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Identity Work to Teach Mathematics for Social Justice

Navy B. Dixon

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Master of Science

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ABSTRACT

Identity Work to Teach Mathematics for Social Justice

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In this thesis, mathematics educators are conceptualized as individuals with multiple, simultaneous figured worlds that inform their decisions while planning. The study explores how two mathematics educators negotiated and orchestrated their figured worlds to plan two mathematics lessons for social justice. The results highlight how numerous the figured worlds each participant surfaced through background interviews. Some of the figured worlds were elicited by the interview questions (i.e., Race, Family, Social Justice Teaching) but other figured worlds organically surfaced through the interviews (i.e., Sexuality, Community, Activism, Critical Information Consumption). A discursive analysis of a selection of these figured worlds revealed conceptualizations that were unique and similar between the two participants' figured worlds. Only some of these figured worlds were orchestrated in the planning of two social justice lessons. First, the figured world of Mathematics Teaching was demonstrated to be in apparent tension with the figured world of Social Justice teaching but were orchestrated by the participants to be valued together through adaptation of the lesson to include both mathematical and social justice goals. Second, the figured worlds of Quantitative Reasoning and Social Justice Teaching were negotiated, with one participant valuing student reasoning with quantities over students reasoning with the injustice evident in the tasks. Third, personal figured worlds (Race, Gender, Church, etc.) limited the participants from fully anticipating the possible reactions of students during the lesson. The results of this study can inform teacher educator practice of the complexity of teacher identity work, particularly to engage in teaching math for social justice.

Keywords: teaching mathematics for social justice, identity work, figured worlds, lesson planning

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CHAPTER ONE: INTRODUCTION

For the cost of one B-2 bomber, how many years of graduating Bolivar [Middle School] classes (assuming the same size each year) could get free rides at UW [University of Wisconsin-Madison]? (Gutstien, 2006, p. 247)

The worldometer (a statistics reporting service) reported that the death rate for those testing positive for the 2003 SARS virus was 10% while the death rate of those testing positive for COVID-19 through June 9, 2020 was about 5%. Explain what this data tells us about the two virus outbreaks and what this data does NOT tell us about the virus outbreaks. (Carlson, Oehrtman, & Moore, 2020, Module 4 Investigation 1 Problem 3b)

In today's climate, mathematical skills are crucial to understanding and participating in political discourse. Since mathematics has privilege in society (Gutiérrez, 2013) the use of mathematics is often a powerful tool of persuasion. Do current methods of teaching allow students opportunities to grapple with this use of mathematics? Gutstein (2006) argued that students need to be prepared to use mathematics to critique and challenge injustices through their mathematics education. Teachers must include relevant and potentially controversial mathematics questions for students to develop the skills to uncover and explain injustice (similar to the examples that begin this introduction). The choice to include or exclude contexts which are seen as emotionally and politically imbued can shape a teacher's identity and teacher identity can shape teaching decisions.

Teaching mathematics for social justice (TMSJ) requires both social justice and mathematical pedagogical goals (Gutstein, 2006). Mathematically, students will be able to succeed academically and gain deeper, richer knowledge of mathematical concepts. With regard to social justice, students will be able to understand relations of power and inequity and use mathematics as an agent for change. The dual purpose of TMSJ can present difficulties in lesson enactment. Sometimes, teachers must decide which goals to prioritize (Bartell, 2013). The

planning and prioritization of goals during lessons emerge from a teacher's malleable sense of identity and critical consciousness.

Teachers' critical consciousness encompasses their sensitivity and understanding of relations of power and oppression. Some teachers may have lived experiences that give first-hand knowledge of the power dynamics and injustice in their community. Other teachers, because of their gender, race, sexual orientation, and/or religious beliefs, may have little experience with and sensitivity to these issues. Since the majority of teachers in the United States are White¹ (Feistritzer, 2011), many teachers fall into the latter category. This lack of awareness can become problematic for enactments of TMSJ lessons, as teachers inadvertently perpetuate Whiteness while teaching students of Color² (Harper, 2020). Furthermore, teachers may avoid topics they are uncomfortable with, like race, and sidestep comments that further marginalize those in and outside the class (Bartell, 2013). Teachers' personal understanding of and sensitivity to dynamics of power are critical to their preparation for TMSJ lessons.

Teachers' sense of self, professionally, also contribute to their TMSJ lessons. Their mathematics teacher selves may be interested or preoccupied with the mathematical content of the lesson, leaving little to no time to discuss the emotionally or politically charged context (Bartell, 2013). If their practice habitually centers the teacher as the mathematical authority, a teacher's opinion of the subject may dominate the conversation, silencing student questions and experiences. Teacher experience may also affect the TMSJ enactment. Inexperienced teachers may have a relatively developed critical consciousness but struggle to connect the issue to the

¹ I choose to capitalize White (as well as other racial identifiers) to highlight the presence of White racial identity instead of suggesting an absence of racial identity.

² When referring to a collective of people who are not white, I will use "<collective noun> of Color." However, when the race of a particular person is known, I use their racial identifier.

mathematical content in a powerful way. As such, teachers' confidence and habits as mathematics facilitators play a role in their preparation and execution of TMSJ lessons.

Finally, a teacher may be confident in their sociopolitical understanding and their ability to facilitate mathematical discourse, but still hesitant to incorporate TMSJ lessons into their practice. A teacher in a position of privilege (White, heterosexual, male, etc.) may feel that talking about traditionally taboo topics in the mathematics classroom is too risky, or inappropriate for their student population (Simic-Muller, et al., 2015). Another dimension of teacher identity central to enactments of TMSJ is their willingness to act on their sociopolitical understanding. An enhanced understanding of the identity work needed to translate understanding into action in the classroom is needed to properly encourage TMSJ.

Translating understanding into action may require teacher identity negotiation as teacher's self-conception and their customary role are at odds with each other. Whether new roles are assigned by the teacher internally or by an external source like parents, administration, or colleagues, rejecting or accepting new roles is central to identity work. For example, a teacher may view themselves as politically moderate, but the choice to implement TMSJ lessons may implicitly brand the teacher as a politically leftist activist. The constant decisions to accept or reject new positions constitute the labor in identity work.

In this thesis, I consider the identity work evident in teachers' practice of TMSJ. This identity work is multifaceted. Teachers' critical consciousness, mathematics teacher identity, and willingness to act are all components of their planning and preparation. In this study, I will focus on the identity work of myself and one other mathematics teacher in reflections and while planning to teach mathematics for social justice. The study will contribute to understanding how

teachers' critical consciousness, mathematics teacher identity, and willingness to act are negotiated and demonstrated.

CHAPTER TWO: BACKGROUND

Literature Review

I begin this literature review by describing the research on teaching mathematics for social justice (TMSJ) in order to elaborate on what theories underpin it and how it is defined and enacted. Further, I review research about students' interactions with TMSJ and teacher education within the context of TMSJ. Next, I review research on figured worlds which is the central theory which will guide my definitions of identity and identity work in this thesis. Finally, I review the research on collaborative lesson planning in order to establish what is known about this practice more broadly.

Teaching Mathematics for Social Justice

Teaching mathematics for social justice has roots in the theoretical work of Freire, Apple, Skovsmose, and Frankenstein. In *Pedagogy of the Oppressed*, Freire (1970/2008) described the current model of education as perpetuating the status quo of the privileged and oppressed by rewarding students integrating or adapting to the oppressive system. Freire argued for a paradigm shift in education, where students are not “docile listeners” but are “critical co-investigators in dialogue with the teacher” (p. 81). Students are “posed with problems relating to themselves in the world and with the world” (p. 81). The desired outcome of the problem-posing education would be increased critical consciousness and transformation of the oppressive system.

Skovsmose, Frankenstein and Apple furthered this work by considering what Freire's problem-posing critical education could look like in a mathematics classroom. Frankenstein (1983) notes that Freire's assumptions on knowledge and teaching contradict positivist notions of mathematics. To implement Freire's ideas into mathematics education, teachers must contradict the prevalent assumptions that mathematics is “objective and value-free” (p. 327) to spark

challenges to mathematical assumptions and data. Often this assumption is inherent in our guiding principles for mathematics teaching. To counter this assumption, Skovsmose (1985) argued that there should be more interaction between critical education and mathematics education. According to Skovsmose, mathematics education should provide students with the tools to develop a critical attitude toward the dominating power structures in a technological society since mathematics education is the “most significant introduction” (p.348) students have to participating in a technological society. In line with this call to critical mathematics pedagogy, Apple (1992) questioned whose knowledge and whose problems are privileged in the National Council of Teachers of Mathematics (NCTM) *Standards*³. Apple determined that the *Standards* are unclear about what mathematical literacy can mean as “[its] meaning varies in accordance with its use by different groups with different agendas” (p. 423). Some meanings of mathematical literacy desire to create “more moral, more obedient, more effective and efficient workers” (Apple, 1992, p. 423), which aligns with Freire’s description of an education system that benefits the oppressors. A critical literacy, on the other hand, would allow students and teachers to problem pose and lead to “larger social movements for a more democratic culture, economy, and polity.” A different understanding of mathematics and the goals of a mathematics classroom are requisite for critical mathematical pedagogy. Frankenstein (2001) proposes goals for a critical literacy curriculum to center reading the world with mathematics by posing questions that spark understanding different numerical descriptions of the world and better understand and critique computational/logical underpinnings to argument. Frankenstein,

³ National Council of Teachers of Mathematics (NCTM) *Curriculum and Evaluation Standards for School Mathematics*

Skovsmose, and Apple took Freire's general approach to education and further theorized how this could look in a mathematics classroom.

Social justice mathematics educators usually view mathematics as access or as critical consciousness. Educator and activist Robert Moses viewed the mathematics classroom as a civil-rights battleground in the civil rights movement for African Americans (Larnell, Bullock, & Jett, 2016). For the Algebra Project movement, the social justice motivations for learning/teaching mathematics were based on access and mathematical fluency for higher education and careers. However, Gutstein takes a different approach. In his book *Reading and Writing the World with Mathematics*, Gutstein (2006) described his process in implementing "real world projects"⁴ in his Chicago middle school classroom that reflect the critical pedagogy championed by Freire, Frankenstein, Skovsmose, and Apple. Gutstein frames his pedagogy as "teaching mathematics for social justice." This thesis will focus primarily on the teaching and types of tasks promoted by Gutstein.

Gutstein's (2006) "real world projects" had the explicit goal of helping students read and write the world with mathematics. Gutstein's entire class was based on reform-oriented mathematics pedagogy which included an emphasis on student-centered discourse and supporting students in discovering mathematical ideas. This context is necessary but insufficient for developing the core understandings about social justice. Gutstein's "real world projects" sometimes were about the general world. For example, Gutstein tasked students to find the proportional areas of Alaska, Mexico, Greenland, and Africa on a Mercator world map projection (which magnifies the global north and is the typical map projection used in

⁴ "Real world projects" is the term used by Gutstein (2006). He uses this term exclusively for tasks that engage students in critical consciousness type discourse. Other authors use this term more broadly for work that is related to everyday living (Simic-Muller et al., 2015) but which may not be critical in nature.

classrooms) and contrast that with the Peters projection, which preserves proportionality of land mass. In another task, Gutstein asked students to determine how their class could be divided to represent the population of each continent and then further how, if a box of cookies represented the world's wealth, several cookies would be distributed among the students to reflect the comparative wealth of each continent. These tasks allowed students to contemplate the distribution of wealth and resources in the world alongside their perception of the world.

Other tasks Gutstein (2006) gave to his class were specific to the context of Rivera Elementary (a pseudonym), the Chicago public school located in a Mexican immigrant community where Gutstein was working. For example, Gutstein used the racial breakdown and police reports of discretionary stops to investigate if Latin@⁵ drivers were racially profiled. In another task, Gutstein brought in housing prices in the students' neighborhood before and after a new real estate development to explore the mathematics of gentrification. The "real world projects" or TMSJ tasks were intended to help students read and write the general world and connect to their specific context.

It is important to note that TMSJ tasks can both be explicitly and implicitly about race and racism. For example, Gutstein's (2006) task on racial profiling in Chicago is explicitly about race. Another task, *It's Black and White*, shows students a graph of the number of people shot and killed by police in the United States compared to a graph of the general racial makeup of the United States (Stephan et al., 2021). Other tasks are not explicitly about racism. For example, the task *Corona Crisis* showed students two different graphs of the spread of the coronavirus outside of China in March 2020 to determine the credibility of various public health sources (Stephan et

⁵ I choose to use Latin@ instead of Latino/a or Latinx since Latin@ honors the grammatical gender of the Spanish language (with a superposition of the "o" and "a" in the @ symbol) while alluding to the limitation of the gender binary present with Latino/a.

al., 2021). Another TMSJ task shows students several maps and asks students to determine a procedure for finding food deserts (Harper, 2017). These tasks are not explicitly about race, but the answers to why food deserts exist in certain residential areas or who is most impacted by the coronavirus pandemic are inevitably tied to race. Other systems of oppression (patriarchy, heterosexism, classism, etc.) are often interwoven in teaching these TMSJ tasks.

Student Outcomes with TMSJ

Developing students' ability to read the world with mathematics is not easy or linear. In Gutstein's classroom in inner-city Chicago, most of the tasks positioned the students as the oppressed or disadvantaged in the injustice. Gutstein (2006) reported that his students vacillated and expressed contradictory views about various issues within his class. For example, one student was a "staunch defender of the Mercator map" and another student vacillated from advocating for the gentrification to be stopped and expressing understanding the developers would not want to "let the opportunity go by" (p. 136-137). Similarly, Harper (2017) examined how students living in low-income area of a small city reacted to mathematical tasks on food deserts. Initially, students did not see themselves as living in a food desert since "they could easily access fast food restaurants or convenience stores within a mile of their home" (p. 517). Throughout the year the students had several projects relating to food deserts in their mathematics class, as well as English and Biology class projects on community gardens and nutrition. By the end of the year, students expressed work in their community garden as benefiting their community as well as recognizing food deserts as a larger problem outside their community. Gutstein also noted students increasing in subtlety and complexity on social justice issues over the course of several projects. Several years after Gutstein taught these middle school students, Gutstein's students said that his class helped their ability "to think critically about the

world [they] live in and to the way [they] respond to it” (p. 100). Even for students whose life experience is validated by mathematics, being able to read the world with mathematics is a slow process.

For students who are privileged by injustice, TMSJ tasks can take on an informative objective. However, students often have surprising reactions to these tasks. For example, Esmonde (2014) studied how affluent students made sense of TMSJ tasks. In one affluent middle school, students were given the continent wealth task and the students “disagreed about whether wealth distribution was just” (p. 385). Some students expressed the belief that African countries are impoverished due to excessive borrowing or loans, ignoring the events that rendered these countries poor enough to necessitate taking out loans. In the *It’s Black and White* task (Stephan et al., 2021), varied student sociopolitical awareness and mathematical reasoning “were found to both support and inhibit one another” (p. 13) in understanding the inequity in police shootings. Of the eight White students in this study, four of the students demonstrated proportional reasoning. Of those students, only one displayed recognition of systems or dominant groups that cause oppression. The other students demonstrated a lack of critical social thought or justified inequity as the natural order of the world. For example, one White student was able to mathematically disprove the statement that “It’s a myth that police kill more blacks than whites” (p. ##) but did not express any desire to act based on their conclusions. Stephan et al. (2021) posit that privileged students were able to “see themselves” in the *Corona Crisis* task more than the *It’s Black and White* task on police shootings and suggest more connected tasks as a starting point for privileged populations. These studies show students can come away with problematic stereotypes reinforced if the task is open-ended. Although students were able to express some evolving sociopolitical knowledge, an increase in student desire to act does not directly follow.

Although gaining sociopolitical mathematical awareness is a slow process, repeated exposure to TMSJ tasks can help students in that process. A single task is not enough to see marked changes in students' ability to read the world with mathematics or act on that new sociopolitical knowledge.

Teacher Preparation for TMSJ

Many of the TMSJ researchers are White and they describe their own enactments of TMSJ. Gutstein, Esmonde, and Harper are all White. The two interviewers for the *It's Black and White* and the *Corona Crisis* task are White (Stephan et al., 2021). Although there are instances in the literature of people of Color implementing TMSJ, the process required for teachers to implement TMSJ seems to vary depending on the teacher's background and if they have relevant life experience to relate to the tasks and/or their students. Here I will outline how Whiteness can inhibit TMSJ preparation and enactment and then I will contrast these difficulties with those described in situations where teachers have relevant experience. The first two barriers to teacher preparation of TMSJ lessons I will describe coincide with elements of Battey and Leyva's (2016) framework for making explicit the operation of Whiteness in mathematics education.

First, the ideological discourse that mathematics is neutral (Battey & Leyva, 2016) inhibits teacher enactment of TMSJ. In surveys and interviews with pre-service elementary teachers, Simic-Muller et al. (2015) found that most of the pre-service teachers (PST's) surveyed (64% were White) were more likely to include "real world" mathematics questions (relating to everyday objects, telling time, temperature) than "controversial" topics or topics relating to injustice. Diversity of their student population seemed to influence the possibility of including controversial topics—for some that meant that talking about race was safe in all-White classrooms and for others that meant that in an all-White classroom race is "not an issue" (p. 70).

For these PST's, they viewed typical contexts like story problems regarding food or nature as objective or neutral. This barrier also was found in Bartell's (2013) study. In anticipating possible risks of including race in a lesson, one White teacher said that "mathematics is pretty neutral" (p. 146) so there were limited opportunities to be offensive. That teacher went on to enact a problematically ambiguous lesson regarding race, GPA, and prison statistics.

Appreciating that mathematics is not neutral would have helped these teachers consider the political ramifications of the contexts they were presenting in their classes.

Second, how emotional and cognitive labor are expected in the classroom (Battey & Leyva, 2016) create difficulties for enacting TMSJ. Sometimes, teachers displayed the belief that the range of emotions acceptable in a mathematics class was limited. Interviewed pre-service elementary teachers positioned themselves as caring nurturers in avoiding controversial topics (Simic-Muller et al., 2015). These White, middle-class interviewees indicated that they did not want to burden their students with the knowledge that they were in poverty or that children were somehow unaware of their own circumstances. Similarly, Harper (2020) studied one White teacher who backtracked on her initial plan to have students interview their own families about their finances and credit, redirecting the unit plan to less inflammatory and more disconnected tasks like creating an informative pamphlet. Additionally, this teacher redirected authentic connection with debt collection by asking students to consider the mathematical exponential model instead of the real consequence of not paying off a credit card for six months. This teacher sidestepped important conversations to maintain predictable student emotional reactions.

Cognitively, teachers sometimes lower the mathematical expectations and demand of the tasks to accommodate TMSJ lessons (Bartell, 2013; Harper, 2020). Although rudimentary mathematics is sometimes underestimated for its mathematical power in TMSJ lessons, this lowering of

cognitive expectations can become a hurdle for teachers to implement TMSJ lessons responsibly. By minimizing the cognitive and emotional labor available in TMSJ lessons, teachers can be underprepared to facilitate meaningful TMSJ lessons.

Next, novice and experienced mathematics teachers carry different burdens to accommodate TMSJ in their practice. Novice mathematics teachers express trepidation to try TMSJ since they have low confidence in their ability to establish a learning environment that would support student learning about social justice through mathematics (Johnson, 2013). In Johnson (2013) a few first teachers question their ability to elicit student responses or ensure that students see the point of the lesson. On the flip side, more experienced teachers in Bartell's (2013) study noticed that their comfort with the mathematical aspect of their TMSJ lesson led them to short-change the social justice discussions in their lesson plan. Experience with TMSJ tasks, then, seem to be a determining factor in the quality and balance of those lessons. The teachers in Harper's (2020) study participated in a summer professional development with experience in planning, enacting, and debriefing a TMSJ unit. Although early-career teachers themselves, relying on preexisting TMSJ tasks and previous experience allowed these teachers to have productive conversations in their classes regarding race and profiling and credit cards.

Finally, community experience and personal sociocultural awareness seem to be high indicators of teacher success in enacting TMSJ. In discussing the possibility of becoming a critical educator, new teachers indicated that they were not yet connected enough to the community to give students purposeful social justice tasks (Johnson, 2013). The teachers in Bartell's (2013) two lesson planning groups exhibited differing inclination to learn more about social justice and student perspectives. The more successful group brought in their own reading and research on their chosen social justice topic. The less successful group did not include

information from suggested reading on their topic. One teacher stated that it was “difficult for him to ‘think about the perspective that African American students have on this lesson because [he doesn’t] know their experience’” (p. 150). In the case for this group of teachers, that lack of experience and preparation was detrimental to their social justice lesson enactment.

In contrast, teachers with experience with the community seem to have more success in TMSJ. In an urban New York non-traditional school, Gonzalez (2009) created a community of practice of social justice educators from teacher self-selection. The teachers interested in the project were “predominantly from the same racial backgrounds as their students” (p. 33). Other teachers shared common socioeconomic backgrounds to their students or even attended that very high school. Gonzalez found that these teachers were acutely aware of the injustices their students faced and crafted lessons to highlight these students’ disadvantages mathematically and how to create opportunities for student empowerment. Similarly, one atypical elementary PST in Simic-Muller et al.’s (2015) interviews expressed a willingness to include “controversial” topics or topics relating to injustice. This PST grew up in a low-income area around the university and had “ready examples” (p. 72) of story problems that would relate to elementary students in her community. Community experience or a willingness to educate oneself in the injustices relevant to the student community seem to be an important precursor for TMSJ enactment.

Figured Worlds

Having reviewed research about TMSJ, which serves as the primary context for this study, I now turn to other relevant research for the study. In this subsection, I review the research on figured worlds, which is the primary theoretical framework through which I define identity and identity work. These definitions will be elaborated in the theoretical framework section of this proposal. In this section, then, I describe existing research in order to define how the theory

of figured worlds has been used by other scholars in contexts that may or may not be about TMSJ. These definitional aspects of figured worlds are used to frame the review of the research that mobilizes this theoretical construct.

The literature that utilizes a *figured worlds* framework has been used in literature about mathematics education, other areas of education, and other non-education related disciplines. For example, studies use the figured worlds framework to understand student achievement and identity in science and mathematics (Calabrese Barton et al., 2012; Esmonde & Langer-Osuna, 2013). Harper's (2017) work on student identity in a social justice classroom is most related to this thesis, but does not center on teacher identity. The figured worlds framework is also utilized in fields outside of education, like literacy (Bartlett & Holland, 2002). Due to the disparate nature of the literature utilizing the figured worlds framework, this review of literature will clarify principles of the figured worlds framework and how it is used in these studies. First, an overview of the concept of figured worlds (introduced by Holland, Lachicotte, Skinner, and Cain in 1998) will be described. Then the central tenets of figured worlds and mediating artifacts will be discussed.

