..?
• Can you tell me a little more about…? Can you describe for me more about…?
• How would you describe…. Can you describe for me…..
• What would you say…..

**Interview 3: Reflecting on the Process** (November/December 2016)
Prior to this interview I will either ask teacher to bring an SJM activity or pedagogical practice that they want to discuss, or I will select one of interest or select a couple and ask the teacher to choose which one they want to discuss (I hope to use the same SJM activity in the interviews with the students.)

This interview focuses on gathering data to answer these two questions:

*RQ 2: How do the backgrounds of the teachers and the contexts (includes to a small extent the students) in which they work influence how they make sense of SJM and what they do in their teaching?*

*RQ 3: What are the tensions and dilemmas that arise when teachers of different backgrounds and in different contexts teach SJM?*

<table>
<thead>
<tr>
<th>Question</th>
<th>Data that I aim to get with this question</th>
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<tbody>
<tr>
<td>1. How are you doing today?</td>
<td>rapport building and to let the teacher mention anything on their mind</td>
<td></td>
</tr>
<tr>
<td>So today I wanted to be able to talk with you about an SJM math activity</td>
<td>what they do in their teaching [RQ 2]</td>
<td></td>
</tr>
<tr>
<td>or pedagogical practice [either show the activity or mention the pedagogical practice I chose to discuss or ask them which one they brought to discuss].</td>
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<td></td>
</tr>
<tr>
<td>2. How would you <strong>describe</strong> this (SJM) activity or this pedagogical practice to someone who is not a math teacher and not familiar with SJM?</td>
<td>making sense of SJM [RQ 2]</td>
<td></td>
</tr>
<tr>
<td>3. What would you say was the most successful part of this activity?</td>
<td>tensions and dilemmas [RQ 3]</td>
<td></td>
</tr>
<tr>
<td>4. We talked about <strong>tensions and dilemmas</strong> of SJM before, were there any that arose with this activity?</td>
<td></td>
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</tr>
<tr>
<td><em>NOTE: Need to preface this to make a SAFE SPACE. Mention that everyone</em></td>
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</table>
struggles with SJM and that the purpose of this study is to investigate what the dilemmas are, but first before discussing dilemmas we will discuss goals.

5. a) What do you think your students got out of it? What were the benefits to them?

b) What do you think they thought of it?

6. Let’s think about the focal students (show list), can you briefly describe for me how each of them are doing? [Go down list of 8-10 focal students. Follow up with questions about students’ perceptions of social justice in math (if time.)]

7. What advice would you give to someone else (unfamiliar with SJM) who wants to do social justice math? What are the benefits/successes and what are the tensions/dilemmas?

8. What would you say is the biggest tension or dilemma with SJM in your own class? What other supports would help you and your students do social justice math?

9. When do you feel most successful or good about this class? Or What are some successes about this class?

10. Has anything changed in your thinking about social justice math? Any reflections, revelations, epiphanies you’ve had this semester?

11. What do you think “the field” should know, meaning what should professors, teachers, parents, and the general public know about SJM? What advice do you have?

12. Anything else you’d like to add?
Additional elicitation questions (as needed):
• What makes you say that?
• Can you tell me a little more about that?
• Do you have anything you’d like to add about…..?
• Can you tell me a little more about…? Can you describe for me more about…?
• How would you describe…. Can you describe for me…. 
• What would you say…..
**Vita**

**Kari Kokka**

<table>
<thead>
<tr>
<th>Year</th>
<th>Institution</th>
<th>Degree</th>
<th>Location</th>
<th>Date</th>
</tr>
</thead>
<tbody>
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<td>Stanford University</td>
<td>B.S.</td>
<td>Stanford, CA</td>
<td>June 1999</td>
</tr>
<tr>
<td>1999 – 2000</td>
<td>Teacher, Berkeley High School</td>
<td></td>
<td>Berkeley, CA</td>
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</tr>
<tr>
<td>2001 – 2011</td>
<td>Teacher, Vanguard High School</td>
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<td>New York, NY</td>
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<tr>
<td>2011 – 2017</td>
<td>Doctor of Education Candidate</td>
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<td>Cambridge, MA</td>
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<tr>
<td>2011 – 2013</td>
<td>Research Assistant, Teaching Fellow</td>
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<td>Cambridge, MA</td>
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<tr>
<td>2013 – 2016</td>
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<tr>
<td>2016 – 2017</td>
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University of San Francisco
University of California Berkeley
San Francisco State University