Holland et al.'s (1998) theory of figured worlds emerged from an intersection between conceptions of identity in psychology and anthropology. In psychology, the social constructivist perspective emphasized the individual's behavior that would negotiate identity in a socially constructed world. Identity would be acquired through "maneuverings, negotiations, impositions, and recreations of relations of status and entitlement" (p. 13). For example, linguistic implications of social status are situationally derived, not embedded in the individual. In contrast, in anthropology, the culturalist perspective emphasized the identities expected and pre-determined in a culturally constructed world. Identity is dependent on gender, age, and other

markers in the culture. To an ethnographer, identity is not created on an individual level, but the culture dictates the identities available to an individual. Holland et al. asserted that both social constructivist and culturalist approaches are limited. The social constructivist perspective underestimates the societal forces that limit the identities available to be constructed. There is no behavior that an individual can employ to climb beyond the limitations of their prescribed social status. However, the culturalist approach fails to account for “culturally meaningful behavior to bring about contested social ends” (p. 13) or ambiguity in cultural situations. The culturalist underestimates the importance of personhood and individual choice in shaping and creating identity. Holland et al. described cultural constraints to be “overpowering, but not hermetically sealed” (p. 18). Holland et al. built off both perspectives to define their perspective of identity.

The culturalist and constructivist perspective together create a meaning for identity that accounts for both individual agency and cultural constraints. Holland et al. (1998) describe what they refer to as “identity”:

People tell others who they are, but even more important, they tell themselves and then try to act as though they are who they say they are. These self-understandings, especially those with strong emotional resonance for the teller, are what we refer to as identities. (p. 3)

Thus, identity is both personally defined and carried out in a cultural space. To Holland et al., individuals are “composites of many, often contradictory” (p. 8) identities. Individuals take on several identities (like mother, activist, good person, environmentalist, student, etc.) simultaneously but without necessarily maintaining harmony between those various identities. These identities are generally malleable and are found in “the material and social environment” (p. 8). By defining identity to be located outside the body but also malleable and contradictory,

behavior then becomes a sign of self in practice but not a sign of self in essence. In this theory of figured worlds, Holland et al. “focus on the development of identities and agency specific to practices and activities situated in historically contingent, socially enacted, culturally constructed ‘worlds’: recognized fields or frames of social life” (p. 7). These fields or frames of social life are figured worlds.

Figured World Criteria

Figured worlds are stable and concretely defined. Holland et al. (1998) posed four criteria for a field or frame of social life to be considered a figured world. They give their own examples of figured worlds (Alcoholics Anonymous, romance, academia). Others have employed the framework of figured worlds in their research, so the examples of food deserts (Harper, 2017), student-led mathematics (Esmonde & Langer-Osuna, 2013), school lunch club (Calabrese Barton et al., 2012), and good readers (Bartlett & Holland, 2002) will also be considered when describing these four criteria. (How these criteria are met in the figured worlds studied in this thesis will be addressed in the theoretical framework section.)

First, figured worlds must be historical phenomena. The use of “historical” here can either mean a lengthy, well-documented history or simply precedence for the social world. For example, the first use of the term “food deserts” emerged in reaction to new housing development in Scotland in the early 1990s (Beaulac et al., 2009). Although for this figured world we can pinpoint a specific start date, that is not necessary for a figured world to be considered historical. For example, romantic social fields like girlfriends, boyfriends, fiancés, and married couples have existed for centuries. Although these dynamics have evolved from the Victorian era to modern patterns of social activity with romance, the figured world has existed for quite some time. Esmonde and Langer-Osuna (2013) give an analysis using the figured world

of student-led mathematics. Although this does not necessarily have the same historical length as romance or other figured worlds, there is published research and data that proves the precedence for student-led mathematics in the classroom. So, student-led mathematics can be considered a historical phenomenon. Figured worlds cannot be completely novel and unique social fields, but must have historical precedence.

Second, figured worlds are social encounters in which participants' positions matter. Rank and social position are key aspects of a figured world and that positionality affects the social activity within the figured world. In the figured world of academia, position or rank such as journal editor, tenured professor, novice researcher, and field expert all carry significance in the relationships formed within the social landscape. Not only do these positions mark the actors, but certain activity and social fields are limited to actors due to their rank. In Calabrese Barton et al.'s (2012) example of a student lunch club as a figured world, positions like the teacher club coordinator, club president, and attendee carry significance to the anticipated activity. In the theory of figured worlds, rank and position are not ignored. Rank and power through position are critical to understanding social interactions and activity within the figured world. However, "position is not fate" as new activity and landscapes give new meaning to interactions that continually change and evolve the figured world (Holland et al., 1998, p. 45). Holland et al. explain that "the forms of novel activity created by a senior generation provide the experiential context in which their children develop the habitus of the group" (p. 45). For example, the innovative activity of a woman proposing to her boyfriend in one generation can be considered more typical in the next generation's social interactions. Improvisation is to be expected in the growing, continual development of these social landscapes.

Third, figured worlds are socially organized and reproduced. Figured worlds can be reproduced via institutions. Alcoholics Anonymous, for example, is reproduced in many places and contexts through chapters within the organization. Romance, as well, is institutionally reproduced through the institutions of marriage and divorce. The figured world of good readers (Bartlett & Holland, 2002) is perpetuated through teaching young children to read and write. Sometimes this teaching and proficiency is institutionalized through formal schooling and testing. Figured worlds do not need to exist within the form of institutions. For example, the figured world of romance exists without the institutions of marriage and divorce ever interacting with participants' social activities. For a historical social interaction to be considered a figured world, the social realm must be organized and reproduced.

Fourth, figured worlds are populated by familiar social types and identifiable persons, distributing those actors across different fields of activity. These social types are not necessarily divided by just division of labor (like club president, club secretary, etc.) but through recognizable selves across the figured world. These selves are distinct from positions mentioned earlier. For example, within the attendees, the selves of reluctant attendee to the enthusiastic contributor or inattentive social butterfly can be recognized within the world of the school lunch club. In the figured world of romance, the identifiable persons such as “‘jerk’, ‘nerd’, ‘fox’, ‘loose woman’, ‘dog’” (Holland et al., 1998, p. 43) distribute participants across the figured world. Within the position of student in the world of student-centered mathematics (Esmonde & Langer-Osuna, 2013), students can take on the identity of nerd, slacker, cheerleader, cool kid, theater kid, or artsy intellectual. With participation and experience in the figured world, these persons are identifiable and give the figured world “human voice and tone” (Holland et al., 1998, p. 41).

Cultural Artifacts

Another key component of the figured worlds framework is physical tools or artifacts. Holland et al. (1998) were influenced by the Vygotskian process of semiotic mediation, where physical tools and signs were means for mediating thoughts and actions. Vygotsky (1960, as cited in Holland et al. 1998) exemplified this process through mnemonics like tying a knot in a handkerchief to remind oneself of something. Similar tools, like taping a motivational quote to a mirror or goal pictures on the fridge of a dieter, repeatedly evoke specific behavior. Through repeated self-training, the tool then “fossilizes” (Holland et al., 1998, p. 37) the new behavior. Hence, physical artifacts become means of identity shifts and development. Holland et al. gave several examples of artifacts, like poker chips in Alcoholics Anonymous or medications in the figured world of mental health. Some studies have utilized artifacts to analyze identity changes in participants within figured worlds.

In Calabrese Barton et al.’s (2012) analysis of female student self-efficacy in science, the artifact of a student-made rocket was used to mark the identity changes in a student. The student, Diane, recalls her winning rocket entry as an example of how she solves problems. The rocket had significant meaning for Diane but was not remembered by her peers. This artifact carried significance for the positions available and internalized by this student within the figured world of school science. In contrast, another student’s video about energy efficiency served as a “symbolic artifact of Chantelle’s science expertise and power in school, as it was referenced by teachers and peers alike” (p. 31). This video mediated Chantelle’s interest in science and marked her new position within the figured world. Through the artifacts of the student-made rocket and student-made video, researchers could chart the students’ identity changes throughout data collection.

In another example, Bartlett and Holland (2002) noted how the artifacts of an ink pad and pen mediate the identities in the Brazilian figured world of literacy. One woman, Eunisa, recounts how when registering to vote, the woman in front of her was unable to sign her name and instead required a pad of ink to sign via fingerprint. This admission of inability to sign was met with laughter and insults. Eunisa was unsure if she could sign her name but was determined to not be labeled as a “donkey” and used the pen to slowly write her name. The inkpad in this situation became symbolic of the figured world of illiteracy and the pen became symbolic of Eunisa’s position in the figured world of literacy. Through these physical objects, Eunisa was able to assert her position and reject other roles offered to her in this interaction.

Artifacts are sometimes used to invoke a figured world. Some researchers focus more on the intersection and static positions within figured worlds instead of the entrance or negotiation of position in a figured world. For example, in Esmonde and Langer-Osuna’s (2013) analysis of student group work in a classroom, their analysis identified the figured worlds of student-led mathematics and romance. Instead of using physical objects to indicate the different figured worlds, Esmonde and Langer-Osuna looked at the dialogic patterns. For example, Esmonde and Langer-Osuna found that one group member’s habitual use of the phrase *all right* to bring the students back to task indicated that he was taking a leadership position like teachers in a teacher-led classroom figured world. Although the phrase *all right* is not a physical object like the rocket, pen, or inkpad, it still invoked a figured world and provided a tool by which the actor could assert his place within the figured world. Holland et al. (1998) described an abstract artifact of pronoun use in the figured world of women in Nepal. The pronoun *ta* (you) is commonly used by husbands to address their wives and is the “least respectful form employed also for children, women, and animals” (p. 62). This pronoun use also carried significance and rank within this

figured world. In keeping words or phrases invoking figured worlds, Harper (2017) analyzed her interview data through considering the figured worlds students were drawing upon in each speech turn. Artifacts do not need to be physical objects. Even words and dialogic patterns can invoke position and participation in various figured worlds.

Cultural artifacts are an important part of the theory of figured worlds. Some studies use physical artifacts as units of analysis in deciphering participant's evolving identity. Other studies pay attention to abstract artifacts like dialogic patterns or pronouns to note the figured worlds evoked in conversations or interviews.

Collaborative Lesson Planning

Much of the interaction between myself and the participating teacher for this thesis will be from collaboratively planning two TMSJ lessons. An important consideration for this type of data is the power dynamics and roles typically at play within a collaborative lesson planning environment. Collaborative lesson planning research is often categorized under the umbrella of lesson study. Lesson study, a teacher-led professional development pioneered in Japan, was popularized in the United States after the TIMSS (Third International Mathematics and Science Study) (Chokshi & Fernandez, 2004). Enactment of lesson study in the United States often lacks a deep understanding and “may mimic superficial features” (Chokshi & Fernandez, 2004, pg. 520) of the Japanese practice. Research on lesson study follows a similar pattern of misunderstanding. In much of the research, lesson study is a general term for an experience where participants jointly plan a lesson, then observe and discuss the lesson enactment. Sometimes, the added step of one of the participants re-teaching a revised lesson is included. This literature review will focus on the dynamics of power and position in the cultural world of collaborative lesson planning, which is often labeled as lesson study.

First, positions of power exist within the collaborative lesson planning environment with respect to the experience participants have with jointly planning lessons. In the United States teachers are typically isolated when planning a lesson (Fernandez, 2002). Some participants may experience initial shyness or trepidation to interact with other teachers while lesson planning. The apprehension is heightened for many when it comes time for the group to observe that teacher enact the lesson, since typically the focus of teacher observation is evaluation (Chokshi & Fernandez, 2004; Fernandez, 2002; Saito & Atencio, 2013). Thus, novice participants of collaborative lesson planning may be less inclined to take risks. In contrast to the novice position in the figured world of collaborative lesson planning, other participants carry power as experts. Some researchers conducted studies on the cross-cultural carryover of lesson study by bringing in lesson study experts from Japan to provide content knowledge and help give insight from their own lesson study experiences (Fernandez, 2002). Other studies have a professional facilitator for the lesson study, like a university tutor (Baldry & Foster, 2019; Archer, 2016). Power within the environment of lesson study or collaborative lesson planning exists from participants' experience with the practice. The most privileged or powerful position is the "expert" in lesson planning and "novices" to lesson study carry less power within the interactions.

Another important consideration in collaborative lesson planning is how the encouraged teaching atmosphere differs from the teacher's typical practice. Although the participant may be very experienced with lesson study or jointly planning with other teachers, they may feel that this type of teaching is special or only reserved for professional development. For example, in East Asia, Saito and Atencio (2013) found that typical teacher's practice was direct instruction and successful lesson study required teacher buy-in into social constructivist teaching. One of the teachers in the study remarked that there was "no relationship between the observed lesson and

daily practices” (Saito & Atencio, 2013, p. 91). Some teachers who collaboratively plan may be confidently involved in the process, but privately consider the exercise an unrealistic expectation for everyday practice. The reluctant lesson planner, then, is another potential position within the figured world of collaborative lesson planning. Similarly, in many studies about lesson study, researchers watched group dynamics of preservice teachers in undergraduate courses. Sometimes, the collaborative lesson experience was seen less as a helpful professional development experience and more of a school assignment (Archer, 2016; Baldry & Foster, 2019). So, some participants’ actions were merely going through the motions for participation credit and did not necessarily translate to changing perspectives on future practice. Although not necessarily an expert or a novice position within the lesson study experience, these positions of student or reluctant participant can subvert the intended outcome of the collaborative lesson planning experience. Therefore, their power can rival the experienced leader’s position and intended goals.

Next, power dynamics within a collaborative lesson planning circumstances can exist from the teaching expertise within a group. For example, in one study several faculty members decided to experiment with lesson study themselves and analyze their positions within a lesson study experience to better understand the dynamics at play with their preservice teachers’ lesson study experiences (Lenski et al., 2018). The most senior tenured faculty member naturally took the role of “sole leadership” (p.7) by directing the pacing and direction of the conversation. At times, this leadership was challenged or shared by the comments and questions of other faculty members (Lenski et al., 2018). Note that this type of experience was not necessarily with lesson planning, but general teaching experience as evidenced by this participant being the most senior faculty member. Thus, one can be either an expert in teaching, which affords power within a

collaborative lesson planning circumstance, or one can be an expert in lesson study. These two areas of expertise may or may not coincide (i.e. be the same person). Lenski and colleagues (2018) suggested strict roles like facilitator, record keeper, and process monitor to mitigate the dominance of a single member of the group. In another example, faculty and students collaborated to redesign an undergraduate course on classroom management (Mihans et al., 2008). Initially the agendas the faculty (as “experts”) had clashed with student expectations for the course, but as faculty began to listen and implement more suggestions made by the students “the professors became the learners and the students became the teachers, a complete flip from what was the norm” (Mihans et al., 2008, p. 5). There was a back and forth of leadership that settled into a partnership, or shared leadership, between the faculty and students. The positions of leadership, challenged leadership, and shared leadership are important to consider while understanding the difference in expertise between participants of a joint lesson planning experience.

Experience with collaborative lesson planning and teaching/content expertise can both shape collaborative lesson planning interactions. Experience with lesson study can position a participant as a leader or a reluctant participant in the professional development situation. Teaching/content expertise can create a natural leadership within the group. Positions like sole leader, challenged leader, or partnership can also characterize the power dynamics within the lesson study group. These positions will be important to consider in the figured world of collaborative lesson planning experiences designed into this thesis.

Theoretical Framework

To understand the evolving identity of teachers, I have chosen to utilize the theory of *figured worlds*. Figured worlds uses a participative perspective on identity (Darragh, 2016).

Actors perform identities as they participate in various cultural realms. These cultural realms, or figured worlds, are stable and contain identifiable persons and positions. In figured worlds, these positions matter and inform participants' interaction. Through actor's rank and activity within the figured world, their identities are made known to themselves and others. Cultural artifacts can be a means of evoking a figured world dynamic or a form of mediating identity through the acceptance and participation in a figured world.

Figured worlds is a helpful framework for understanding teacher identity in trying to teach mathematics for social justice (TMSJ) since the figured worlds framework allows for multiple, overlapping figured worlds that an individual simultaneously participates in. I hypothesize that teachers' hesitancy or willingness to engage in critical mathematics teaching will be better understood through considering the intersection of teachers' moral, political, and professional identities. Furthermore, the figured worlds framework explicitly considers the positions of power and privilege within the cultural world. Addressing and understanding privilege and power is another important component of the theoretical framing of identity in this thesis, as TMSJ is inherently subversive to the dominant mathematics teaching. For these reasons, I have decided to frame teachers' identity work through their roles and participation in various figured worlds. Here, in order to show examples of relevant figured worlds and how they meet with the criteria for figured worlds, I elaborate on hypothetical examples. The data revealed particular figured worlds and those are reported in the later chapters. For each hypothetical example, I will describe how each cultural world meets the criteria described previously and then briefly describe the roles and artifacts that may be present in each.

Mathematics Teaching Figured World

Mathematics teaching fulfills the criteria of a figured world. First, mathematics teaching has a historical precedence dating back to the birth of mathematics (early examples including but not limited to Greek philosophers). Second, within social encounters of mathematics teaching, teacher positions matter. For example, experienced or inexperienced teachers carry different power within this cultural world. Third, mathematics teaching is reproduced throughout the world through mathematics being a central part of government approved education. In most schools in the United States, multiple mathematics teachers work at every school and perpetuate this figured world. Finally, mathematics teaching is populated by identifiable persons. These persons can be described as roles, which teachers may accept or reject as they participate in this figured world. Identifiable persons or roles may include a reform-oriented teacher, traditional teacher, a teacher-researcher, critical mathematics teacher, and many more.

This figured world of mathematics teaching can be evoked through activity or the presence of artifacts. For example, the act of teaching would indicate some level of participation within this figured world. The role a teacher inhabits, however, may be clearer through the existence of classroom artifacts like a lesson plan, seating arrangement, curriculum, worksheets, and manipulatives. For example, a PowerPoint presentation, fill-in-blank notes, and lecture-style seating may indicate the teacher's role as a traditional mathematics teacher. Artifacts such as manipulatives, grouped seating, and distributed whiteboard markers among students indicate the teacher's role as a reform-oriented mathematics teacher. Different positions within this figured world may be evoked through quotations or references to NCTM's standards or practitioner advice. Mathematics education research articles also may serve as artifacts in this figured world.

This figured world may be limited to a smaller scope, like simply a reform-oriented mathematics teaching figured world. Although this smaller scope will still satisfy the criteria for

a figured world on its own, I considered the broader figured world until subsets of the world were exclusively present in the data.

Church Figured World

This thesis is contextualized at Brigham Young University (BYU) in Provo, Utah. Not only is the Mormon faith (The Church of Jesus Christ of Latter-day Saints, subsequently referred to as “the Church”) dominant in this region, but BYU is the private religious university sponsored by the Church. The teacher-participant and I are both members of the Church and most, if not all the students were members of the same faith. So, the figured world of the Church is important to consider. Although the Church is a global institution, this thesis particularly focuses on the cultural world of the Church in Utah and at BYU, particularly.

The Church fits the criteria for a figured world in several ways. First, the cultural world of the Church in Utah traces back to 1847. The cultural world of the Church in Utah is often multi-generational—many BYU students have family members who went to the same university and many Utah Mormons have generations of family members from Utah. Second, within the cultural world of the Church, participants’ positions matter. Positions of power are often designated capacities, like bishops, seminary teachers, or general authorities. Due to the organization of the Church, most of these significant positions are officialized. Participants’ interactions in the cultural world of the Church often depend on the individuals’ resumé of Church official capacities. Third, the institution of the Church ensures the reproducibility of the cultural world. The Church’s geographical organization and missionary program help perpetuate the cultural world. Finally, the Church is populated by identifiable persons. One common distribution of actors are three categories of “activity” in the Church—active, less-active, and inactive. It is quite common for members of the Church to classify themselves and others into

one of these three groups. A recently returned missionary is another readily identifiable person or role within the cultural world of the Church. Other positions may include an orthodox member, progressive member, convert, lifetime member, and more. Since the Church in Utah is a historical cultural world that is reproduced and institutionalized with significant positions and identifiable actors, the Church qualifies as a figured world.

The figured world of the Church provides an important framework for the participants' moral identity. Artifacts such as scripture, hymns, and addresses by General Authorities may serve as mediating artifacts for teachers' willingness or not to participate in TMSJ. For example, the admonition of the prophet to "lead out in abandoning attitudes and actions of prejudice" (Nelson, 2020, para. 22) may serve as motivation to engage in TMSJ. However, scripture can also be utilized to justify an opposition to TMSJ. For example, the scripture that individuals are responsible for their own sins, and not for the sins of their forefathers can be employed to avoid action in response to an injustice they benefit from (Anderson, 2021)⁶. Since the cultural world extends further than the institutional Church, artifacts may also include social media posts and Sunday lessons and talks that are individually shared thoughts of members instead of canonical text. All of these artifacts may serve as mediating objects for identity or evoking common beliefs or experiences between participants in the figured world.

Party Politics Figured World

The figured world of party politics in the United States may potentially play a role in the identity work of teachers' enactment of TMSJ. Party politics is a figured world for several reasons. First, the cultural world of party politics is certainly not a new phenomenon. The trends

⁶ Educators in Utah were surprised to see scripture quoted in an elected official's presentation on how critical race theory is present in education. This elected official used scripture from the Book of Mormon to denounce education about White privilege to Utah students. This citation notes one educator's surprise via Twitter.

and patterns in national parties and national debate have evolved for decades if not centuries. Positions like an elected official, constituent, journalist, or a lobbyist all carry power within this cultural world and inform the interactions of different persons and positions. Third, the cultural world of party politics is maintained through legislation, elections, and media that ignite and reignite political conversation and interaction. Finally, there are identifiable people or roles that distribute actors within the cultural world of politics. For example, some actors are easily identified as passionately involved in politics or indifferent to the news. Some recognizable roles are liberals, conservatives, and moderates. Some other roles are more specific like Trump supporters or Gen-Z liberals. Due to the trends in party affiliation along demographic lines, identifiers such as race, socioeconomic status, religion, gender, and sexual orientation identity will also be included as identifiable traits in this cultural world. So, the position of a cis-gendered conservative middle-class White woman can be considered an identifiable position within this cultural world. The cultural world of politics in the United States, therefore, meets the criteria of a figured world.

There are many physical artifacts that mediate individual change in this figured world. The voter's ballot or party registration documents signify membership in an individual change within this figured world. Other artifacts that invoke change are news articles, videos, social media posts, and books. For example, a participant's experience with a political pundit's Instagram may alter their self-conception from indifferent to politics to an active member of a political party. Artifacts may be as simple as words or phrases that invoke different positions. Buzzwords like "cancel culture", "woke", or "insurrection" sometimes indicate position within the party politics figured world. These artifacts may be referenced to elicit this figured world.

Social Activism Figured World

The figured world of social activism is another hypothetical example described which is a separate cultural world from the party politics figured world. Social activism is a figured world for several reasons. First, social activism is present in society throughout history. From the Protestant Reformation to the Boston Tea Party to the Stonewall Riots to Black Lives Matter protests, formal activism has permeated societal change. These social activism efforts are facilitated or impeded by the positions of power that exist within this cultural world. For example, the power of the position of a trained clergyman was leveraged to gain traction in the Protestant Reformation. These positions of relative power inform the interactions within the cultural world of social activism. Social activism implies a formal cause or family of organizations dedicated to that cause. Activists and organizations intentionally recruit higher participation for their causes, thereby perpetuating the cultural world. The cultural world of social activism has identifiable persons such as an organizer, public speaker, social media content creator, or artist. Identifiable persons may also include positions like lobbyist, political campaign manager, or campaign volunteer. These positions overlap with the figured world of party politics. The motivations for the action (based on cause/principle or commitment to a political party) will help determine, if needed, the relevant figured world in the case of an ambiguous position.

The figured world of social activism has considerable overlap with the party politics figured world. Since activism causes may or may not align with party platform agendas, they are considered separately. It is important to note that for some, activism may be synonymous with a position within the party politics figured world. It is important to me to separate these two figured worlds theoretically to pinpoint if one is dominant over the other. At the same time, I anticipate the possibility for the two figured worlds to be intertwined for the participant.

Relevant artifacts for the figured world of social activism may include event apparel, flags, and handmade posters. The process of hanging a flag or making a poster may mediate shifts in someone's self-conception. They may also signal to others ones' affiliation or position within this figured world. Words or phrases can also be artifacts to invoke a figured world. For example, if a company uses phrases such as "carbon neutral" or "cruelty free" to advertise their products, they are intending to appeal to environmental or animal rights activists. These words or phrases then can invoke the figured world of social activism.

All four of these figured worlds (Mathematics Teaching, the Church, Party Politics, Social Activism) have many subsets that also would qualify as a figured world (Reform Math Teaching, Return Missionary Culture, Liberal Politics). These broader figured worlds are considered together since they have similar size and scope. To best compare action and participation between simultaneous figured worlds, these four worlds of similar size can be compared for the participants. A fifth figured world is hypothesized to emerge. This figured world is smaller in scope but is relevant to the structure of the data collection.

Lesson Study Figured World

In data collection, the participant and I jointly planned two TMSJ lessons. As such, our positions within the figured world of collaborative lesson planning, or lessons study, were important to consider.

Lesson study was first popularized as a form of professional development in Japan and has since been duplicated throughout the world (Chokshi & Fernandez, 2004). Teachers are often incentivized to collaboratively plan and observe each others' lessons through professional development and undergraduate training (Fernandez, 2002; Lenski et al., 2018). As such, collaborative lesson planning is a reproduced cultural world that can be traced to its roots in the

practice of lessons study in Japan. Recent research has taken into consideration the dynamics of power or the micro-political world of lesson planning. Positions such as sole leader, challenging leader, or shared leadership (Lenski et al., 2018) may shape the teacher interactions within the cultural world. Identifiable roles in the cultural world of lesson planning may include facilitator, record keeper, and process monitor (Lenski et al., 2018). Then, collaborative lesson planning is a historical, reproduced cultural world with identifiable actors with positions that matter. Thus, collaborative lesson planning is a figured world.

Artifacts in this figured world may include a shared lesson plan document, document suggestions or edits, curriculum, and a whiteboard. The control and pace of these tools can inform the dynamics between the teacher and myself. This positionality may be important to consider while reviewing the participants' positions in other figured worlds.

These five figured worlds can together help consider what identities the teacher is participating in as they consider and plan a TMSJ lesson. Through charting these various identities, the relevant identity work needed to enact TMSJ can be better understood.

Although researchers commonly infer figured worlds through observing group interactions (i.e., Esmonde & Langer-Osuna, 2013), this study will infer participation in figured worlds based on the individual's description of their life experiences and planning for and reflecting on teaching math for social justice. Some of these figured worlds, like Church or Party Politics, may not be observable in group dynamics in the context of this study. Nevertheless, participant involvement in these figured worlds may factor into their identity work and are, therefore, considered without descriptions of the participant's negotiated membership or shared creation of various figured worlds.

Identity Work

In this thesis, I considered teachers' identity work as they engage in TMSJ. In the context of the figured world framework, *identity work* is sometimes referred to as self-authorship or authoring selves. The concept of authoring selves draws from Bakhtinian dialogism and Vygotsky's zone of proximal development. The Bakhtinian idea of dialogic selves can be interpreted as an interplay between various self-conceptions or identities in different settings. In the framework of figured worlds, this heteroglossia requires repeated "sorting out" or negotiation. According to the figured world framework, the process of "orchestrating voices is much more than sorting out neutral voices in some rationalist's argument; the voices, after all, are associated with socially marked and ranked groups" (Holland et al., 1998, p. 183). Orchestrating or sorting out these different voices or selves is not a straightforward process since the different selves carry different dynamics of power within various figured worlds.

The negotiation of these selves, or positions within the figured world, inform activity between actors within the figured world. The informed activity can be seen through the participant's decisions and the deliberation of those decisions. The negotiation of selves can manifest through the different positions the participant petitions or refuses in their decision deliberation. Sometimes this negotiation or orchestration occurs within a single figured world, but many examples illustrate the tension between various selves between distinct figured worlds the actor participates in. For example, negotiation or orchestration between a participant's liberal self in the figured world of party politics and their role of peacekeeper in the figured world of family would constitute identity work as defined in this framework. Their negotiation of these identities would be apparent in their deliberation about decisions (or decisions themselves) with respect to interactions they have with a family member. Within the figured world framework, this orchestration does not need to be consistent. Apparent contradictions to an outside observer

may not feel contradictory to the participant. In keeping with the previous example, a participant may express more extreme policy-making opinions in the figured world of party politics than in the family figured world, while still self-identifying or authoring oneself as a liberal in all settings. Hence, the decisions carried out by the participants can show which figured world or position is considered most vital in that moment.

In this thesis, I considered short-term identity work or the orchestration of various positions evident in the participant's decisions and their decision making processes. Since this data is short-term and focused on attempting to teach mathematics for social justice, claims on the teacher's identity work are not intended to be generalizable to the teacher's holistic self-authoring. Identity work, then, in the context of this thesis is the negotiation of selves as they are relevant to attempting TMSJ for the first time. As the teacher makes pedagogical and social decisions, various selves will emerge in the deliberation of those decisions. The participant can then consider the possible selves embedded in the possible resolutions they can make. A decision resolution, then, will indicate which positions are refuted, taken on, or consistently most prized to the participant. The possible selves considered and then given the most voice will demonstrate the teacher's identity work.

Research Questions

- What figured worlds are evident in two novice mathematics teachers preparing to teach mathematics for social justice?
- What does identity work (orchestration or negotiations of figured worlds) look like for two novice mathematics teachers while planning to teach mathematics for social justice and reflecting on these practices?

CHAPTER THREE: METHODOLOGY

Participants and Data Collection

This thesis focuses on two participants: Hannah⁷ and me. I will describe each of us and then explain why these two participants were chosen.

Hannah is a White, novice teacher in her mid-twenties. She has three older brothers. Hannah's father worked outside the home while her mother took care of the children until Hannah (the youngest) was old enough for her to go back to teaching elementary school. When Hannah was young, she lived in southern California. Then the family moved to Utah when she was in elementary school. Hannah's grandparents and other extended family live in Utah. Hannah is a lifelong member of The Church of Jesus Christ of Latter-day Saints. She served a full-time LDS mission in Brazil for a year and a half. At the time of this study, Hannah had been married for about five years.

Hannah studied Mathematics Education and Graphic Design at BYU for her undergraduate degree and then immediately followed-up her bachelor's degree with a master's degree in Mathematics Education at BYU. Hannah completed her student teaching at a high school. During the master's program, Hannah was a teaching assistant for sections of Calculus for her first year. During her second year of the program, Hannah became the primary instructor for two sections of College Algebra. At the time of this study, Hannah had taught College Algebra for one semester and was currently teaching her second semester.

I am also a White, novice teacher in my mid-twenties. I have three younger brothers. My father worked outside the home as a lawyer while my mother took care of us four. I was born in Utah while my dad completed law school, but my family then moved when I was two years old

⁷ Hannah is a pseudonym chosen by the participant.

to southern California. I lived in southern California until I began college, which I completed at BYU. I am also a lifelong member of The Church of Jesus Christ of Latter-day Saints. I served a full-time LDS mission in the Philippines for a year and a half. At the time of this study, I had been married for two years.

During my bachelor's degree at BYU, I studied Mathematics Education and TESOL (Teaching English to Speakers of Other Languages). I was also a teaching assistant for the College Algebra course for two and a half years. During my last year of my undergraduate degree, I taught a night community class focusing on English grammar. Immediately following my student teaching at a middle school, I began my master's program in Mathematics Education at BYU. I was also a teaching assistant for Calculus for my graduate teaching assignment, and then I became the sole instructor for the Trigonometry classes.

Hannah was selected so that there would be several figured worlds in common with myself. This decision was made because it is easier to identify figured worlds as an insider who knows more about the artifacts and other aspects of the figured worlds. For this study, I selected one inexperienced (less than 5 years of teaching) mathematics teacher. This teacher's experience is important so that in the planning interviews, the lesson-planning figured world consisted of two inexperienced mathematics teachers (the researcher and the studied teacher). Because we were co-planning the lessons, I also chose a participant who was participating in graduate level study of mathematics education at the same university as me. The common pedagogical preparation provided a common background in student-centered mathematics teaching, which I consider to be requisite for critical mathematics education. Coming from the same graduate program as myself, the participating teacher has engaged with several readings on sociopolitical mathematics education theory. Through this selection, the participating teacher had some

exposure to teaching critical mathematics. Hannah also exhibited a general willingness to enact critical mathematics teaching in her classroom, which provided another consistency within the lesson planning figured world. Finally, to examine racially privileged teacher identity work in preparing to teach mathematics for social justice, Hannah was also chosen because she is also White.

Primary participant data consists of six interviews (see Table 1) and secondary data consists of classroom observations. The purpose of the first interviews (two interviews for each participant) was to ascertain the participants' background relating to their mathematical and social identity. For example, the participants were asked "When did you know you are White?" and "What role model do you have for yourself as a classroom teacher?" For the full list of questions, see Appendix A. As opposed to skipping questions or cutting the interview too short, the full interview protocol was completed in two parts for Hannah. The second interview was a series of questions about decisions and hypothetical decisions about engaging in social justice or activism work in various social settings (for this series of questions, see Appendix B). I conducted the interviews for Hannah and my thesis advisor, Kate Johnson, conducted the interview for me. For the first background interview, I was interviewed before I interviewed Hannah. For the second background interview, I interviewed Hannah before Johnson interviewed me.

The other four interviews are pre- and post- interviews of two lessons. The pre-interview was a collaborative interview with the researcher to plan the TMSJ lesson. The planning for the TMSJ lessons took longer than two hours, so they were broken up into two parts each. After the TMSJ enactment, the post-interview reflected on the lesson plan and execution (for the interview protocol, see Appendix C). The primary data was from audio and video recordings of these four

interviews. The length of each of the interviews, along with their acronym that will be referenced in Chapter 4, are noted in Table 1.

Table 1.

Interviews, their acronyms, and durations

Navy Background Interviews	Duration	Hannah Background Interviews	Duration
Navy Interview 1 (NI1)	1:54:28	Hannah Interview 1 Part 1 (HI1P1)	1:19:09
Navy Interview 2 (NI2)	1:27:21	Hannah Interview 1 Part 2 (HI1P2)	1:02:32
		Hannah Interview 2 (HI2)	1:45:24
Lesson Planning and Reflection Interviews			
		Lesson Plan 1 Part 1 (LP1P1)	2:23:42
		Lesson Plan 1 Part 2 (LP1P2)	45:26
		Reflection Interview 1 (RI1)	32:50
		Lesson Plan 2 Part 1 (LP2P1)	2:16:00
		Lesson Plan 2 Part 2 (LP2P2)	1:11:48
		Reflection Interview 2 (RI2)	45:34

The secondary data consists of researcher notes during the lesson observations. These notes informed the post-lesson interviews and were vital to analyzing the teacher’s reflection on the lesson in comparison to the researcher observations during the lesson.

Data Analysis

To answer each research question, I have developed related but different analytic plans. Here, I describe each plan according to the research question.

Research Question 1

- What figured worlds are evident in two novice mathematics teachers preparing to teach mathematics for social justice?

In answering this research question, I developed portraits of both the participating teacher and myself. These robust descriptions serve as the answer to this research question by allowing me to identify and describe the various figured worlds that are present for each of us. These descriptions were then also used in pursuit of answering the second research question about how figured worlds are negotiated in the act of planning to teach mathematics for social justice.

To answer this question, I transcribed the recorded answers for the first interviews that answer the participant background questions in Appendix A and Appendix B. Long responses to questions were chunked into one-minute sections of audio transcript. Then, I followed a data analysis pattern of thematic analysis (Herbel-Eisenmann & Otten, 2011) to chunk the data. The interview transcript was considered linearly at first. For each few sentences or full contribution, I considered the following analytic question: what is the apparent identity/theme in this contribution? These then served as column headers for chunks of the discourse (see Table 2 below for an example).

Consider, for example, the following partial response to Johnson's follow-up question to my comment that growing up I felt that there were practices that I should not engage in with my Korean friends growing up. Johnson asked "Can you think of practices that you thought you should not engage in?" The interview continued with me saying:

Navy: Um. Like. I shouldn't call their mom "oma" or I shouldn't um, like even if I, with other friends I could be like so-and-so's mom, I should probably keep that same language throughout. I couldn't like, (Johnson: Oh, I see) um, or you know that, I, it would not be appropriate if I went to their church 'cause their church was all Korean. Um. Things like that.

Johnson: Okay. That makes sense.

Navy: Um, that's still kind of highlighting differences though instead of like. I don't know. Or are you asking me, like, when I felt, like 'okay, these are like, this is, like, the community I am, like, am a part of?' Um. (NI1)

This transcript would be chunked as depicted in the table below with the column headers developed during the analytic process led by the analytic question: "what is the apparent identity/theme in this contribution?" The apparent identity/theme in my first contribution was Race, Family, Languages, Friendship, and Church. My second contribution was chunked into the categories of Community, Race, and Friendship. Table 2 depicts how this chunking would appear just for the categories of Race and Languages. Note, some chunks are repeated in multiple columns because they represent discourse that is related to both identity/theme.

Table 2.

Sample Chunking of Data

Transcript	Race	Languages
Navy (00:22:31):		
Um. Like. I shouldn't call their mom "oma" or I shouldn't um, like even if I, with other friends I could be like so-and-so's mom, I should probably keep that same language throughout. I couldn't like, (Johnson: Oh, I see) um, or you know that, I, it would not be appropriate if I went to their church 'cause their church was all Korean. Um. Things like that.	Um. Like. I shouldn't call their mom "oma" or I shouldn't um, like even if I, with other friends I could be like so-and-so's mom, I should probably keep that same language throughout. I couldn't like, (Johnson: Oh, I see) um, or you know that, I, it would not be appropriate if I went to their church 'cause their church was all Korean. Um. Things like that.	Um. Like. I shouldn't call their mom "oma" or I shouldn't um, like even if I, with other friends I could be like so-and-so's mom, I should probably keep that same language throughout. I couldn't like, (Johnson: Oh, I see) um, or you know that, I, it would not be appropriate if I went to their church 'cause their church was all Korean. Um. Things like that.
Johnson (00:23:00):		
Okay. That makes sense.		
Navy (00:23:02):		
Um, that's still kind of highlighting differences though instead of like. I don't know. Or are you asking me, like, when I felt, like 'okay, these are like, this is, like, the community I am, like, am a part of?' Um.	Um, that's still kind of highlighting differences though instead of like. I don't know. Or are you asking me, like, when I felt, like 'okay, these are like, this is, like, the community I am, like, am a part of?' Um.	

Once the interview has been analyzed this way, each column of the table was considered its own chunk of data for the next phase. Each column of the table or theme was considered if it meets the criteria of a figured world (as described in Chapter Two). This produced a long list of figured worlds evident in the background interviews (see Tables 4 and 8 in Chapter 4). The

quantity of apparent figured worlds were too numerous to investigate deeply for the scope of this thesis. I then chose three themes or figured worlds to investigate deeply for each participant. These figured worlds were chosen to provide comparison of figured worlds between myself and Hannah, as well as to explore figured worlds that were relevant to TMSJ.

Once the selected columns were chosen, each chunk of data was analyzed following a discourse analysis (Gee, 2011). Gee describes significance, practices, identities, and politics as four of the “seven building tasks” of language (p. 16-20). Each chunk of data was analyzed using the following subset of Gee’s proposed analytic questions:

- How is this piece of language being used to make certain things significant or not and in what ways?
- What identity or identities is this piece of language being used to enact (i.e., get others to recognize as operative)?
- What practice (activity) or practices (activities) is this piece of language being used to enact (i.e., get others to recognize as going on)?
- What perspective on social goods is this piece of language communicating (i.e., what is being communicated as to what is taken to be “normal,” “right,” “good,” “correct,” “proper,” “appropriate,” “valuable,” “the ways things are,” “the way things ought to be,” “high status or low status,” “like me or not like me,” and so forth)?

The answers to these questions served as a tool to construct narrative portraits about the identities and figured worlds apparent in the background interviews. These portraits will be for each of the participants (myself as author and Hannah) and focus on developing a thick description (Geertz, 2008) of the figured worlds. These descriptions served as context for the results from the analytic plan for the second research question.

Research Question 2

- What does identity work (orchestration or negotiations of figured worlds) look like for two novice mathematics teachers while planning to teach mathematics for social justice and reflecting on these practices?

In answering this question, I describe how the participant and myself negotiate and orchestrate our identities during the times when we co-plan lessons for the participant to enact in her classroom. These descriptions then characterize the identity work of both of us working together. In order to begin these descriptions, my analysis focused on chunking the discourses of these planning interactions around the decisions that are being made. Each data chunk then was analyzed to surface the multiple figured worlds at play and how those are prioritized during each interaction.

The interview data was transcribed and separated by lines to aid in analysis. To illuminate the participants' identity orchestration, attention was given to the decisions the participants made. For the lesson planning interviews, planning decisions were made throughout the process. First, the interview data was chunked by the participant's decision. A decision was identified by expressing resolve to do or say something (or resolve to not do or say something). Decisions made by either the researcher or participant were included. Again, the number of decisions that were made throughout the lengthy planning process for each lesson were numerous. I chose eight decisions to investigate further (see Table 3). These decisions were chosen for their relevance to TMSJ instead of instructional organization or decisions solely related to teaching mathematics. Each data chunk then was analyzed to surface the multiple figured worlds at play and how those are prioritized during each interaction.

Table 3.

List of decisions from each lesson

Lesson 1	Lesson 2
We chose to do Kaluhiokalani's (2022) task on Hawaiian housing prices and its impact on local Hawaiians.	We chose to focus on the divide of men and women receiving PhDs for the ratio task instead of division based on race.
We chose to alter the task to motivate the change of base formula for logarithms.	We chose to fit the mathematical goals of vertical asymptotes and undefined rational functions within the social justice task.
We chose to launch the task by asking students what age they expected to become homeowners.	We chose social justice goals for the lesson.
We discussed, but ultimately did not plan for, the possibility of students demonstrating prejudicial reasoning about Hawaiians.	We chose to limit a social justice question to only the women in the class to answer in a whole class discussion.

Each decision was marked by who made the decision and then I paraphrased the decision resolution for the purposes of labeling it. For example, Hannah deliberated on whether or not to ask men the impact of female professors on themselves and their educational experiences, ultimately deciding to only ask the women in the classroom. The decision was marked to belong to Hannah and the conclusion to only ask women the question. The entire discourse of the deliberation interaction was retained for the next phase of the analysis.

After the data was chunked by decision, a discursive analysis was conducted to determine the words, contexts, content that are significant in the deliberation of the decision. This again follows Gee's (2011) description of discourse analysis and significance. To determine what language is rendering or signaling significance, several analytic questions will be considered:

- What words seem meaningful in the deliberation of the decision?
- How is the context of the decision marked and made significant by the words?

- How is the content of the decision marked and made significant by the words?

Initially, the prioritization of these words, contexts, or content was not considered. A growing list of words that were meaningful to the participant in their deliberation was created. For example, when I described my first experience with a political campaign as something I felt “very, very intense about” (NI1), I signaled that my feelings were significant by the use of the word “very.” Beyond the word level, the content and context made other words significant. The figure (Figure 1) below shows one decision chunk, excluding the content of the interview transcript. The first column shown gives the relevant words, context, and content to the decision. The subsequent columns show the figured worlds and roles evident in the decision and then the prioritization.

Figure 1.

Analysis of prioritized words, roles, and figured worlds

Words, Content, Context	Figured Worlds	Roles
Wednesday, COVID tasks, exponentials, 3.2, curriculum, questions, injustice, create, task, Kamalani task, plan, done, book, craft data, socail justice, next week, cite, paper, exponential functions,	Research, College Algebra Team, Teaching, Pathways Curriculum, Graduate Program, COVID-19, Injustice, Data (Critical Info Consumption	Repeat instructor, curriculum follower, task writer/adapter, student peer, research participant, lesson completer, injustice recognizer, data crafter

Prioritized Words/Context/Content	Prioritized Role	Prioritized Figured World
Kamalani task, done, social justice, next week, curriculum, questions	Repeat instructor	Teaching

The words, contexts, and content illustrated which figured worlds are present in the deliberation of the decision. For example, if a participant described “scaffolding” a discussion with a family member about social justice issues, the context, content, and words would show different figured worlds at play. The figured world of family is present in the context of talking to a family member. The figured world of social activism is present in the content of discussing social justice and the figured world of teaching is evident through the use of the word “scaffolding” to bridge an understanding between the interviewer and participant who are both teachers. At this stage, only compiling a list of the relevant figured worlds was necessary. When the data presented figured worlds not theorized previously, consistent naming of recurring figured worlds was maintained for clarity. As I defined these figured worlds, I tried to be as faithful as possible to how the figured worlds are conceptualized and defined for each participant. However, I was limited by my life experience and understanding in my descriptions of the figured worlds that I saw and noticed.

After each figured world was identified in the decision, the role or position taken in each figured world was determined. Through the content, context, and words, it should be clear if, for example, the participant was acting as a daughter or as a sister in the figured world of family or if the participant was acting as a student-centered or lecture-based teacher in the figured world of mathematics teaching. The analytic question to illuminate these positions were: What apparent position is the participant occupying in each figured world identified in the deliberation? These positions represented the different identities that were later considered for relative significance.

Next, the words, contexts, and content coded previously were considered again for the prioritization. Given the ultimate decision within each chunk, the words, contexts, or content that contributed to that decision outcome was highlighted within the list of significant words,

contexts, and content. To determine these significant words, contexts, and content, the following analytic question was considered:

- What words are most significant in the outcome of the decision deliberation?

For example, if the decision was to include accurate data in a lesson, then words or phrases such as “calculators” or “more real” were marked as more significant as they described the prioritized significant aspects of the decision to include messy data values instead of clean, easy algorithmic values for students. The content and context of the decisions gave more meaning to which words are most significant.

Finally, the figured worlds listed previously were reconsidered to determine which aligned with the words, contexts, and content that were prioritized. For example, if the context of family outweighed the content of talking about social justice, then the figured world of family would be coded as having more power than the figured world of social justice. Once the prioritized figured world was detected, then the prioritized position within that figured world was determined. This prioritization of figured world/position pairs demonstrated which identity is negotiated as most important or crucial in that decision. For example, if the figured world of family is prioritized but the instance includes both the role of a daughter and a sister, then the position that is most crucial to the decision outcome will be recorded as the most prioritized position within that decision chunk.

Throughout this analytic process, I first analyzed Hannah’s data before beginning to decipher my own transcript. I chose this order so that I could become accustomed to the analytic plan before adding the emotional weight of closely analyzing my own words and decisions. When I began to make conclusions on my own data, I asked Dr. Kate Johnson, my interviewer and thesis advisor, to check if my analysis seemed complete and in the same spirit of humane

critique as my conclusions for Hannah. My careful analysis of Hannah's background interviews and planning revealed both her strengths and weaknesses with regard to Teaching Math for Social Justice. Although the tendency to search for all strengths or all flaws was pervasive, I strove to display a similar balance with reporting on myself.

After the analysis process for research question 2 was completed for the eight decisions chosen for relevance to TMSJ, common themes from across the decisions were considered. The results are presented by theme instead of by decision. Since only eight decisions were considered from both iterations of lesson planning, the prioritization of the identities can not be considered to be conclusive. Instead, important negotiations for each participant (Hannah and myself) individually, as well as pervasive orchestration between the two of us within our coplanning culture are explored.

CHAPTER FOUR: RESULTS AND DISCUSSION

Research Question 1

To answer the question of which figured worlds are evident for Hannah and myself, I considered the background interview data both broadly and then several excerpts in depth. First, I will describe the figured worlds evident in Hannah’s interview data. Then, I will describe the figured worlds evident in my data and then discuss the comparison between our figured worlds.

Hannah’s Figured Worlds

The thematic analysis (Herbel-Eisenmann & Otten, 2011) on Hannah’s background interviews (Hannah Interview 1 Part 1, Hannah Interview 1 Part 2, and Hannah Interview 2) chunked the data into many themes. The description of what constituted each theme is presented in Table 4. I then inspected the data within each theme to determine if the theme met the criteria of a figured world (Holland et al., 1998). So, within each chunk of data related to the theme, I wrote a short description of how I described each figured world, as shown in Table 4 as well.

Table 4.

List of Hannah’s themes and figured worlds

	Theme Description	Figured World Description
Race	Hannah's recognition of her own Whiteness and conversations with other White people about racism and White privilege. Her discourse about diversity is also included.	Hannah’s position as a privileged White person informed her interactions with White family members and her White-passing husband. Artifacts include surnames and #BLM social media posts
Socioeconomic Status	Hannah communicated about her class implicitly from describing her background and other times, she discusses poverty and class more explicitly. She did not use the term class, but the term socioeconomic	Hannah's position with an upper-middle class background and how that role impacted her interactions with people of various socioeconomic backgrounds.

	status to describe this phenomena.	
Politics	Hannah described certain topics as politically charged. Her conversations about family member's policy opinions and media consumption.	Hannah's position as a moderate informed her relationship with liberals and conservatives. Buzzwords like affirmative action and critical race theory are artifacts of this figured world.
Church	Hannah described her participation and status as a member of the Church of Jesus Christ of Latter-day Saints. Through this lens she communicated her beliefs about right and wrong.	Her interactions with friends and family were filtered through the positions of being active or stable members of the Church. Artifacts of this figured world include missions and scripture.
Volleyball	Hannah described her experiences as an athlete and her teams and experiences with volleyball in junior high and high school.	Hannah's role as a skilled volleyball athlete insulated her from worries about belonging on advanced teams. She constructed herself as a teammate despite a lack of close friendships on the team.
Generation	Hannah compared her experiences with her parents, which she attributes to a difference in age. Then, she also described how her siblings, husband, students, and myself as the interviewer may share commonalities due to being part of the same generation.	Hannah took on the role of a Gen Z or Millennial, which impacted how she viewed and interacted with people of different ages or generations than herself. She assumed that those of her same generation will have similar social positions and worries as herself.
Femininity	Hannah's presentation of her own gender and how she perceived and interpreted the femininity of others (for example, as a "Barbie"). She also described women's issues in the Church and for her personally, like the pressure to have a child.	Hannah noted her position as a woman to be a marginalized position systemically, but did not interpret her interpersonal interactions as marked by sexism. Artifacts in this figured world are Barbies, children, and cars.
Friendship	Hannah described her childhood and adolescent friendships as casual or distant. Her varied relationships with teammates, classmates, and adult friendships.	Hannah's position as a distant friend without many close friends. She recounted never having close girl friends and most of her adult friendships were classmates or her husband's friends.
Family	Hannah's description of her family	Hannah's roles as a daughter, sister, cousin,

	of origin and extended family, but not her relationship with her husband.	and granddaughter. Her relationships with her parents, brothers, grandparents, cousins and in-laws were marked by the differences in position within the family cultural world.
Marriage	Hannah's description of her husband and conversations she had with him. Her conversations with other people about her husband are also included here.	As a subset of the figured world of family, marriage includes Hannah's role as a wife and future mother of a new family unit. Her interactions with others (like family members) are often informed by how she is more knowledgeable of her husband's identity.
Sexuality	As a closeted bisexual woman, Hannah's perception of LGBTQ marginalization was filtered through her experiences in a straight-passing relationship. Included also is her perception of the LGBTQ community.	Hannah's position as a closeted bisexual woman informed how she interacted with her family, straight people, and the LGBTQ community. Artifacts of this figured world include BYU's Honor Code and wording like being on "the spectrum" of queer sexuality.
Schooling	Hannah described herself as a visual learner. She described her experiences in elementary school and in select mathematics classes.	Hannah's position as a student, both in college and earlier grades. Although she did not place her student identity as very important to her everyday life, her school experiences informed her perception of the purpose of education.
BYU	Hannah described the demands on her as a BYU instructor and her knowledge of social issues within the BYU community.	Hannah was an instructor at BYU and a member of the student body. These positions informed her relationships with other BYU students. Artifacts of this figured world include BYU's mission statement and Honor Code.
Teaching	Hannah described her goals in teaching. She described her experiences with other teachers while planning or collaborating, as well as her knowledge of teaching as the child of a teacher.	Hannah's construction of her teacher identity was shaped by teacher role-models and her perception of teachers as a marginalized identity. Her teacher-self impacts how she interacted with other teachers and her students in an official capacity, as well as her interpersonal

		relationships when she had opportunities to explain a new idea.
Mathematics	Hannah discussed her academic and professional experiences with mathematics as a field of study. She viewed her students as novice mathematicians and hopes to encourage hands-on, collaborative mathematical activity in their experiences with mathematics.	Hannah's role as a mathematician, which she perceived as a privileged identity. Hannah viewed herself as a mathematician that can acculturate other mathematicians to the practices of problem solving and critical thinking.
Problem Solving	From Hannah's Calculus experiences taught by a former engineer, Hannah valued engaging in "real" problems in a mathematics class. She also talked about problem solving within the mathematics classes that she teaches.	Hannah positioned herself as a problem solver. She viewed other people as incompetent at problem solving and that she could acculturate others into the practice and cultural world of problem solving. She also took a graduate course on Problem Solving, which expanded her cultural world of problem solving.
Graduate Program	Hannah's shared experiences with faculty and classmates from classes and graduate assignments. The most pertinent shared experience is the graduate Equity and Identity course.	As a graduate student, Hannah's interactions with fellow graduate students and faculty were informed by her position within the cultural world of the BYU Mathematics Education Master's program. Shared experiences within classes and artifacts like Mathematics Education papers and theories are part of this figured world.
College Algebra Team	Hannah's graduate assistantship assignment placed her as a College Algebra instructor. The group of instructors, faculty advisor, and teaching assistants attempted to create coherence across various sections as they implemented a quantitative reasoning, inquiry-oriented curriculum.	Hannah's role as instructor informed her interaction with fellow instructors, teaching assistants, and the faculty advisor for the College Algebra class. Artifacts of this figured world include the common assessments and lesson plans, common books to read for weekly meetings, and common rubrics.
Critical Information	When talking about news and social media, Hannah often commented on	When engaging with social and other media, Hannah constructed herself as a

Consumption	the reliability of different sources. She also described which people in her life employ the “critical thinking” necessary to appraise various sources.	critical evaluator of information for reliability. She interacted with others based on how (or if) they similarly evaluate the bias and claims of news and stories. Hannah also encouraged her students to be critical thinkers and consumers of information.
Research Participant	Hannah was the participating teacher in my thesis study and I was the participating teacher in her thesis study. Although she rarely explicitly drew attention to this, Hannah often asked if she had answered an interview question completely or what more was needed from her for the purposes of the study.	The assumptions and power dynamics from that mutual relationship (Hannah’s position as the participant in my thesis study and myself as her participant) informed how Hannah participated in the planning and interviews. Artifacts of this cultural world include consent forms and audio recording and video recording devices.
Teaching Math for Social Justice (TMSJ)	Hannah had read about Teaching Math for Social Justice from Mathematics Education research articles and class discussions. Some interview questions asked her to discuss what this practice means to her.	Hannah’s position as a novice TMSJ teacher. Her interactions with other teachers, researchers, and her practice of TMSJ proceeded from her construction of this cultural world. Artifacts of this cultural world include TMSJ tasks and published papers and books about the practice.
Art	Hannah described herself as an artist and the importance of visuals in her learning. This also included how she discusses her research, which focuses on visual learning.	As a graphic designer and artist, Hannah’s knowledge elevated her as an authority on principles of design compared to other mathematics teachers. Artifacts include her professional artwork, editing software, and class slides and presentations.
Hometowns and Residences	Hannah described her hometown and how her relationships with people (family, teammates, etc.) were impacted by their hometown. She described local areas of Utah, experiences in California, as well as the hometowns of her students. She also described Brazil and her international students’ background and that impact.	Hannah’s identity as a Utahn and Californian characterized how she interacted with other Utahns based on what region they are from and how she interacted with people of other states. She also lived for over a year in Brazil, which impacted her interactions with people from other countries.

I chose three figured worlds to explore more in-depth: *Race*, *Critical Information Consumption*, and *Sexuality*. For each of these figured worlds I will briefly summarize the interview data relevant to this figured world. Then, I will outline what, from my data, shows that the theme adheres to the criteria of figured worlds. Finally, I will explore various characteristics of the figured world yielded by my discourse analysis (Gee, 2011). These will provide a robust description of these select figured worlds for Hannah.

Race

Hannah described her childhood in California as “diverse” (HI1P1) and then growing up in Utah as very White. During her childhood she remembered playing with kids of all different racial backgrounds and it did not matter at all to her. When she was on her first club volleyball team in Utah, she was the only White girl on the advanced team. The volleyball club was her first most memorable experience with race, particularly feeling for the first time that she was not in the majority. While Hannah was in high school, she came across the story of Michael Brown⁸ which “sparked [her] interest” (HI1P1) and made her consider how racism is relevant in her own life. On her mission to Brazil, she was able to experience the class and racial distinctions with another culture and recognize that those that are considered White in Brazil are not considered White in America, furthering her recognition of race as a social construct. In college she took classes that deepened her understanding of race and Whiteness. In 2020, Hannah was facing the prospect of moving to the East Coast since her biracial (El Salvadorian/White) husband wants to

⁸ Michael Brown was a Black man fatally shot by a police officer in 2014. Brown was unarmed and eyewitnesses say he had his hands up.

live somewhere with more “[racial] diversity”⁹ (HI1P1). She was feeling nervous that she would be inept socially in a more diverse environment. That year Hannah “got pretty into” (HI1P1) the Black Lives Matter movement and decided she needed to form her own opinions on the Church’s history of restricting priesthood access from Black members¹⁰. In 2021, Hannah took a graduate level course on equity and identity in mathematics education and had discussions with her parents about what she was learning concerning critical race theory and White privilege. She took it on herself to disrupt the racist beliefs of her parents, since she has a close enough relationship with them to challenge them.

Hannah’s figured world of *Race* aligns with the criteria for figured worlds (Holland et al., 1998) as shown by Table 5. Through a discourse analysis (Gee, 2011), several aspects of her conception of the figured world are made evident, including her perspective on diversity, activist movements relating to race, the racist identities, biracial marginalization, and theology related to race.

⁹ Hannah stated that her husband “wants to be somewhere with lots of diversity” and then continued by saying that she was hesitant because she has lived in predominantly White communities for so long. I infer then that she means that her husband would like to live somewhere with more racial diversity.

¹⁰ From 1852 until 1978, Black membership of the Church were restricted from full participation in rites and responsibilities considered necessary for eternal salvation. These rites and responsibilities included the “priesthood,” which is a rite/responsibility for men particularly and was used as the short-hand to refer to the entire set of restrictions, even though they applied to both women and men. The ban was limited to only those of African lineage and was lifted via revelation given by President Kimball, the Church president and prophet.

Table 5.

Characteristics of Hannah’s figured world of Race

Historical	Hannah referenced events in history like trans-Atlantic slavery, the Church’s priesthood ban, and multiple instances of police brutality dating back to Rodney King. So, Hannah saw race as a long-standing, historical phenomena.
Positions that matter	White (privileged position), racist, people of Color, people of Color who pass as White (like her husband)
Reproducible	As demonstrated by her experiences both in America, Brazil, Utah and California, Hannah saw racial issues as pervasive regardless of location.
Identifiable persons	White, African American, Latin, Asian, Polynesian, mulatto, preto, Brazilian-White, indigenous people (of Brazil)
Artifacts	Story about Michael Brown, social media BLM posts, journal from President Kimball regarding the priesthood ban, signs of segregation in the South, last names, the book <i>White Privilege</i> ¹¹

First, Hannah viewed diversity as positive and desirable. Hannah drew a parallel to her childhood experiences with diversity in California to an online post about a young White child who wanted to dress to match his “twin”, a Black classmate. Hannah remarked that the post is “very cute” (HIIP1), indicating that she viewed this post as the way things ought to be. Later, she recounted that her husband wants to move somewhere with more diversity than Utah. Her discourse showed that, for her, diversity is normative and homogeneous settings, particularly dominantly White settings, are less desirable. This perspective on diversity impacted how she views the Church institutionally, calling the appointment of the first Hispanic (Brazilian) and

¹¹ It is unclear if Hannah refers to *White Awake* (Hill, 2017), or *White Fragility: Why it’s so hard for White people to talk about racism* (DiAngelo, 2018), or *White Privilege* (Rothenberg, 2015).

Asian American apostle¹² as “progress” (HI1P1). However, she qualified the event as not being sufficiently progressive. Although others “revered” (HI1P1) the appointments as creating more diversity, many were unaware of how White the new Brazilian apostle is. Although the term “progress” and “revere” are marked for their positive connotation toward measures to diversify, Hannah’s language indicates that she also sees space for further radical diversification. All of this language combined shows that Hannah desires diversity in her local experiences, despite her upbringing in Utah.

Second, Hannah’s language emphasized the unexpected passion she holds for the Black Lives Matter movement and White privilege. Hannah recounted a conversation with her mom in 2021 about White privilege and critical race theory in schools and that she was uncharacteristically animated. She explained:

I’m not really one to, like, yell or anything. And even then I wasn’t yelling, but I was talking pretty firmly of, like, no, this is really what it actually is. And she was like ‘wow’ like ‘oh, I can tell you feel very passionate about this.’ (HI2)

Hannah’s mother commenting on her own passion for racial issues is a memory that Hannah repeated three times during the interview. She contrasted her feelings about talking about politics with her husband (“I don’t have a strong opinion on it”) to discussing critical race theory and White privilege with her mom (“something I do feel very decided on and, like, have a strong opinion on”) (HI2). Through her language, Hannah was contrasting how she normally presents herself and the identities she typically holds, like being noncommittal, agreeable, and quiet to her actions and identity when related to racial injustice. For racial injustice, she described herself as

¹² The Church’s top leadership include a presidency (prophet and two counselors) and then twelve apostles. These fifteen men collectively make important decisions for the entire Church. Historically, these positions have exclusively been held by White men.

loud and holding firm opinions. Through her repetition of this experience, it is evident that Hannah valued this passion in herself and wished to emphasize that role within the figured world of race.

However, her expressed passion for racial injustice is in tension with her description of Black Lives Matter movement and the question of that relevance in 2022. She described the George Floyd protests and cultural war concerning critical race theory through a metaphor of fire and heat. First, her initial viewing of videos and stories related to police brutality “sparked [her] interest and had [her] thinking about things” (HI1P2). She also described racial issues as “really hot the last two, two to three years” (HI1P2) and legislation concerning critical race theory “was like a real hot button topic” in 2021 (HI2). In keeping with the metaphor of fire and heat, she also described that she feels that the racial issues have “been, like, dying down recently, right?” (HI1P2). Like coals of a fire, Hannah wonders if the issues were “hot” a year or two prior, but currently fading in significance. When asked what political issues affect her students, Hannah was unsure if racial issues should be included. She asked, “But it’s probably still a pretty pressing issue, like the issue of race, right?” (HI1P2) Since she had taken a step away from social media, she was unsure if it was still a trending or popular topic. Despite her emphasis on her passion for racial injustice, Hannah’s passion seemed to wax and wane with the news cycle. An earlier comment clarified her stamina for heated racial injustice discourse. To explain the several year gap in her experiences with stories and information relating to racial injustice and police brutality, Hannah said that after her interest was sparked and she was “thinking about things, but then like, my own life happens, right? And I kind of, like, move on and keep going.” (HI1P1). Although Hannah held uncharacteristically (for her) strong opinions and beliefs on racial injustice, she simultaneously struggled with persistence regarding racial advocacy. This tension

complicated her declared position as a passionate and involved member of racial movements. Her language indicated that she viewed racial injustice movements as fleeting and her involvement as inconsistent.

Hannah's perspective on who is identifiable as a racist is also evident in her background interviews. At the very beginning of the first interview, I gave her a preview of some of the questions and then began by saying that I may take notes throughout the interview but these notes are not necessarily dependent on what she is saying. Hannah then nodded and said facetiously, gesturing as if writing notes, "She's totally a racist" (HI1P1). Although this comment lightened the formal mood of the interview, Hannah's sarcasm and use of humor distanced herself from the identity of being a racist. When faced with impending questions about her racial identity, Hannah quickly lightened the conversation and also asserted herself as someone who is not racist. However, Hannah did indirectly attribute the identifiable persona of racist to her mother. Hannah said that her mom "is doing a lot better" but she "used to hold a lot of pretty racist, um, beliefs" (HI1P1). Hannah was quick to attribute growth to her mom's racial sensitivity but also admitted that her mom's actions were racist. She gave examples of her mom joking that a Muslim person is a terrorist and that all Asians are poor drivers. Hannah positioned herself as shutting down these comments and explaining to her mother that they are racist. Actions like these (joking about racial stereotypes) Hannah attributes to the identifiable persona of racist. Although Hannah had not had conversations at length about race with her brother, she hypothesized that her older brother would probably hold similar views to her regarding race in comparison to their parents. She said that she assumed this because her brother and her are in the same generation. Thus, Hannah's identifiable persona of racist also assumes a demographic of

age. For Hannah, older people who engage in joking and entertaining racial stereotypes are considered racists.

Hannah also reasoned with the social construction of race several times throughout the interview. First, she considered the duality of how a White person in Brazil can come to America and not be considered White. She further described how her biracial husband is racialized differently depending on the situation. When applying to schools she said that since “he’s got a Hispanic last name on, like, paper, you know, to a university he’s definitely Hispanic to them” (HI2). Although her husband may have other characteristics that contradict his Hispanic identity, she emphasized that “on paper” (HI2) he is Hispanic. This quote suggests that her husband’s racial identity was more complicated than how it may appear. Her husband’s Hispanic identity was substantiated by their experience in El Salvador when locals tried to speak to him in Spanish, so “there...he was very Hispanic” (HI2). However, her family perceived her husband as White. This observation was exemplified through her mother’s reaction to her husband not getting accepted to a top graduate program. Her mom said that perhaps he did not get in because Harvard was “looking for more diversity” (HI2). Hannah emphasized that her mom “said that to my husband who is Hispanic” (HI2). This emphasis showed that Hannah felt that she needed to highlight the context of the situation that made it funny for her, making it evident that her mom forgot that her son-in-law was part El Salvadorian. She reflected on these experiences by saying that although her husband “can self-identify one way, but people can identify him a different ways” (HI2). For Hannah, this ability had ramifications to how racial privilege can be leveraged or not, based “not just like the way you self-identify, but on how other people view you” (HI2). The subjectivity of racial identity and the privilege that accompanies that identity was a key part

of how she interprets roles and actors within the figured world of race. She emphasized location and how society interpreted the individual's identity over self-identification.

Finally, Hannah's figured world of *Race* is marked by religion. She described that her experiences with Black Lives Matter in 2020 caused her to start "grappling" (HI1P1) with the racialized history of the priesthood within the Church. In describing her wrestle with racism and faith, Hannah described identifiable persons within the overlap of racial injustice advocacy and religious activity. She narrated:

It ended up still building my testimony, you know, it didn't, like what happens to a lot of people when they, I think when they start looking into those things is that it ends up pushing them away from the Church. Um, but with the answer that I came up with that felt right to me, it still brought me closer to the Church, you know. It didn't push me away from it. (HI1P1)

Hannah described other people who similarly wrestle with the history of the Church and race, and that those others were pushed away from the Church. She contrasted herself from this and underscored her identity as a faithful member of the Church who came closer to the Church after contending with its racialized history. Later, Hannah recounted how her dad, after a discussion about racism and White privilege, expressed concern of her religious convictions. She reported:

He started, like, expressing concern about me, um, like 'getting into all this,' probably the way he would describe it. Just, like, starting to think about, like critical race theory and things, because he had seen some of my cousins leave the Church over issues like this. (HI2)

Her dad also identified a predictable role in the overlap of the racial activism and Church figured worlds. This identifiable role is a person who, although initially a faithful member of the Church,

became radicalized by racial activism and subsequently left the Church. Hannah, while recognizing the same identifiable person, emphasizes with her language that she is distinct from that typical role and that her experience with racial activism led her closer to the Church. She said that during her conversation with her dad, “it was even more poignant to be able to, like, bear my testimony to my dad and be like...I don’t find conflict between these things” (HI2). The use of the phrase “even more poignant” emphasizes that although there is a common identifiable role, she authored herself as faithful *and* involved with racial advocacy. Hannah’s figured world of *Race* overlaps with her figured world of *Church*, as evidenced by her figuring within that overlapping space.

Hannah’s conception of the figured world of *Race* was marked by the contradiction of her fleeting, yet intense passion for racial activism and then her inconsistency regarding racial injustice as currently relevant. Hannah viewed diversity as a virtue of a society and was also fascinated by the relativity of racial identity recognition. She identifies those in her generation as not racist, but individuals her parents’ age as typically racist. Finally, Hannah authors herself as both a racial activist but also a faithful Latter-day Saint, perhaps contrary to the identifiable role of a radicalized member who loses their faith.

Critical Information Consumption

Hannah described critical thinking as one of the three major skills she hopes to instill in her students (along with problem solving and collaboration). She also identified the “information crisis” (HI1P2) as one of the most pressing social issues for her students. Hannah defined the information crisis as the phenomenon that, since social media has generated a wealth of knowledge out in the world, people lack the skills to interpret it and distinguish between quality and faulty information. This emphasis then colored how she described her experiences with

#BlackLivesMatter, the Church’s racialized history with priesthood, and conversing with her parents about critical pedagogy.

Hannah’s figured world of *Critical Information Consumption* aligns with the criteria for figured worlds (Holland et al., 1998) as shown by Table 6. Through a discourse analysis (Gee, 2011), several aspects of her conception of the figured world are made evident, including her perspective on sources, politics, teaching, and implications for the mathematics classroom.

Table 6.

Characteristics of Hannah’s figured world of Critical Information Consumption

Historical	While Hannah viewed the information crisis as a particularly pressing issue for this generation, she described it as something her parents struggle with and that students will continue to struggle with.
Positions that matter	Credible sources, deceptive sources, gullible follower, independent thinkers
Reproducible	Hannah discussed the importance of information literacy in English, history, and mathematics classes as well as in religious and political settings. So she saw this as a pervasive issue.
Identifiable persons	Opinion sharers on twitter, well-read moderate, believe-everything Republican, biased reporter
Artifacts	Google, New York Post article, President Kimball’s journals, Twitter, emails with her dad, podcast

Through Hannah’s language, she foregrounded her preference for unbiased sources. In her struggle with the Church’s racialized history of the priesthood, Hannah felt that her searching was complete when she found a *BYU Studies* article that was in-depth but “it wasn’t really, like, pushing any specific explanation or agenda with it. It was just a very unbiased history of it all” (HI1P1). She repeated a few times that this article was an unbiased account of history. This emphasis highlighted how Hannah valued what she interprets as unbiased sources when making

decisions. When describing how she hopes her students interpret information, she said that she hoped they would know if someone is “purposely trying to distort or deceive you through the information they’re relaying” (HI1P2). She, therefore, seemed to be defining unbiased sources as one without an overt persuasive tone. She attributed the words “distort” and “deceive” to persuasive sources, showing that she does not trust these sources of information. Hannah’s language demonstrated a preference to sources without a clear message or persuasion.

Hannah also conflated her perception of political identities with identities within the figured world of *Critical Information Consumption*. When describing her own political identity, she described:

I used to think I leaned conservative and now I’m like maybe I lean more liberal?

I don’t know. Things kind of change and go, you know? Um, taking information, so yeah. I think I’d say fairly moderate. (HI1P1)

Note that Hannah described the activity of “taking information” to inform her political identity, which is as a moderate. Hannah’s conception of moderates appeared to be those that critically appraise information instead of dogmatically following a certain set of sources. For example, Hannah categorized her mom as a conservative and her practice of critically evaluating information as lackluster. Hannah said her mom would say “if they, you know, if Fox News says it, then it’s the truth, um, which is definitely not always the case” (HI1P2). So although Hannah both described herself as skilled at information literacy and therefore a moderate, her conservative mother and mother’s friends were also gullible believers of Fox News (which she defined as an untrustworthy source). This analysis revealed that political affiliation was closely connected to identifiable persons within the figured world of information literacy for Hannah.

Four times throughout the interview, Hannah repeated that one of her main goals for her students is to become critical thinkers. She also listed the information crisis as one of the main social or political issues facing her students. Hannah placed significance on the practices Hannah hoped to instill in her students (“to, like, take in the information and digest it properly and interpret it well” HI1P2). She also said that she hoped that her students do not become like her mom (HI1P2), meaning that she hopes that her students will question their sources. Hannah’s emphasized critical thinking generally as a way to connect to the skill of appraising and interpreting information. Hannah said that if she were to run a school, all courses would have the goal of cultivating critical thinking skills. The repeated significance of Hannah’s goal shows that it is central to her philosophy of teaching and her teacher identity.

Within a mathematics classroom, Hannah hoped to socialize her students into the cultural world of *Critical Information Consumption*. Hannah’s language suggested practices or skills involved with that cultural identity. She hopes that her students will be “really thinking” about a problem “not just, like, reading a statement and being like ‘oh, there’s a big number there’” (HI1P2). She described wanting her students to interpret and make sense of the quantities in a problem and “checking the mathematics you’re seeing to make sure it actually, like, makes sense and is reasonable” (HI1P2). The verbs of thinking, reading, checking, making sense all are attributed to what Hannah hoped they engage in during her class, while simultaneously being similar to her own descriptions of non-mathematical information appraisal and literacy. Thus, through the practices she described Hannah indicated that she viewed critical information consumption as an extension of her mathematics teaching practice.

Hannah’s figured world of *Critical Information Consumption* is characterized by what sources are considered credible and to what extent people question their sources. Hannah

conflates position within this cultural world with political identities. She emphasized that skills associated with critical thinking and appraising information was a primary goal in her mathematics teaching.

Sexuality

Hannah was asked to name some of her identities that are important and less important to her everyday life. Although Hannah cited her identity as a wife as one of her most important identities, she also said that her sexual identity was less important to her everyday life. I asked what she meant by this apparent contradiction, to which Hannah clarified that her sexuality is more on the spectrum than her straight-presenting marriage would suggest. Hannah said that she is not super open about that part of her identity, but she's not "completely straight" (HI1P1). Later, when asked about her privileged and marginalized identities, Hannah did not include her identity as a bisexual woman on either list. During the next interview, I asked why she did not include her sexual identity as a marginalized identity and Hannah said that she did not include it because society does not view her as bisexual. Hannah also mentioned LGBTQ issues at BYU as a social or political issue her students face.

Hannah's figured world of *Sexuality* aligns with the criteria for figured worlds (Holland et al., 1998) as shown by Table 7. Through a discourse analysis (Gee, 2011), several aspects of her conception of the figured world are made evident, including her perspective on the prominence of her sexual identity, which positions are marginalized and privileged, and her inclusion in a broader figured world of LGBTQ advocacy.

Table 7.

Characteristics of Hannah's figured world of Sexuality

Historical	Hannah alluded to 2020 news about BYU's succession of changes to the Honor Code ¹³ and in general LGBTQ issues and the Church. Her knowledge of these events (although not extensive) showed that her perception of this cultural world is historical.
Positions that matter	Member of nuclear family, straight, gay, student at BYU
Reproducible	Hannah described societal perspectives on family structure and sexuality both at BYU and broadly, suggesting that she sees this figured world as present across contexts.
Identifiable persons	Visibly gay, straight presenting
Artifacts	Honor code policy and news (Since this figured world was not significant for Hannah, she mentioned few artifacts.)

Hannah's descriptions of her sexual identity were limited and uncertain. Hannah first mentioned her sexual identity as one of the least important identities. Another day I revisited this topic by asking why she did not mention her sexual identity as a marginalized identity. Hannah said that since her sexuality did not come to mind, it further showed that it is not a significant part of her identity. She recounted:

I would think then, like, thinking about, like, psychology, like, since it didn't immediately come to mind, it must not be something that really heavily weighs on my, like, everyday choices and actions and opinions. Um, not something like that I think about a whole lot, really, I guess. I don't know. (HI1P2)

¹³ BYU's Honor Code historically bans same-sex dating. An announcement of a change to this rule was rescinded after a month in early 2020. For news coverage, see: <https://www.sltrib.com/news/education/2020/03/04/after-byu-honor-code/>

Here Hannah's language was uncertain, using the filler "like" several times and hedging her statements with "I guess" and "I don't know" (HI1P2). Although this was not uncommon in her speech, this quote demonstrates that Hannah was uncertain either with discussing her sexuality with another person (particularly since she is not typically open about her sexuality) or that she had not considered at great length the impact of her sexuality on her everyday life. She invoked authority like "psychology" (HI1P2) to describe her thinking patterns, insinuating that her decision in the interview was not conscious. Altogether, her language supports the expressed unimportance of her sexuality. Her hesitation and puzzled responses to questions regarding her sexuality demonstrates that she had not given the topic much thought. Consequently, there were few contributions throughout the interviews concerning her sexuality. This lack of discussion shows that her sexuality was not a prominent role in Hannah's life.

Despite being bisexual, Hannah did not list that aspect of her identity as one of her marginalized identities. As a White, Christian, middle-class, able-bodied, cisgender individual, there were few aspects of her identity that could be categorized as marginalized. She named being a teacher and a woman as marginalized aspects of her identity. When questioned about the absence of her sexual identity as marginalized, Hannah said:

I wouldn't say it's marginalized. We had kind of talked about it a bit, um, because the way most people view me is straight, right. Even if, though I, I, like, self-identify that way exactly. Um, and so I wouldn't, yeah. I wouldn't place it as a marginalized identity for that reason because nobody knows basically [short laugh]. Right? Everyone sees me as straight. (HI1P2)

In this quote Hannah emphasized how other people view her over how she self identifies. She continued that her sexual identity is "just to [herself] basically" (HI1P2). This language is similar

to how she describes the racialized experiences of her biracial husband. She said that he can pass as White in certain situations while he is considered Hispanic in other situations (HI2). Hannah appears to define marginalization based on how others in society view the individual instead of intrinsically feeling connected to a marginalized group due to self-identity. Due to her definition of LGBTQ marginalization, Hannah was able to distance these issues from herself because she was “living a straight life” (HI1P1). Hannah also mentioned that a nuclear family structure is still a privileged family structure, demonstrating her determination that heteronormative relationships are privileged. Although her characterization of positions that hold power are clear, she was more concerned about outward expression for determining marginalized positions in the figured world of *Sexuality*.

Hannah distanced herself from LGBTQ activism and issues at BYU. Despite being a bisexual BYU student, she used language that dissociates herself from those causes. When asked what social or political issues her students face, Hannah said:

I dunno if it's an issue, but like LGBTQ and BYU is, is still something, um, that is rough for a lot of students, especially with that whole change in the wording that was, like, confusing for a lot of people. (HI1P2)

The “change in the wording” alluded to here is the change and then quick reversal of BYU’s Honor Code policy regarding gay dating at BYU. Hannah’s language emphasized that it was other students, not herself, that struggled with that issue. She says twice that it is difficult for “a lot of people”. Pronouns like “us” or “we” would have included her in that struggle, but Hannah’s word choice showed that she does not participate herself or feel connected to that social struggle on campus. Her other narration about marginalization combined with this isolation show that Hannah did not see herself as an involved member of the LGBTQ

community. Although she described her sexuality as “on the spectrum” (HI1P1), her figured world of sexual identity did not include LGBTQ advocacy.

Hannah stated that her position as a bisexual woman did not hold prominence in her life, which is reinforced by her language. Hannah also distanced herself from LGBTQ advocacy, relying on being straight-presenting to avoid societal marginalization. Her focus on perception dictating marginalization was similar to her characterization of biracial individuals.

My Figured Worlds

The thematic analysis (Herbel-Eisenmann & Otten, 2011) on my first (Navy Interview 1) and second (Navy Interview 2) background interview chunked the data into many themes. The description of what constituted each theme is presented in Table 8. I then inspected the data within each theme to determine if the theme met the criteria of a figured world (Holland et al., 1998). The theme of authority, while present throughout my data, appeared to characterize the positions of authority and power in other figured worlds instead of constituting a figured world itself. Also, the theme of calamities was also determined to be not aligned with the historical criteria for figured worlds. However, all the other themes were considered to meet the expectations of figured worlds. So, within each chunk of data related to the theme, I wrote a short description of how I described each figured world, as shown in Table 8 as well.

Table 8.*List of my themes and figured worlds*

	Theme Description	Figured World Description
Race	My description of my Whiteness, conceptions of diversity, and the marginalization of those of other races. Discussions of critical race theory, media representations of people of Color, and antiracism were also coded under race.	As a White person, my interactions with other White people and people of Color form a figured world informed by White supremacy. My educational and other experiences constructed my antiracist position and explicit attention to my Whiteness.
Class	My overt discussion of finances, wealth, and social class as well as implicit messages about my socioeconomic status from my description of my upbringing. Conversations about institutional power and money are also coded under class.	Coming from an upper-middle class background, my interactions with those more and less wealthy than myself and the economic privilege associated with those positions. Artifacts include money, cars, homes in certain areas, etc.
Politics	My description of elections, citizenship, and partisan politics. Referencing something as Republican, liberal, conservative, or “political” was usually placed into this category.	My evolving participation in partisan politics and how I interacted with others based on a liberal/conservative spectrum. I hesitated to define my own position clearly, but suggested that others classify me as a liberal.
California	Events or descriptions specific to my upbringing in California. This included descriptions of people from California, how California differed from Utah, events that were specific to California.	My characterization of myself as a Californian and interactions with other Californians and people from other states.
Utah	Events or descriptions specific to my time as a college student in Utah. This included descriptions of people and places in Utah, how California differed from Utah.	Having lived in Utah for several years, I described myself as a Utah transplant. My interactions with other Utahns, “Utah transplants” and my extended family living in Utah.
Church	Discussion of my experiences with the Church of Jesus Christ of Latter-day Saints and my full-time mission. My references to right and wrong,	My membership and status in the Church of Jesus Christ of Latter-day Saints as an active member and return missionary. I talked about my interactions with other

	beliefs, and morality are also included in this since my sense of morality is closely connected to my faith.	members, non-members, and leaders of the Church (both local and institutional).
Family	How I describe my family of origin and my extended family and in-laws.	My roles as daughter, sister, granddaughter, daughter and sister-in-law, etc. The power dynamics between parents and siblings, older and younger siblings are present within this figured world.
Marriage	My discussion of conversations and interactions with my husband and our interactions with others as a couple.	My relationship with my husband. This figured world is a subset of the figured world of family.
Gender	My self-described feminism and conversations about patriarchy, gender roles, and marginalization of women.	My position as a woman in society and how I constructed myself as a feminist and women as a marginalized group. My interactions with other women and men often illuminated the power dynamics and my interpretation of this figured world.
Friendship	My construction of friendship both from my childhood and as an adult. This theme was often Church or racially coded as I discussed how I presented my faith socially or how I interacted with friends of Color.	My construction of friendship both in my youth and as an adult. I discussed how I interacted with friends in politically or racially charged situations.
School	My experiences as a student (from elementary school through university). My interactions with other teachers, students, and assignments are included in this theme.	My position as a student (from elementary school through university). My interactions with my teachers and peers constitute this figured world. Artifacts include specific readings or assignments.

Teaching	My teacher-self and how I interacted with students and other teachers. My goals, actions, and beliefs as a teacher are included here.	My role as a teacher and how I constructed my teacher self as I interacted with my students and other teachers as peers. I positioned myself as a reform-oriented math teacher and, at times, an ESL teacher. The power dynamics of myself as a new teacher under supervision was also explored.
BYU	As various questions target my perception of BYU as an employer, my interactions with the institution are included here. I spoke of issues for the general study body at BYU from an instructor perspective.	This figured world is the intersection of my teaching and school figured worlds, as both an employee of BYU and member of the student body. Artifacts of this figured world include directives and statements from the university.
Reform Math Teaching	I alluded to reform teaching as mathematics education research defines good teaching. This was described as inquiry-oriented, task-based instruction that I learned throughout my undergraduate and graduate education.	I took on the role of a reform-oriented mathematics teacher. My interactions with other teachers were informed by this role and if I recognized them as a similarly reform-oriented or a more traditional teacher.
Mathematics	My experiences and beliefs about mathematics and mathematical content that I teach.	My role as a mathematician and how I viewed mathematics as a field of practice. As I enculturated my students as mathematicians, the practices and opinions I hope they form show my position within the cultural world.
Trigonometry Class	For my graduate assignment, I was assigned to teach the Trigonometry class at BYU. My supervisor, class expectations, and interactions with students fall under this umbrella.	For my graduate assignment, I was assigned to teach the Trigonometry class at BYU. This is a specific subset of the figured world of Teaching.
Curriculum	My use of curricular materials and how I talked about tasks and textbooks.	My role as a curriculum adapter for my classroom and one with potentially limited ability to choose curriculum. My interactions with supervisors, students, and (indirectly) curriculum developers are part of this figured world.
Language	I both employed language as a tool to underscore education and	I both employed language as a tool to underscore education and privilege, and

	privilege, and distance between people who speak other languages. Language acquisition is also coded under language.	distance between people who speak other languages. As an ESL teacher, I also discussed language-acquisition as a cultural world.
Teaching Math for Social Justice (TMSJ)	My definition of TMSJ and how I explained it to others and have attempted to enact TMSJ in my own classroom.	Within the context of this study, I was positioned as the expert on TMSJ from my readings on the subject. However, I also was a novice compared to others in their research, reading, and practice enacting TMSJ.
Advocacy	My description of being defensive for someone or certain causes (like TMSJ, feminism, etc.). These conversations were contextualized within defense of marginalized people and are closely connected to activism.	My role as an advocate or activist. My interactions with others in their apathy or involvement in social causes and who I chose to disrupt or educate on issues relating to marginalization.
LGBTQ	My interactions with LGBTQ+ activism both in my youth with Proposition 8 (to legalize gay marriage) and as a BYU student with LGBTQ controversy on campus.	My role as a cis-gender, straight person. My interactions with LGBTQ+ activism both in my youth with Proposition 8 (to legalize gay marriage) and as a BYU student with LGBTQ controversy on campus.
Disability	I described myself as an able-bodied person and some of my students as members of the disabled community. This description is adjacent to my description of the pandemic.	My position as an able-bodied person and my interactions (usually described as teacher-student interactions) with those that have a disability. I described disability as a marginalized identity.
Community	I described my community (my Church congregation and those in the “village” that raise me) and the communities of others (like Gutstein’s community in Chicago).	I described myself as part of a community and my community as the “village” or group of people around me as I grew up. Closely connected to my Church congregation, I described positions of alignment or distance from my community and interactions of various local communities (i.e. Rico’s community in Chicago).
Authority	I described authority figures in my life and how they differed from my role-models. I also interpreted myself as an authority and others as	<i>Determined to not be a figured world.</i>

	authorities depending on the situation.	
Maturity	My age and perceived maturity. I sometimes mentioned my moral or cognitive development or how I was too young to understand certain aspects of my early experiences.	At various points I made explicit attention to my age, cognitive and moral development, and how others view my maturity. The role of youth and experience advised how people interact with one another.
Calamities	Both 9-11 and the COVID-19 pandemic created opportunities for me to consider and discuss the role of teachers in the lives of students. As a teacher, I saw calamitic events as motivation for engaging in TMSJ.	<i>Determined to not be a figured world.</i>
Researcher Interviewee	As both researcher and participant, I both expressed that I have not considered certain questions personally while also being familiar with the purpose and intent of the interview questions.	The research project consisted of the faculty advisor and committee, my participant (Hannah) and myself as participant-researcher. During my interview, the interactions between myself as interviewee and my advisor as interviewer were informed by the cultural world of thesis projects.

I chose three figured worlds to explore more in-depth: *Race*, *Advocacy*, and *Community*. For each of these figured worlds I will briefly summarize the interview data relevant to this figured world. Then, I will outline what, from my data, shows that the theme adheres to the criteria of figured worlds. Finally, I will explore various characteristics of the figured world yielded by my discourse analysis (Gee, 2011). These will provide a robust description of these select figured worlds.

Race

When asked about my first memory with race, I recounted a story about myself that I have heard several times from my parents. I once labeled a Black person a “Keisha”, after the name of the one Black girl on the children’s show *Barney*. Although I did not remember this

experience, my family has retold the story several times, usually in tandem with the story of my uncle calling a Black man a “Root” (after the 1977 historical miniseries starring LeVar Burton). When I was older and entering first grade, I remembered my first experience having a Black classmate and being unsure how to associate with him. When asked about my construction of my White identity, I first recalled when I felt outside my friend’s Korean community. Then, I concluded that my unpacking of my Whiteness and White identity came during a university course about multicultural education. I also described my experiences teaching English to Spanish speakers and the racist attitudes my students may face in America. I also introduced BYU’s statement on belonging, which includes condemnation of racism, to my mathematics students but used the statement to begin a discussion on open, respectful communication in the classroom.

In the second interview I recounted sharing with my mom the Mercator map social justice task (Gutstein, 2006) , but my mom’s incomplete reasoning with maps made it so that I did not discuss the racist implications of the map. When asked to think of a hypothetical discussion about TMSJ, I conjectured that I could talk to my best friend’s current roommate, a Latina teacher in inner-city Boston. I wrestled with how much to explain about TMSJ and how much to listen in that hypothetical interaction. This self-debate led Johnson to ask if Gutstein’s work was more approachable to me since Gutstein is White, which I agreed was impactful on my approach to TMSJ.

My figured world of *Race* aligns with the criteria for figured worlds (Holland et al., 1998) as shown by Table 9. Through a discourse analysis (Gee, 2011), several aspects of my conception of the figured world are made evident, including my description of Whiteness, introspection on internalized racism, and my struggle with racial insensitivity.

Table 9.

Characteristics of my figured world of Race

Historical	I referenced historical events like Jackie Robinson and the Civil Rights Movement in my discussion of race in America. Additionally, I recounted my parents' and grandparents' dealings with race.
Positions that matter	White, Educated & White, Black, Hispanic
Reproducible	I talked about both experiences in Utah and in California, as well as hypothetical experiences in Boston and Gutstein's real experiences in Chicago. This suggests that I did not view my figured world of race as isolated or an aberration.
Identifiable persons	White, Black (a "Keisha" or "Root"), Korean
Artifacts	Barney episodes, language ("Oma"), the name "Keisha", churches, essay <i>White Privilege: Unpacking the Invisible Knapsack</i> (McIntosh, 2007), book <i>Reading and Writing the World with Mathematics</i> (Gutstein, 2006), book <i>Radical Equations</i> (Moses & Cobb, 2002), BYU statement on belonging

First, my language expressed a perspective of Whiteness being valuable to account for within myself. I used the word "Whiteness" several times throughout the interviews, despite there only being one question that explicitly probed into my White identity. In response to that question (When did you know you were White?) I recounted my introspection during the Multicultural Education course I took during my undergraduate program. I said:

I was a little bit more comfortable like owning, recognizing all the baggage that comes with it and still feeling like "no, I need to own this, that my, I am White and this is, like, all of the things that can come with it and my Whiteness and the White privilege that kind of accompanies it." (N11)

Several times I repeated that I need to "own" (N11) my Whiteness, demonstrating the significance I placed on taking personal responsibility for the impact of Whiteness on my life

and how I interact with others. When discussing my self-described privileged identity of being educated, I state that the combination of being White and being educated “changes how... my Whiteness presents itself” (NI1). From the structure of the personal pronoun, I constructed my sentence so that I personally own Whiteness. Thus, my language presents two meanings for ownership of Whiteness: I described Whiteness both as an attribute to reconcile and take personal responsibility for, and also as an object that I carry with me and “present” (NI1) to other people. In the next interview, I again mentioned my Whiteness and how it could come through in my interactions. In a hypothetical conversation about TMSJ with my best friend’s Latina roommate, I said that I wanted to be sure that I “not mansplain, but Whitesplain I guess” (NI2). I created a parallel between mansplaining, when men explain something to a woman that she already understands, to myself being liable to explain racism or injustice to a person of Color. Through the repetition of references to Whiteness within myself, I emphasized that I consider Whiteness to be a pervasive attribute of my interactions that ought to be reconciled and understood.

In a couple instances during the interviews, I considered my subconscious racist habits or attitudes. When asked about my first experience with race, I described feeling that I needed to treat my 1st grade Black classmate differently. I buffered this experience by recounting an earlier experience that I do not remember about calling a Black person a “Keisha” and my parents’ reaction. Despite talking about very early memories, I detailed a potential internal monologue from that time, that my parents were communicating that “there’s something about this [race] that I do not fully appreciate and I need to be careful” (NI1). With my Black classmate, I narrated that I thought “Oh, you are not just, like, you kind of look like me but a little bit different” and looking around to internally question “How? What’s going on with this? I haven’t

experienced this before” (NI1). The pairing of the experiences that I described help buffer the reaction I was communicating about my Black classmate, shifting responsibility to my parents. The phrase “a little bit different” and situating the story from the perspective of a child’s narration softens the experience, communicating that the experience, while my first experience with race, was still within the realm of a “safe self-critique” (Haviland, 2008). In the second interview, Johnson asked if Gutstein’s identity as a White man impacted how I read his (2006) book and if it would have been altering for me if it was written by a Black man. I compared my reaction to Gutstein’s *Reading and Writing the World with Mathematics* to Moses and Cobb’s (2002) *Radical Equations* and admitted that *Radical Equations* was not as impactful, potentially because of the mathematical differences or the anecdotal nature of Gutstein’s writing. Then, I said:

But maybe it is because of the, like, I would, of the Blackness of the author, where the ideas were coming from, that that was on some level influencing how I felt about it. (NI2)

I used the phrase “on some level” and “maybe” to suggest the bias would be subliminal or subconscious. I repeated the filler words “like, I would, of the” (NI2) in the quote. Although not included above, at this point of the interview I trailed off and began new thoughts several times and repeated fillers like “um” and “like”, demonstrating the discomfort I had going from a “safe self-critique” (Haviland, 2008) to an example that was more current. My language both demonstrated my discomfort but persistence in introspectively considering my personal racist attitudes. Through these two aspects of the interviews, I considered my prejudice and its manifestations.

Throughout the interviews I described what actions I considered to be inappropriate for me to engage in as a White person. First, with my Korean friend in elementary school, I described using the Korean word for “mom” to reference my friend’s mom or attending their all-Korean church as inappropriate for me to engage in. In discussing the impact of Gutstein’s (2006) work coming from a White author, I said:

If Rico’s book was, like, same content, it was just coming from a not-White educator, I would’ve felt more like this is not something I can do. Other people can do this, but I can’t do this. I want to support this. I think this is really awesome, but I can’t personally do this (NI2).

Through my language I was emphasizing that the background of the teacher would impact if they “can” engage in critical pedagogy. Particularly in my repetition of the conjunction “but” to contrast my support and respect for critical mathematics pedagogy to my inability, I highlighted a tension between what I consider to be important to what I can personally accomplish. It is unclear in this passage if I believed critical mathematics pedagogy was beyond my ability or beyond what was appropriate for me to engage in given my White, middle-class background. The explicit attention to inappropriate behavior in cultural situations earlier in the interviews and subsequent comments suggest that I considered the impropriety of my participation would render me incapable of that pedagogy. For example, in hypothetically explaining TMSJ to my friend’s Latina roommate, I said:

Or, like, I would just know, I don’t have to explain this to you. Like, that’s not my place at all. Like I, you know, [laughs] you should, you can explain things to me, but not the other way around. (NI2)

Here I used the word “should” and the phrase “that’s not my place” to suggest that I am discussing the suitability of the conversation. In close proximity, I used the verb “can”. By saying that the Latina roommate “should” and “can” explain injustice to me, I conflate both ability and appropriateness. Thus, through my language I communicate what I “can” and “can not” do, in terms of what conversations and pedagogy I can engage in given my role within the figured world of *Race*.

My figured world of *Race* focused on my understanding of my role as a White person and how I engaged with non-White people. I drew explicit attention to my Whiteness as well as what is appropriate behavior for me to engage in. As I storied my experiences with race, I shared my inner-dialogue and possibility of my own prejudice influencing my opinions and actions. I also discussed what was permissible or not for me to engage in as I interact with other people within the figured world of race.

Advocacy

I first described myself as an advocate or activist in the context of feminism. Although I identified as a feminist, I shared a bit of my struggle to be inclusionary instead of narrow-minded in my feminism. When asked about a social or political issue that had an impact on who I am, I talked about my 7th grade experiences as a member of the Church in California with Proposition 8. Proposition 8 (Prop 8) was a bill to ban same-sex marriage in California and the Church invested a lot of resources, both institutionally and locally, to passing the bill. Although I explained that my views on Prop 8 have changed, seeing my community “mobilize” (NI1) for a cause it believed in was impactful to me. My experiences with Prop 8 also led me to internalize messages of civility in advocacy discourse, as I expressed disappointment in friends vandalizing Prop 8 signs. I also described how my teacher self included advocacy in my English and

Mathematics teaching experiences. Finally, my hypothetical descriptions of discussing TMSJ with friends demonstrated the factors that contribute to my messaging on advocacy in various contexts.

My figured world of *Advocacy* aligns with the criteria for figured worlds (Holland et al., 1998) as shown by Table 10. Through a discourse analysis (Gee, 2011), several aspects of my conception of the figured world are made evident, including the importance of advocacy to me, as well as what actions constitute advocacy, the role models I have for balancing privilege with advocacy, and how I present my advocacy in my teaching.

Table 10.

Characteristics of my figured world of Advocacy

Historical	I mentioned the Civil Rights movement, California’s Proposition 8 in 2008, as well as current efforts at advocacy. This suggests that I consider advocacy a historical figured world both personally and generally.
Positions that matter	Male feminists, White anti-racists, cis-gender inclusive feminists
Reproducible	I discussed my experiences with advocacy in relation to other movements of advocacy, like feminist movements, LGBTQ advocacy, civil rights, and social justice teaching.
Identifiable persons	Feminist, TERF (trans-exclusionary radical feminist), volunteer for Prop 8, voter against Prop 8, social justice teacher
Artifacts	Book <i>Reading and Writing the World with Mathematics</i> (Gutstein, 2006), Prop 8 signs, Church callings for Prop 8, ESL readings on Jackie Robinson, blue and pink paper mathematics handouts

When asked about a social or political issue that had an impact on who I am, I discussed my experiences with Prop 8 in ways that reflect the intensity and significance of the experience. I was able to give many details of my experience and highlighted the high emotions associated with that time. I said:

I have dramatically changed my opinion on it [laughs] since that time, but it was, um, I remember feeling the intensity of two sides of an issue that both sides felt very, very intensely about, about it (NI1)

The repetition of the words “very” to describe how “intensely” myself and others felt about Prop 8 during that election cycle showed the significance of the emotions. I not only repeat that both sides felt intensely, but underscore that it was “very, very” intense (NI1). Then, when Johnson asked me why the experience was so impactful, I expressed how rare the situation was. I said:

It was also the first time my family and my church community explicitly were expressing a political/social opinion so, like, so explicitly. (NI1)

I repeated and gave emphasis in my speaking to the phrase “so explicitly”, indicating the significance of the overt political messaging by my family and church. My language about my Prop 8 experience was marked for the intensity of my emotions and resolute opinions.

My language also demonstrated what actions I associated with advocacy. Within the context of Prop 8, I said that it was the first time “my ward and church were all like coming together on something that they felt like needed to happen” (NI1) and that it was impactful to see “people I knew mobilize like that” (NI1). The actions of “coming together” and to “mobilize” are activities I portrayed others engaging in to participate in advocacy work. Later, I used words like “fight for” and “champion” for different causes (NI1). All of these activities were very general and I gave few examples of concrete activities that this amounted to. I mentioned going “door to door” (NI1) and “talking with friends in gym class” (NI1) as the other memories of actions associated with fighting and championing various causes. It appears that my experiences with advocacy are more intellectual or metaphorical than tangible, given the disparity of the actions and activities that I attributed to Prop 8 advocacy.

Throughout my interviews I named various levels of privilege that I hold in society. In my examples of advocacy, I associate my role in advocacy as closely associated with my privilege. In talking about feminism and general advocacy, I said:

I think that men should be feminists. I think that White people should be, you know, antiracist...But then I also recognize that there are probably sometimes where, um, it can be tricky to parse out what do I feel about feminism and is, do those same things apply or how does, um, uh, how do women who are transgender, like, factor into my feminism? (NI1)

In this excerpt I discussed two issues (sexism and racism) and the dominant or privileged group (men and Whites, respectively) becoming advocates on that issue. I said that these people “should be” (NI1) feminist or antiracist, indicating that this phenomenon is what ought to be. I then introspectively questioned if I utilize my privilege appropriately in my advocacy in feminism. I further questioned:

I think that in my feminism I am often not good enough about being intersectional, um, about it. And I know that's a problem for a lot of White, educated, upper-class women [laughs] um, to not be conscious of the intersectionality of it and making sure that its, um, you're not just raising the, like, improving the conditions for White, upper-class women. (NI1)

While in the previous quotation I mentioned potentially excluding transgender women in my advocacy, in this excerpt I am more general about the “intersectionality of it” (NI1). In naming the dominant group as White, educated, and upper-class, presumably the marginalized groups that are potentially excluded in my advocacy are not-White, non-educated, or lower-class women. I said that I must be sure I am “not just raising” (NI1)

the quality of life of these privileged women, indicating that I considered this to be incomplete or insufficient. Through my language I described an inclusive goal with advocacy, instead of just raising the wellbeing of those who enjoy multiple levels of privilege in their life.

I included my role as a teacher within the cultural world of *Advocacy*. I presented this in different ways in how I describe my teaching. First, when discussing my curricular freedom in teaching English to adults, I said:

I did find myself, like, adding lots of things of, like, if you're a new citizen and you don't know a ton about Black history maybe we should have some things about like Jackie Robinson. Things like this that I would, um, I pulled in things about environmentalism a lot. Or, like, I could have made it really basic but I definitely chose not to. (NI1)

Here I emphasized the intentionality of presenting my students with material on Black history or environmentalism instead of “really basic” (NI1) topics. From this language I am positioning the traditional reading curriculum as normative and basic but readings about Jackie Robinson or environmentalism as examples of important or pressing topics to present to students. I demonstrated a similar propensity to see my classroom as a space for activism in teaching mathematics. When I taught trigonometry, I explained how I dealt with important issues to my students by trying to “name it” (NI1). For example, I “try to make it clear what my position is on things, like how I view disability, mental health. I try to just be, like say it, like this is what I think on this” (NI1). In this quotation, I named two issues that I felt were important or pressing for my students to know my position: disability and mental health. In my interview I also named sexism and the male-

dominance of my trigonometry class as pertinent to my interactions with students that I ought to describe explicitly (N11). Through my language I was communicating a perspective of attempting to relate my teaching practice to my advocacy with respect to various issues, including racism, environmentalism, disability, and sexism. This is present in both my experiences in teaching English and mathematics.

My figured world of *Advocacy* is marked by its significance to me. I described that my privilege ought to propel me to advocate for those who are not in the same position as myself. Despite my concrete experiences altering curricular materials when teaching English as a second language or teaching mathematics, the activities I associated with advocacy were consistently abstract.

Community

I used the word “community” several times throughout my interviews in various contexts. Initially I described my community as middle-class and consisting of White, Hispanic, and Asian peoples. I also attributed my reckoning with my own Whiteness as recognizing that I am part of a particular community. I also attributed my local ward and stake growing up as my community, particularly when talking about the impact of Prop 8 advocacy in California. I also discussed community in the context of teaching math for social justice. I described TMSJ enactment as more powerful when it is centered on local issues of injustice.

My figured world of *Community* aligns with the criteria for figured worlds (Holland et al., 1998) as shown by Table 11. Through a discourse analysis (Gee, 2011), several aspects of my conception of the figured world are made evident, including the racialized and religious aspect of how I define community and how I connect community to family and relevance to TMSJ.

Table 11.

Characteristics of my figured world of Community

Historical	I described my personal community indirectly and related to events in my life. I also gently alluded to other communities. Although I am not very explicit, my description of community throughout my life demonstrates some longevity to my meaning of this cultural world.
Positions that matter	Teachers, Church leaders, members of a White community
Reproducible	Since I talk about TMSJ enactment as generally being applicable to various communities, my meaning for community suggests that I believe this can be recreated in various contexts.
Identifiable persons	Member of the church, local resident, family members
Artifacts	Prop 8 signs, titles like adopted uncle, ward callings

When I first described my hometown and upbringing, I discussed the class and racial makeup of my area. I said that there are a lot of White and Asian people at my high school. I also said, “There were a lot of people who were Hispanic, um, and Black as well, but less so in my immediate community” (NI1). Here, I invoked the word “immediate community” to describe a group of people who are mostly White and Asian Americans. Later in the interview, when asked about my recognition of my White identity, I first recounted when I felt outside a particular culture (my friend’s Korean-American culture). Then, I said:

That's still kind of highlighting differences though instead of, like. I don't know.

Or are you asking me, like, when I felt, like, okay, these are like, this is, like, the community I am, like, am a part of? (NI1)

I connected the idea of Whiteness and my White identity to the idea of “community”. I named my White culture as my community that I belong to and part of my development of my White racial identity. This further suggested that instead of a heterogenous, multi-racial community, my

meaning for community was a White community. Although I invoked the word “community” to describe groups of Hispanic or Black people, it is never with inclusive pronouns. Thus, my figured world of community was racially coded and exclusive to White people.

I used the word “community” several times when talking about my experiences with Prop 8 in 7th grade. I said that it was the first time I saw “my church community” (NI1) get involved in politics. I remarked that it was impactful for me that:

I saw so many people that I trusted so much, on, like, a, not just a 'oh you're, like, an adult in my community,' but you are an adult that I trust to be like a teacher of what's right and what's wrong. (NI1)

In these two excerpts, I used both the word “church” to modify community and that adults in this community teach me about “what's right and what's wrong” (NI1). So, moral as well as religious capital were shared among what I describe as this figured world. In describing the people involved in Prop 8, I said that, “the community, my ward and church were all, like, coming together on something” (NI1). Here in my language I clarified my meaning for “community” by “my ward and church” (NI1). By “my ward” I was referring to the local congregation and people that I knew personally. However, by also including the general “church” in that statement, I suggested that any and all members of the Church were included in that community. For example, I said that “as an organization, as, like, a community, we're going to...fight for” Prop 8 (NI1). Here I used the word community in association with the Church, but in this quote I cited the Church as the institution or “organization”(NI1) that was providing financial resources. I used the word “community” in close association with the words “Church”, “right and wrong” , “ward”, and “organization”. So, my figured world of community was tied to my local and global religious culture.

In describing my community, I used familial language. For example, when describing my upbringing in California I said, “our ward, our church community, became like an extended family network, um, adopted-ish” (NI1). I invoked the analogy of being “adopted” into a community and the members were “an extended family” (NI1). This language showed the close-knit and connected roles the members of my figured world of community represent. This is further exemplified by my description of one member of my community who voiced concern over the Prop 8 activism. I said:

I never knew of individual people who disagreed with it, except I did know that my, he’s my dad’s former companion, but he’s basically an uncle to me, um, like he, like voiced a concern. (NI1)

Even though I was describing an action that could create distance within the community (voicing a concern over Prop 8), I named him as my dad’s former missionary companion and further described him as “basically an uncle” (NI1). So despite not participating in lock-step with the White, heteronormative, religious community I had described, I still chose to represent this person as a member of my adopted religious family. From my language associated with community throughout the interview, I characterized my figured world of *Community* as connected, close-knit, and like a family.

I also talked about community in the context of how to engage in TMSJ. When defining what TMSJ means to me, I described that ideally the studied injustice would be relevant to students’ lives, but TMSJ can also inform students of injustice outside of their life experience. Then I emphasized, “It doesn’t have to be about your particular situation and community, but I think it is more powerful if it is that way” (NI1). The emphasis in this sentence was given to the “but”, indicating that my beliefs on social justice were rooted in community issues and problems.

I later cited Gutstein's examples of TMSJ being about "local issues and encouraging students to get more involved in, like, issues in their community" (NI2). Here my meaning of community was grounded to local issues and concerns. However, the context of Gutstein's work was dominantly Latin@, so the racial and geographic marking of my meaning for community are intact. Also within the context of talking about TMSJ, I include teachers as part of the community. I explained that, "my mom cares that teachers are, um, part of the village of raising a child and that there should be, like, it's not just content that they teach" (NI2). This idea of teachers raising a child is similar to the language I use to talk about adults in my Church community teaching me the difference between right and wrong (NI1). I expanded this definition beyond Church teachers but mathematics teachers as well in my description of "the village" (NI2) or community that is relevant to TMSJ. Through the association of community and TMSJ, I include teachers and local issues as critical players in the figured world of *Community*.

My figured world of *Community* is marked both by race and religion. I included White people and members of the Church as my community and displayed my acceptance of various actors through familial language. By contrast, in discussing TMSJ, I referenced other communities, like the community Gutstein (2006) was working with. This community was still racially homogenous and I considered TMSJ to be most impactful if it connects to the local issues present for that community. I also included mathematics teachers as important actors in their local communities.

Research Question 2

To answer question two, I will describe the identity work Hannah and I engage in as we planned TMSJ lessons and reflected on this practice. First, I will give a brief overview of the two tasks that were planned and then enacted in Hannah's class in order to provide the context for the

remaining discussion of the data. Next, I will describe the figured world we co-constructed and figured our roles. Then, I will describe the negotiation Hannah and I made with the *Math Teaching* figured world and *Social Justice Teaching* figured world, both in ways that prioritized *Math Teaching* and in ways that gave precedence to *Social Justice Teaching*. I then will also describe how Hannah and I orchestrated our positions within the figured worlds of *Race* and *Gender/Femininity* with *Social Justice Teaching*.

The Two Mathematical Tasks

Although it might be typical to present an overview of the two tasks that were planned for and enacted in this study in Chapter 3, I provide a short overview here instead for the purposes of readability. This placement supports the reader in better making sense of the following data.

The first task we planned for was adapted from a culturally relevant unit on logarithms, written by Kaluhiokalani (2022). The task provides details on the median house cost, interest rate, and down payment expected in Hawai'i and then asks students to find how long a local Hawaiian would have to save in order to afford a down payment on a house (see Appendix D). The result (around 50 years) brings to light the predicament local Hawaiians face as they are economically unable to raise their children in their same culture. Mainland elites purchasing vacation homes and saturating the market, accompanied by the high cost of living in Hawaii, illuminates the difficult choices Hawaiians face to continue their cultural heritage. Full realization of this task would challenge students to consider the long-term impacts of an economic injustice and what can be done (personally and systemically) to address this injustice.

The second task we planned for was adapted from an existing task within Carlson et al.'s (2020) curriculum. The original task introduced features of rational functions through the context of the ratio between men and women awarded PhDs by year over time. Hannah and I adapted the

task to contrast the data on men and women awarded PhDs to the male to female tenure-track faculty ratio at BYU (see Appendix E). Although the recent ratio of men to women awarded PhDs is less than one (indicating that more women than men are awarded PhDs), the ratio of male to female faculty is around three, indicating that there are about three times as many male faculty than female faculty at BYU. The students were then asked why the discrepancy exists (at any college, and perhaps at BYU specifically as a private, religious university). Finally, students were asked to reflect on the impact female professors have on students' educational experiences. Full realization of this task would provide an opportunity for students to critique the impact of unequal power relations on the development of group identities and cultures (both within the classroom and in the broader social context).

As a reminder to the reader, the context for these two lessons is a student-centered, reform-oriented teaching practice and supporting curriculum. Although this setting provides an important backdrop for these social justice lessons, reform mathematics teaching alone was not entirely sufficient to teach these two lessons to their full potential. In this next section, I draw on eight different focal decisions made while preparing to teach these tasks that were selected and noted in Table 3 in Chapter 3. These eight decisions are used to characterize the shared figured world of *Social Justice Planning* as well as the themes found in the decisions that were analyzed for evidence of how we were collectively and individually engaging in identity work during the planning, enacting, and reflecting process.

Our Shared Figured World of Social Justice Planning

During the two rounds of lesson planning, Hannah and I drew on our previous experiences planning together for research and undergraduate class settings. However, these experiences were our first time planning social justice lessons together, which led us to figure

what our shared culture of collaborative social justice planning would become. Our experiences together were marked by our positions of power as researcher and research participant, as well as varying knowledge on social injustice and social justice teaching. Our collaborative experiences of social justice planning aligns with the criteria for figured worlds (Holland et al., 1998) as shown by Table 12. Through a discourse analysis (Gee, 2011), several aspects of our figured world are made evident, including our negotiation of planning authority and unity, as well as our shared figuring of what it means to be a social justice teacher.

Table 12.

Characteristics of our figured world of Social Justice Lesson Planning

Historical	Our planning drew on the norms established in our previous planning for a different study and for undergraduate coursework.
Positions that matter	Class teacher, social justice teaching expert, research participant, researcher
Reproducible	Hannah mentions continuing in TMSJ if a co-teacher is willing to do SJ planning again, suggesting that she sees this figured world as reproducible.
Identifiable persons	Reform-oriented teacher, curriculum expert, social justice teacher, culturally relevant teacher, social justice hesitant teacher
Artifacts	Lesson guides, <i>Pathways</i> curriculum text, previous semester slides and handouts, Youtube videos, online homework questions, excerpts from <i>High school mathematics lessons to explore, understand, and respond to injustice</i> (Berry et al., 2020), the term “social justice”

First, when Hannah and I began to collaborate to plan the social justice mathematics lessons, I initially took the position of leader of the discussion but repeatedly emphasized that I wanted to share the leadership between the two of us. When we first were deciding what places in the curriculum to include a social justice lesson, I took the lead and suggested several ideas. But, then I said:

So here, I guess I should preface this with like any, like, this is where I could see potentially having connections or, like, places in the curriculum. ... Um, but I'm also open to any of your, any of your ideas. I've just, instead of just, like, asking you what your ideas were [Hannah laughs], I thought I would share my ideas first.
(Hannah: Yeah.) (HI2)

I backtracked from my initial display of sole or primary leadership of the collaborative social justice planning, as evidenced by my language. I described my suggestions as “potentially

having connections” (HI2) to future lessons, instead of the definitive suggestions Hannah must accept. I also voiced that I was only suggesting ideas initially to avoid putting Hannah on the spot at the very beginning. By saying that I was wanting to avoid “just, like, asking you what your ideas were” (HI2), I used words like “just” to suggest that leaving the decisions completely up to Hannah would be too demanding on her as interviewee/participant. Hannah expressed congeniality and ease with my explicit attention to our arrangement through laughing and agreeing at the end. Initially while planning I repeated several times that I wanted to hear Hannah’s ideas and input, emphasizing my priority for shared leadership within this figured world. However, in subsequent planning that pattern was already set and less explicitly mentioned for a shared leadership dynamic. Hannah and I continued in our planning to openly exchange ideas and suggestions without a clear leader of the discussion.

Second, our figured world of *Social Justice Planning* demonstrated unity. My position as researcher led me to sometimes have different priorities than Hannah as the research participant and classroom teacher. However, despite the differences of goals and motivations within the planning (as discussed later in this chapter), our language valued partnership and cooperation. For example, this collegiality was demonstrated with our collective sharing of goals and priorities. In planning lesson one, Hannah communicated that she felt constrained to teach the change of base formula during the lesson:

Hannah: Not having another discussion about the properties, like having to, like, rehash why they work, um, will free up more time. Um, but I can not get out of--
Navy (overlapping): You’ve gotta go over change of base.

Hannah: --change of base. I have to do that. Whether we figure out a way to put it into the task, or if I can do it as a separate thing...Otherwise they won't be able to do the test, (Navy: Mm-hmm) is the main thing. (LP1P1)

Hannah was already demonstrating a willingness to include social justice teaching, but here I revoiced and reaffirmed Hannah's priority or goal to cover change of base. I finished Hannah's sentence and later used an encouraging interjection ("Mm-hmm") to communicate that I agreed with her goal and was willing to take it up. Hannah also continued to communicate a unity of goals and purpose with the use of the word "we." She was saying that either we can co-plan a way to include change of base into the task, or she will be on her own to do it later. This moment demonstrated how I valued her goals and constraints while Hannah also demonstrated a willingness and motivation to plan jointly. Hannah often used the word "we" to talk about our planning, despite the fact that only she would be teaching the lesson. She said that "we could change the task" and "we can still do whatever we want" with the task (LP1P1). Despite our differences in position and goals, our language demonstrated an intention for unified decision making within the planning.

Our unity within the social justice co-planning figured world can also be attributed to our similarity in experience with the College Algebra class. Hannah observed the class for a semester prior to teaching the class for a semester. This study occurred during Hannah's second iteration teaching the College Algebra class. Hannah was also aware of my experiences with the College Algebra class. I worked as a Teaching Assistant for the course for five semesters during my undergraduate program. As such, I was quite familiar with the sequence of topics, the goals for various lessons and units, and the expectations on the homework and tests. I made this apparent in our first planning discussion by pointing out "where I could see potentially having connections

or, like, places in the curriculum” (HI2) for a social justice lesson. Instead of pushing all of the decisions and brainstorming for incorporating social justice lessons to Hannah, I was able to be an equal partner in that brainstorming. Hannah occasionally explained to me what happened in the previous semester that she had taught a lesson, but she did not need to explain the curricular goals or focus.

However, Hannah did take up the role as an expert in her own classroom and the current iteration of the course. Hannah was positioned as an expert in her own students and the norms created in her two sections and how they compare. For example, while planning the first lesson I asked Hannah if any of her current students are Hawaiian. By asking this question, I was establishing that there was information pertinent to the planning that only Hannah had access to bring to our planning discussions. Hannah also volunteered information about her students and current classroom experience. For example, in planning the second lesson Hannah considered her specific students' potential reaction to the question “What is the impact of having female professors?” Our conversation went as follows:

Hannah: My class discussions are definitely dominated by the men in the classroom.

Even though I have like a, uh, actually, I don't know what is mine? I think they're 50/50.

Navy: But it's, the men dominate?

Hannah: The men dominate the discussion. (LP2P2)

Hannah was able to provide valuable information (that the male students “dominate” the class discussions) that informed the planning. I asked a clarifying question while Hannah considered if she had an equal split of male and female students in her class, demonstrating that I valued Hannah’s perspective on her class and her suggestions for how to ask social justice questions to

achieve the social justice goals that we had set. Throughout the coplanning experiences, Hannah took on the role of expert in her specific substantiation of the College Algebra class.

Finally, Hannah and I figured our varying experience with social injustice and social justice teaching within our co-constructed world of social justice lesson planning. I brought in cultural artifacts from a book on social justice teaching (Berry et al., 2020), offloading the authority from myself to the pages of the book to reference while planning the lessons. We used the book to decide on social justice goals and outline how to plan for the social justice discourse and its similarities to mathematical discourse (Berry et al., 2020). However, there were also moments where I made comments that were educative about the mindset or perspective that Hannah could keep in mind while teaching the social justice lesson. For example, while planning lesson one I articulated how Hannah ought to position herself during the lesson. I said:

You're definitely in a position of being in the mathematical authority as a math teacher, but it doesn't necessarily mean that you have to position yourself as the social, like the authority on what's fair in Hawai'i. (LP1P2)

I invoked terms like “mathematical authority” and “position” and “social...authority” that are specific to the register of the mathematics education research literature. By invoking these terms, I was positioning myself as an authority on what it means to be a social justice teacher—that the teacher does not need to center their own social understanding in their lesson. I also communicated what I consider to be success with a social justice lesson. I said that if students’ assumptions are “pushed”, then “that would be a success even if they don't change their minds” (LP1P2). So my tone oscillated between offloading the position of authority on what it means to be a social justice teacher to other sources and teaching within the planning what it means to be a

social justice teacher. Overall, my position as the researcher placed me as the comparative expert at social justice mathematics instruction.

However, Hannah sometimes challenged or questioned my position as a social justice teaching authority during our planning. Hannah asserted her competence by contradicting my assumptions as I explored the social injustice described by the lesson tasks. For example, Hannah reminded me that there are more than two genders (LP2P1) while planning for the lesson on the ratio between men and women tenure-track faculty at BYU. Also, for the first lesson, I was thinking aloud of how the Hawaiian housing crisis could be compared to corporations buying major housing complexes in Provo, consolidating market power and leaving college students vulnerable. Hannah then reminded me that the injustice within the Hawaiian housing market was not due to corporations but due to the actions of non-Hawaiians. She said:

There's some, like, social justice going on with, like, that kind of idea too, you know, like bigger corporations, like jacking up prices but not really doing that much. Um, one of the things I still really like about the Hawai'i one, um, is that it's like a, it's not a, the housing crisis there isn't a problem for people who aren't from Hawai'i, right? Like they are the ones causing the problem. (LP1P1)

Within the context of the planning, Hannah invoked the term “social justice” to highlight that she can also identify the nuance of the injustice on display in the task. She was asserting herself as an authority within our planning, feeling comfortable to question or challenge my position. She said she “still really like[d]” (LP1P1) the duality of the Hawaiian housing task of locals and non-locals buying real-estate, communicating that she saw value in showing the injustice mainland Americans perpetrate against Hawaiians. My position as the social justice authority was

challenged by Hannah as she reminded me of the nuance and complexity of social issues present in the planning.

Hannah and I figure ourselves as social justice teachers together in our shared figured world of social justice planning. We collaborated on shared goals and generally shared the leadership of the discussion. However, I generally voiced the position of the expert in social justice teaching, while Hannah sometimes challenges this position by asserting her own competence in describing nuance of social issues in Hawai'i and with respect to gender.

Negotiating Mathematics Teaching and Social Justice Teaching

Since the College Algebra curriculum was not designed with a social justice focus, Hannah and I had to negotiate our mathematics teacher roles with our emerging roles as social justice teachers. Hannah's discourse in the background interviews did not suggest that Hannah had a well-defined *Math Teaching* figured world. From the figured worlds described in the background interviews, during the preparation to teach a social justice lesson Hannah was negotiating in her participation in the figured worlds of *Teaching*, *Teaching Math for Social Justice*, and the *College Algebra Team*. For myself, I was orchestrating my participation in the figured worlds of *Reform Math Teaching*, *Teaching Math for Social Justice*, and *Curriculum* in conversations with Hannah. Important attributes of these figured worlds, as demonstrated in the background interviews, are repeated from previous tables in Table 13.

Table 13.*Negotiation of Mathematics and Social Justice*

	Navy's Figured Worlds		Hannah's Figured Worlds
Reform Math Teaching	<p>I took on the role of a reform-oriented mathematics teacher. My interactions with other teachers were informed by this role and if I recognized them as a similarly reform-oriented or a more traditional teacher.</p>	Teaching	<p>Hannah's construction of her teacher identity was shaped by teacher role-models and her perception of teachers as a marginalized identity. Her teacher-self impacts how she interacted with other teachers and her students in an official capacity, as well as her interpersonal relationships when she had opportunities to explain a new idea.</p>
Teaching Math for Social Justice	<p>Within the context of this study, I was positioned as the expert on TMSJ from my readings on the subject. However, I also was a novice compared to others in their research, reading, and practice enacting TMSJ.</p>	Teaching Math for Social Justice	<p>Hannah's position as a novice TMSJ teacher. Her interactions with other teachers, researchers, and her practice of TMSJ proceeded from her construction of this cultural world. Artifacts of this cultural world include TMSJ tasks and published papers and books about the practice.</p>
Curriculum	<p>My role as a curriculum adapter for my classroom and one with potentially limited ability to choose curriculum. My interactions with supervisors, students, and (indirectly) curriculum developers are part of this figured world.</p>	College Algebra Team	<p>Hannah's role as instructor informed her interaction with fellow instructors, teaching assistants, and the faculty advisor for the College Algebra class. Artifacts of this figured world include the common assessments and lesson plans, common books to read for weekly meetings, and common rubrics.</p>

The negotiations of these figured worlds are exemplified by how Hannah was able to address all of her mathematical goals for the lesson while still implementing a social justice task. In order to accomplish these mathematical goals, however, the mathematical tasks in the lessons needed to be modified. For the first lesson, Hannah had to alter the task to include the topic of change of base for logarithms and then for the second lesson, Hannah had to expand the first context to include thinking about vertical asymptotes for rational functions. These situations exemplify how Hannah prioritized her mathematics teacher role while still choosing to be a social justice teacher.

The first lesson was the College Algebra class's second day discussing logarithmic functions. The first day was an introduction to logarithms and then the second class (the observed lesson) was the final day to discuss logarithms. Although we planned together, Hannah reflected on why she was not able to address the social justice questions in Kaluhiokalani's (2022) task the previous semester:

So the other wrench that was lame about last semester that made it so I couldn't spend as much time on the social justice task (Navy: Mm-hmm) is the change of base that we have to go over. Because so many of them, like we expect them to find the val-- exact values and put those as answers on the test. And um, then most of them don't have calculators that you can stick in the base. So we have to talk through how to evaluate something like, right. (LP1P1)

Hannah described her enactment last semester as "lame" (LP1P1), communicating that she felt that not addressing the social justice questions was not her ideal situation. She also called the topic of change of base a "wrench" (LP1P1). Hannah's default lesson would be to do Kaluhiokalani's (2022) task as written, but introducing the change of base formula complicated

that possibility. Instead, Hannah emphasized that we “have to” introduce the change of base formula for students to be able to complete the test. The use of the pronoun “we” with regard to the test (“we expect them to find”) indicates that this test was created as a *College Algebra Team*, but that her position on that team did not give her the flexibility to change her students’ test. In this way, Hannah was showing that she desired to prioritize her social justice teacher self in the next lesson, but felt constrained by her other, competing goal to prepare students with the necessary skills to perform well on the test. This tension was mediated through the artifact of the College Algebra test and the social justice task. Hannah desired to participate in the figured world of *Teaching Math for Social Justice* more completely (i.e. by spending the entire class period on the task), but felt constrained to teach change of base due to the power dynamics of the *College Algebra Team* and her own role as a preparer of students for tests within the figured world of *Teaching*.

Figure 2.

First few questions from the original task (Kaluhiokalani, 2022)

Living in Paradise

- 1.** When you graduated from high school, your parents took all the money from your grad party, \$1,500, and invested it in your name. The interest is being **compounded continuously**.

You were given full responsibility of the account when you turned 18 years-old, which means you can withdraw at any time.

- a) What would the interest rate (APR) have to be if your account had a balance of \$4,981 12-years after it was invested?
- b) After working every month, you are barely able to break even with the cost of rent and other living expenses. The median house price in Hawai‘i is around \$992,500 due to wealthy foreigners paying well over the asking prices. Thankfully, a 5% or 10% down payment is acceptable and common. At the previous interest rate you found, how long would it take for your investment to reach 10% of the median house?

As shown in Figure 2, the task was designed to be utilizing continuous compounding interest, which required the natural log function to solve for the exponent. I remarked that, “natural log is always on, um, people’s calculators usually. So the tricky part is when you have something that’s not a base of e or 10” (LP1P1). I connected my comments back to the importance of students’ calculators that Hannah mentioned previously, presenting the problem that the task was not creating a need to talk about change of base. Through this comment, I demonstrated my experience both as a mathematics teacher (within my figured world of *Reform Math Teaching*) and as an experienced user of the College Algebra curriculum (within the figured world of *Curriculum*). Hannah then replied:

But we could change the task to not be natural log, right? (Navy: Yeah) Like we do have freedom to edit this, however. Like this was Kamalani's [Kaluhiokalani's] task, but we can still do whatever we want with it. (Navy: Mm-hmm) Um, yeah. So, so we could try and bake it [change of base] into the context or, like, maybe use the context to motivate the need for it in some way, (Navy: Mm-hmm) um, could be helpful just so that we spend more time in the context. (LP1P1)

Hannah disrupted the assumption that I was making in our planning that we needed to stick with Kaluhiokalani’s (2022) task without any modifications. She emphasized that “we do have the freedom to edit” (LP1P1) the task, demonstrating a perspective that we have more options than those I perceived as available to us. Kaluhiokalani was part of the previous semester’s *College Algebra Team*. Hannah was demonstrating that within the figured world of the team of instructors, she felt beholden to their common assessments but did not feel constrained to complete the same task as another team member. She was able to figure herself as both committed to the mathematics teaching required by the team of instructors by motivating the

need for the change of base formula and committed to teaching social justice mathematics lessons by communicating a goal to “spend more time in the context” (LP1P1). Hannah’s language demonstrates that she was negotiating her identities by pointing out, both to me and to herself, the flexibility and freedom she did have within the constraints of the *College Algebra Team*. Noticing this flexibility supported her goal to more fully implement the social justice lesson (the figured world of *Teaching Math for Social Justice*).

As Hannah and I planned together, we changed the task to be compounding monthly instead of compounding continuously (as seen in Figure 3). Due to this adaptation, the expression students needed to find changed from $\frac{\ln(4981)}{12}$, which can be solved using most calculators, to $\log_{1.07}(35)$, which is impossible to solve on many calculators. Although Hannah expressed that she liked giving students the opportunity to solve for the interest rate instead of time (as students are asked in the original task’s part a), we decided to push that discussion to the back page of the task. As we settled on this adaptation to the task, Hannah repeated that she liked having the discussion of change of base on the first question on the task, so that she was sure to address it during her lesson. Through this change, Hannah was able to both prioritize her mathematics teaching goals and her goal to address the social justice questions from Kaluhiokalani’s (2022) task. Hannah was innovative in how she negotiated the apparent tension between the figured world of *Teaching*, and specifically within the context of the *College Algebra Team*, and the figured world of *Teaching Math for Social Justice*. Instead of choosing between completing the social justice task or preparing students for the test, Hannah changed the actual artifact of the social justice task to simultaneously fulfill her mathematics teaching obligations and engage in social justice pedagogy. Instead of choosing between prioritizing two competing figured worlds, she created a way to participate in both simultaneously.

Figure 3.

The adapted task given to Hannah's class

Living in Paradise

1. When you graduated from high school, your parents took all the money from your grad party, \$1,500, and invested it in your name. The interest is being compounded **monthly** with an APR of 7%

You were given full responsibility of the account when you turned 18 years-old, which means you can withdraw your money at any time.

- a) After working every month, you are barely able to break even with the cost of rent and other living expenses. The median house price in Hawai'i is around \$1,050,000 due to wealthy foreigners paying well over the asking prices. Thankfully, a 5% or 10% down payment is acceptable and common. Given the information above, how long would it take for your investment to reach 5% of the median house price?

While the first lesson was the last lesson in a unit on exponential and logarithmic functions, the second lesson was the first, introductory lesson on rational functions. There were several mathematical goals for this lesson. First, the students were to be introduced to the idea of ratios and rational functions, then students were to be introduced to vertical asymptotes and how to find them, as well as approaches notation (such as $x \rightarrow 0^+$). Finally, students needed to know what it would mean for a rational function to be undefined. The College Algebra course included a pre-class assignment for students to be introduced to the material before the in-person lesson. Hannah reviewed the pre-class introductory assignment and noted that most of the contextual problems were addressed before students came to class. She said:

The teaching for social justice part is a pretty small part of the lesson. (Navy: Yeah) It's not, like the last task we did, it was like the whole day basically (Navy: Uh-huh) was like that task and everything. Um, but this is just introducing, it's only the introduction really. It's just introducing students to that idea of covarying

quantities in a ratio. (Navy: Yeah.) Um, and then we pretty quickly move on to asymptotes, like, no function, no, uh, context at all. (LP2P1)

Hannah described the PhD task as “just introducing” and “only the introduction” (LP2P1), emphasizing that the context is not pervasive throughout the lesson. Hannah’s perspective on whether or not context, particularly social justice related context, was important is highlighted by her language of “just” and “only”. She was not satisfied with the abstract questions that dominate the lesson plan and goals. Later, she said that this was a “bummer” that the PhD task was “a small part of the lesson” (LP2P1). She wanted to prioritize the contextual part of the lesson, but felt constrained to keep with the abstract questions to meet her mathematical goals of vertical asymptotes, approaching notation, and undefined rational functions. Here, her position within the figured world of *Mathematics Teaching* was clarified; Hannah authored herself as a mathematics teacher that relies on her curriculum to pace her mathematical goals and she did not have a position of power to alter the goals of various lessons within the *College Algebra Team*. My occasional affirming comments throughout the passage (“Yeah” and “Uh-huh”) confirmed Hannah’s assessment from our shared experience with the curriculum. Thus, my participation in the figured world of *Curriculum* was also demonstrated in this exchange. From this excerpt, it is evident that both the mathematical goals were valued by Hannah, but she wanted to continue with the lesson as a social justice lesson. She also desired to participate within the figured world of *Teaching Math for Social Justice* and viewed a small discussion to be insufficient to be really fully engaging in TMSJ. This perspective was exemplified through her language (like “just introducing” and “bummer”) that she was wanting to prioritize both.

As we continued to plan, I suggested that we continue to plan a ten minute discussion on question 1, which focused on the ratio of women to men awarded PhDs by year. Through this

action, I demonstrated a belief that even brief participation in TMSJ was important participation to prepare for (demonstrating our roles as novices in the figured world of TMSJ). The curriculum highlighted in question 1 that the number of women and men awarded PhDs can increase while the ratio decreases. We then planned a few questions asking students to reason with the ratio and how the quantities related to one another. We planned to include questions on the ratio of male and female faculty at BYU and several social justice questions and goals. We finished our planning knowing that Hannah would flesh out her plan with another teacher on the College Algebra team to plan the context-free questions for the rest of the lesson.

Figure 4.

The context-free questions in the lesson for the mathematical goals (Carlson et al. 2020)

*2. Consider the function $f(x) = \frac{\lambda}{x}$. What happens to the value of the function when x gets close to 0? Use the given tables to help you formulate your response.

x	$f(x) = \frac{\lambda}{x}$
-2	
-1	
-0.1	
-0.01	
-0.001	

x	$f(x) = \frac{\lambda}{x}$
0.001	
0.01	
0.1	
1	
2	

*4. Determine whether the following sequences of numbers are increasing or decreasing (*Note: A sequence of all negative numbers is increasing if successive numbers are getting closer to 0.*)

a. $\frac{1}{100}, \frac{1}{200}, \frac{1}{320}, \frac{1}{450}, \frac{1}{1089}$

b. $\frac{2}{100}, \frac{5}{40}, \frac{10}{35}, \frac{15}{9}, \frac{50}{6}$

c. $\frac{100}{2}, \frac{40}{5}, \frac{35}{10}, \frac{9}{15}, \frac{6}{50}$

d. $\frac{-1}{100}, \frac{-1}{200}, \frac{-1}{320}, \frac{-1}{450}, \frac{-1}{1089}$

6. Suppose $f(x) = \frac{p(x)}{r(x)}$ where p and r are polynomial functions.

a. For what value(s) of x is $f(x)$ undefined?

b. For what value(s) of x does $f(x) = 0$?

9. For each of the following functions, predict where a vertical asymptote will exist. Then test your prediction using a graphing calculator.

a. $f(x) = \frac{8}{x+1}$

b. $g(x) = \frac{x}{2x-8}$

*c. $h(x) = \frac{6x^2 - 24}{2(x-3)(x+1)}$

d. $m(x) = \frac{x+3}{x^2+4x-5}$

*e. $n(x) = \frac{x^5+1}{x^2+1}$

*f. $c(x) = \frac{2(x+6)}{x+6}$

During the lesson enactment, Hannah spent much more time in the PhD and BYU faculty ratio context than anticipated. For her 50-minute lesson, she spent 20 to 25 minutes within the context instead of only ten minutes. Hannah also added questions to the BYU faculty ratio context to address several of her mathematical goals. For the BYU faculty questions, Hannah asked students to determine what would need to happen for the ratio to be 1, infinity, 0, or undefined (see Figure 5). Next, question 6 (see Figure 4) was used to prompt generalization and then students practiced with question 2 and 9. Hannah was not only able to spend more time on the social justice task, but she also had more time than she had anticipated with the final practice (question 9). I asked Hannah in the reflection interview for her process to synthesize the mathematics goals with the context she was able to spend more time in. She said:

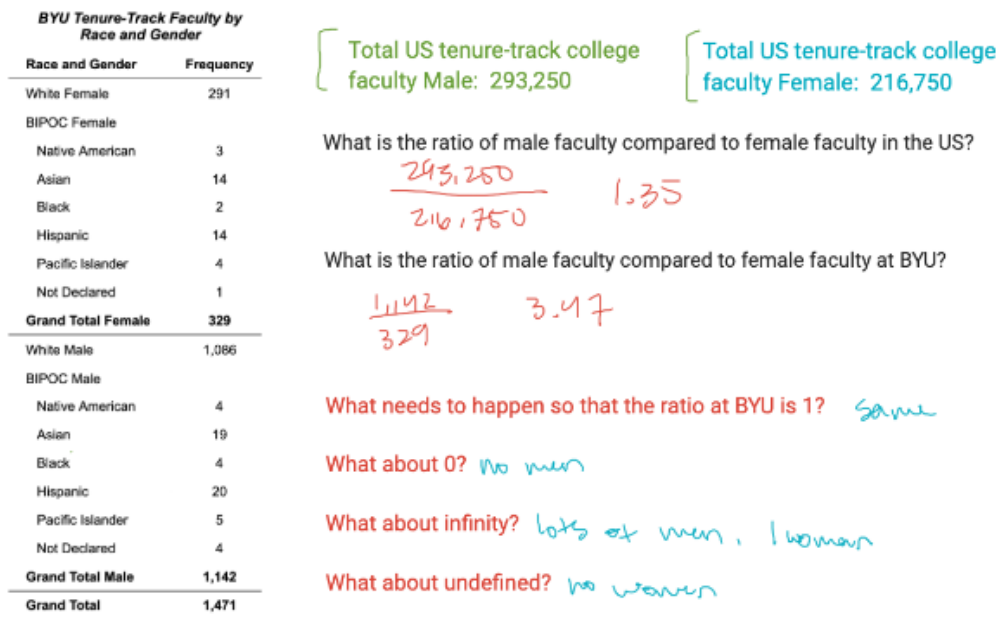
In an effort to, um, tie that into the context, uh, so that, ‘cause I feel like if I kept it all in one context, it would take less time than if I were to, like, do my things with the PhD stuff and then like switch to that question. ... And I think it helped, that idea of thinking about the increasing and decreasing helped scaffold them into all the rest of the mathematical goals, more than last semester felt like there was a big disconnect between the two parts of the lesson. (RI2)

Hannah underscored her changes to her lesson plan with the phrase “in an effort to...tie that into the context” (RI2). This language demonstrated that while she was making mathematical changes to her plan, her changes were with the goal to spend as much time within the social justice context and questions. Here Hannah was demonstrating that she wished to prioritize her participation in the figured world of *Teaching Math for Social Justice*. She justified her changes by explaining that it would take less time to switch from a context to the other questions without a context. She also employed language that invoked the figured world of education, like

“scaffold” (RI2) and creating connections between parts of the lesson. By invoking the figured world of *Teaching*, Hannah demonstrated how she fulfills her participation within this figured world while also orchestrating her priority to fulfill the role of a Social Justice Teacher. Hannah’s orchestration allowed her to prioritize the PhD and BYU ratio context within her lesson plan, while simultaneously connecting mathematical ideas and reaching her mathematical goals. In this way, Hannah was able to negotiate her mathematics teacher role and herself as a social justice teacher together.

Figure 5.

Hannah’s slide on the BYU ratio and Hannah’s additional questions in red



In these two lessons, Hannah demonstrated a desire to prioritize the social justice mathematics tasks. She also expressed an obligation or priority to prepare her students for the mathematics tests the College Algebra team created and to reach the goals the team has set for the introductory lesson on a new unit about rational functions. Hannah adapted the social justice tasks to include her mathematical goals, even though she was unsure if that was possible at the

onset. Through these experiences, Hannah negotiated her position within the figured world of *Teaching Math for Social Justice* and her position within the figured world of *Teaching*.

Negotiating Focus on Quantities and on Injustice

As we figured together during coplanning, I often emphasized communicating the injustice present in the lesson while Hannah prioritized students focusing on the relationships between the numbers in the context. Hannah’s focus on student’s reasoning with numbers can be attributed to the quantitative focus of the College Algebra class, her personal goals as a teacher, or her experiences as a student in the Graduate Program. For Hannah, the figured worlds being orchestrated are *Teaching*, the *College Algebra Team*, the *Graduate Program*, and *Critical Information Consumption*. My priority to plan for the injustice can be attributed to my role as a social justice teacher and advocate. For me, the negotiated figured worlds are *Teaching Math for Social Justice*, *Reform Math Teaching*, and *Advocacy*. Important attributes of the figured worlds present in these negotiations and decisions are shown in Table 14.

Table 14.

Negotiation of Quantities and Injustice

Navy’s Figured Worlds		Hannah’s Figured Worlds	
Teaching Math for Social Justice	<p>Within the context of this study, I was positioned as the expert on TMSJ from my readings on the subject. However, I also was a novice compared to others in their research, reading, and practice enacting TMSJ.</p>	Teaching	<p>Hannah's construction of her teacher identity was shaped by teacher role-models and her perception of teachers as a marginalized identity. Her teacher-self impacts how she interacted with other teachers and her students in an official capacity, as well as her interpersonal relationships when she had opportunities to explain a new idea</p>
Reform	I took on the role of a	College	Hannah’s role as instructor informed

Math Teaching	reform-oriented mathematics teacher. My interactions with other teachers were informed by this role and if I recognized them as a similarly reform-oriented or a more traditional teacher.	Algebra Team	her interaction with fellow instructors, teaching assistants, and the faculty advisor for the College Algebra class. Artifacts of this figured world include the common assessments and lesson plans, common books to read for weekly meetings, and common rubrics.
Advocacy	My role as an advocate or activist. My interactions with others in their apathy or involvement in social causes and who I chose to disrupt or educate on issues relating to marginalization.	Critical Information Consumption	When engaging with social and other media, Hannah constructed herself as a critical evaluator of information for reliability. She interacted with others based on how (or if) they similarly evaluate the bias and claims of news and stories. Hannah also encouraged her students to be critical thinkers and consumers of information.
		Graduate Program	As a graduate student, Hannah's interactions with fellow graduate students and faculty were informed by her position within the cultural world of the BYU Mathematics Education Master's program. Shared experiences within classes and artifacts like Mathematics Education papers and theories are part of this figured world.

In the first lesson, the first question tasked students to find the number of years it would take for an initial investment to accrue for a Hawaiian to afford a house in Hawai'i. As we planned, I asked Hannah how she expected students to react to the answer of 36 years. I considered this point in the lesson to be an important place to assess if students were understanding the unjust system of Hawaiian housing. Hannah, however, said that, "Honestly, I

don't think they'll think anything of it because half of them don't pay attention to the quantities.” (LP1P2). Hannah continued:

“You have to like, get them to think about it back in the context, after they've done all the math stuff and they forget to like, look back into the context and make sure it makes sense.” (LP1P2)

Hannah was skeptical that her students will remember what the question was asking by the time they arrive at a final answer. She repeated that she will have to draw their attention “back into the context” (LP1P2), demonstrating a belief that her students see the mathematics and the context as separate without probing. Hannah anticipated that her students will need direction to remember the context after “all the math stuff” (LP1P2). Her focus was on how the students are reasoning with the numbers contextually. Hannah described this as making sure the number “makes sense” (LP1P2). Since the College Algebra curriculum consists of many contextual problems and questions drawing attention to the context, Hannah may be participating as a teacher who deftly implements the curriculum in this exchange. Hannah was invoking her participation in this figured world through the attention to these details of the mathematics lesson. Hannah, however, may also be attributing lack of student attention to the context as evidence of her role as an appraiser of information within the figured world of *Critical Information Consumption*. Hannah's teaching goals to have students think critically about numbers, coupled with her experience as a College Algebra instructor, distracted Hannah from noticing my attention to that point in the lesson as a Social Justice teacher.

At this point, I more explicitly commented on the important social justice pedagogical moment presented by the answer of 36 years. I noted that this point in the lesson is important to “highlight...what's, like, the unfairness? Or the injustice of it all” (LP1P2). Although I did not

refute Hannah’s claim that the students will need encouragement to check their answer for reasonableness, I told Hannah that the weight of the answer will come from how *unreasonable* the answer actually seems. I explained:

So I feel like it's good for them not only to interpret it, but then, like, to reflect on—like is that—not just is that a reasonable answer given the information you have, but like not like mathematically reasonable, but is that, like, should it take that long to be able to afford a down payment on a house? You know? (LP1P2)

I repeated the word “reasonable” and qualified it the second time with the adjective “mathematically reasonable” (LP1P2). Although I agreed and shared common ground with Hannah’s perspective that it is “good” for students to interpret and reflect on their answers, I questioned if reasonability was the correct direction for that reflection. Through discursively sharing common ground with Hannah, I acknowledged my shared participation with her in the figured world of *Teaching* (for me specifically, the figured world of *Reform Math Teaching*). Through my use of the words “should” and “take that long” (LP1P2), I was communicating a perspective that the answer of 36 years ought not be the amount of time to save for a house. Although Hannah’s discourse focused on the importance of students reflecting on the quantities in the context, my language emphasized that the common advancing question of if their answers “make sense” (LP1P2) would be insufficient to illuminate the injustice present in that mathematically correct answer. I rejected the priority of the practices common in the *Reform Math Teaching* cultural world in this situation, instead valuing advancing questions more common in the figured world of *Teaching Math for Social Justice*. Hannah’s focus was on the students’ quantitative reasoning while I focused on the students’ reasoning with injustice.

Our differing focus was also present while planning the second lesson. Although we explored several options of data to emphasize in their introduction to rational functions (i.e. the divide between Black and Whites, the divide between various PhD degrees, etc.), Hannah chose the direction that focused on the divide between men and women awarded PhDs by year and the ratio of male to female tenure-track faculty at BYU. Hannah justified this decision by saying:

I think I'm leaning most towards questions that are also causing them to think about the ratio idea, right. Since that's like what the, um, whole like purpose of the task is (Navy: Uh-huh). Um, so like I like the question you had brought up before, of, like, what do these ratios mean? (LP2P1)

Hannah justified her decision of which social justice direction to take the lesson by considering what the mathematical goal for the lesson is (“purpose of the task”) and how students can reason with ratios within the social justice context. This discourse reflected the figured world of the *College Algebra Team*, which often made decisions and created lesson guides to clarify the purposes of the curricular tasks. Specifically, Hannah wanted students to reason with “what do these ratios mean” (LP2P1). Hannah later mentioned that this focus would be important since students rarely learn fractions properly (LP2P1). This context clarified that her focus was on how students are interpreting fractions and ratios, irrespective of the context. Hannah also created questions for students to reason with the ratio increasing or decreasing while the total number of PhDs awarded or faculty members decreases or increases. These decisions demonstrated the significance Hannah places on the students' reasoning with the ratios and fractions. Hannah’s focus on quantities and ratios may surface from the cultural and priorities of the *College Algebra Team*, her own priorities as a Teacher, or from her experiences in the *Graduate Program*. Some of the artifacts of the *Graduate Program* included papers on the importance of foundational

understandings of ratio and fractions. Thus, Hannah was invoking that literature and our shared participation in that figured world to justify her decision to take a specific direction (specifically, a focus on the marginalization of women) in the social justice task. Instead of justifying her approach with reasoning related to *Teaching for Social Justice*, Hannah leveraged her roles as a mathematics teacher to make that determination.

By contrast, I repeatedly suggested that the questions students are posed within the rational function task should clarify or challenge student understandings of sexism and equality. When Hannah suggested that students can find an instance where the number of men and women receiving PhDs increased but the ratio decreased, I tried to rephrase that question in a way that would foreground the injustice. I said:

Here's where I think it could be interesting with that--because I could see that connecting to this idea, like social justice wise, because there's sometimes people have like kind of a zero sum game idea with affirmative action. Like you're taking my spot that I would've had otherwise. But if there were just more spots you could have everybody is getting more (Hannah: Yeah), but it's still getting more fair if that makes sense. (LP2P1)

I invoked my role as the authority of the *Social Justice Teaching* within our coplanning culture by saying “social justice wise” asking the question a different way would be beneficial. I then explained that increasing the total number of “spots” (or PhDs awarded) while still trending toward a more equitable ratio (“still getting more fair”) would be another way to phrase the question. By rephrasing the question I validated Hannah’s objective for students to reason with the various quantities (number of men awarded PhDs, number of women awarded PhDs, and the ratio), while emphasizing the narrative of justice and injustice communicated to students. Later, I

questioned if the students needed to reason with the question of students creating an example where the number of men and women receiving PhDs decreases and the ratio increases. Although Hannah suggested this question for students to reason with the quantities, I interrogated if this was beneficial for the social justice narrative. I said, “I don’t know if that’s, like, makes sense. ‘Cause I mean this is bad, right? This would not be a thing we would want” (LP2P1). The undesirable “thing” that I mentioned is both a decrease in PhDs awarded and for the ratio of men to women to increase, meaning that the gender gap would widen. I emphasized that this hypothetical scenario, bluntly, was “bad” (LP2P1). When I said that the scenario did not make sense, I was not referring to the mathematics but the scenario we wanted students to consider. My focus was on what narrative students ought to consider when it comes to sexism. I also said that increased inequity was not something “we” would want, potentially describing feminists in general. Thus, I was also eliciting my role as a feminist within the figured world of *Advocacy* in this exchange. Although I considered the question about increasing the total PhDs awarded and decreasing the ratio to be a positive change to consider, I questioned that for the converse. I agreed with Hannah on the utility of some mathematical questions, but not when it contradicted a priority on communicating the reality of sexism. Although Hannah brainstormed questions to further students’ number sense about ratios, I questioned which of those questions were advantageous to the social justice goals of the lesson.

Hannah was comfortable planning questions for students to reason with the quantities. She sought to pose questions for students to reason with the meaning of their calculated answers. Due to the lack of a well-defined *Math Education* figured world for Hannah, several related figured worlds can be connected to this prioritization. Hannah may be foregrounding herself as a *Critical Information* educator, or as a quantity-focused educator based on the perspectives and

artifacts from the *Graduate Program*. Or, this priority may be aligned with the *College Algebra Team* and herself as a teacher. I furthered our conversations about probing students' reasoning with the numbers to emphasize the injustice explored by the task. This shows my priority as a *Social Justice* educator.

Negotiating the Self with Anticipating Social Justice Thinking

During the lesson planning, Hannah and I struggled to anticipate and plan for social justice “misconceptions.” Just as we planned for mathematical misconceptions or incorrect thinking, we tried to plan for a variety of student responses to the social justice questions we planned. The challenging responses for us to anticipate were racist or sexist comments. During the first lesson planning, I was less direct about anticipating racist student comments and during the second lesson planning I was more direct. My direct and indirect planning for racist or sexist comments impacted Hannah’s enactment of the social justice teaching.

During these exchanges, we negotiated our roles as White women with each other and our students while figuring ourselves as *Social Justice Math* teachers. For me, the evident figured worlds that were negotiated are my roles within the figured worlds of *Teaching Math for Social Justice, Race, Gender, and Advocacy*. For Hannah, the apparent figured worlds that were negotiated are *Teaching Math for Social Justice, Teaching, Race, Femininity, and Church*. Description of these figured worlds as described from the background interviews are shown in Table 15.

Table 15.

Negotiation of Self and Student Thinking

	Navy's Figured Worlds		Hannah's Figured Worlds
Teaching Math for Social Justice	<p>Within the context of this study, I was positioned as the expert on TMSJ from my readings on the subject. However, I also was a novice compared to others in their research, reading, and practice enacting TMSJ.</p>	Teaching Math for Social Justice	<p>Hannah's position as a novice TMSJ teacher. Her interactions with other teachers, researchers, and her practice of TMSJ proceeded from her construction of this cultural world. Artifacts of this cultural world include TMSJ tasks and published papers and books about the practice.</p>
Race	<p>As a White person, my interactions with other White people and people of Color form a figured world informed by White supremacy. My educational and other experiences constructed my antiracist position and explicit attention to my Whiteness.</p>	Teaching	<p>Hannah's construction of her teacher identity was shaped by teacher role-models and her perception of teachers as a marginalized identity. Her teacher-self impacts how she interacted with other teachers and her students in an official capacity, as well as her interpersonal relationships when she had opportunities to explain a new idea</p>
Gender	<p>My position as a woman in society and how I constructed myself as a feminist and women as a marginalized group. My interactions with other women and men often illuminated the power dynamics and my interpretation of this figured world.</p>	Race	<p>Hannah's position as a privileged White person informed her interactions with White family members and her White-passing husband. Artifacts include surnames and #BLM social media posts</p>
Advocacy	<p>My role as an advocate or activist. My interactions with others in their apathy or involvement in social causes and who I chose to</p>	Femininity	<p>Hannah noted her position as a woman to be a marginalized position systemically, but did not interpret her interpersonal interactions as marked</p>

disrupt or educate on issues relating to marginalization.	by sexism. Artifacts in this figured world are Barbies, children, and cars.
Church	Her interactions with friends and family were filtered through the positions of being active or stable members of the Church. Artifacts of this figured world include missions and scripture.

The first lesson tasked students to explore how long after an initial investment at graduation would a Hawaiian be able to afford a house. I noted while planning that, mathematically, it would be “tempting” (LP1P1) to assert that Hawaiians simply must invest more. Hannah replied that “the main thing” (LP1P1) to remind students is the part in the directions that clarifies that many Hawaiians are living paycheck to paycheck and do not have extra funds to invest. Later, Hannah and I were anticipating how students would react to the question “What do you think happens to local residents based on what you found in (a) and (b)?”. Hannah and I discussed the long-term impact of Hawaiians not being able to afford to own a house and accumulate generational wealth. At this point, my language revealed my hesitancy to explicitly name a racist line of thinking that may be brought out during the lesson. I said:

And this is, so this happens, like, I don't know, because the thing is that there is the, um, [exhales] kind of the stereotype that like Polynesians are lazy (Hannah: Mm-hmm) or that they don't work as hard as people who are like, I don't know, like European American, like Western-y types or whatever. And so it's important to point out that, like, maybe they're not as well off of the people because things like, you know, crap like this happens and then, like, what happens to that long

term. (Hannah: Mm-hmm) So, I hadn't thought of that, but I was initially looking at that question. (LP1P1)

Although I named a “stereotype” that “Polynesians are lazy” (LP1P1), I prefaced it with phrases like “I don’t know” and exhaled before naming that stereotype explicitly with Hannah. My language was hesitant and non-committal instead of direct. Instead of asking Hannah to directly plan for this stereotype, I continued on to soften the comment. I connected the stereotype surfacing in connection to discussing how “crap like this”, meaning the lingering effects of colonization to Hawaiians, inhibits long-term or generational wealth accumulation. The only action that I mentioned in this passage is to “point out” the impact on generations, which is removed from any action in response to the prejudice I mention. I ended with how I did not consider the impact on generations when I initially worked through the task myself. My ending comments allowed Hannah plenty of room to respond to many ideas instead of needing to respond to the potential surfacing of the stereotype that I named. The pattern of hesitation and deflection in my comments indicated my role as a White person in this exchange. In response, Hannah did not take up the stereotype, but responded generally to how students may react to the question. She said that, “It’ll be interesting just to see, like, to hear what they have to say and be able to identify which way they’re thinking about it” (LP1P1). Hannah did not respond in a way that expressed a need to respond to various ways of thinking. Although Hannah and I were beginning to talk about how students may volunteer comments aligned with racial stereotypes during the class, we did not explicitly plan for how Hannah would respond to those comments. Hannah’s comment perhaps mirrored my hesitant discourse being explicit about racism, thus also invoking her position within the figured world of *Race*, but also was indicative of herself as a teacher. In this first lesson, Hannah may be inexperienced in anticipating varied student thinking

as part of her typical practice. Her position as a novice teacher then may be impacting her response to my suggestion to plan for racist student thinking.

The lack of planning for potentially racist comments impacted how Hannah enacted the plan. While Hannah was monitoring group discussions, one group brought up to Hannah that the Hawaiian should invest more to be able to afford a house more quickly. With that small group, Hannah drew their attention to the part in the directions that emphasizes the cost of living and difficulty to get by in Hawaii. From my perspective as an observer, I was able to hear other students express discontent with the idea of being able to afford a house on such a small initial investment. In the reflection interview, I asked Hannah why she decided to resolve this question just with the one group instead of the entire class discussion. Hannah replied:

Oh, um, I probably just didn't even think that it was, that that was something that was on everyone's mind. Like it wasn't a thinking I guess I was anticipating. Um, and I think it mostly stemmed from them just not having read through the context all the way. Um, so they didn't, like, read that detail on part A, but I didn't, I don't think I considered that the whole class might have also been having the same thought, you know? (RI1)

Hannah's language suggests that she was feeling uncertain about her action to only address the student thinking with one group. Hannah repeated that she had not anticipated that possibility or considered the potential for the entire class to be struggling with that same idea. She said she "just didn't even think" about the possibility of addressing that one group's question with the entire class, further emphasizing her surprise with that idea. Hannah's surprise that one group's comment was present in multiple groups is indicative of her position within the figured world of *Teaching*. Hannah's perspective that the only student misconceptions were the ones surfaced by

her monitoring is indicative of her novice position within this figured world. Furthermore, Hannah's comment that student's responses "stemmed from them just not having read the context all the way" (RI1) demonstrates that Hannah was hesitant to place racist ideas or attitudes onto her students. Despite Hannah's circumstance enacting TMSJ to a predominately White classroom, Hannah expected her students' reasoning to be divorced from prejudice or stereotypes. This was also demonstrated by Hannah's reflection that the lesson went well since none of the students were "lame" about the task or had "very racist things to say" (RI1). Hannah's participation within the figured world of *Race*, coupled with her perception of her role within the figured world of *Teaching Math for Social Justice* are demonstrated by these reflections. Although Hannah chose to enact a TMSJ task related to the impact of mainland Americans on local Hawaiians, she was hesitant to plan for and anticipate racist or prejudicial comments from her students. Hannah's response to the student thinking during the lesson is a manifestation of how indirect my nod toward this potential student response came across during the planning.

The second lesson provided another opportunity for us to clearly anticipate problematic student social justice reasoning. Within the context of BYU, we planned to ask students why the ratio of male to female faculty is so high. As we began to anticipate potential responses to that question, Hannah expressed that there are so many possible answers to that question, making it difficult to know how to respond. In response, I said:

I think that the things to be careful of are anything that, like, even suggests that women just don't wanna work. You know what I mean? (Hannah: Yeah.) Or that there's some sort of, like, innate thing about being a female that makes it so that this is a natural order of things. If that makes sense. ... I think that's like, I think

that a lot of answers could be really valid. ... I think that for some people who, like, don't have, if they don't have an opportunity to really grapple with it, they'll just kind of assume that the inequality, like the numbers are the way they are, because that's just nature. That's just how things are. And there's like, it's just a fact of life without, like, giving time to think about that. (LP2P2)

At this stage in the planning, I communicated that there were many possible answers that are permissible, but some responses that were more problematic. I repeated words like “innate”, “natural”, and “nature” to emphasize that a student response to inequality that suggests a fixed status quo of inequality ought to be challenged. By interrogating a “natural order of things” with women being marginalized, I demonstrated my participation within the figured worlds of *Gender* and *Advocacy*. As a woman, my position as a feminist led me to notice the consequences of this discourse and as an advocate, I encouraged Hannah to disrupt others’ apathy or ignorance concerning sexism. I attributed a more active role to what Hannah ought to consider while teaching. I described certain thinking as “things to be careful of” (LP2P2). Although this is still a delicate suggestion to act, it was still more substantial than the actions attributed to mentioning stereotype-prone responses in the first lesson planning. I also highlighted that students need “an opportunity to really grapple with it” (LP2P2), further giving more action associated with what Hannah ought to invoke within the students through the lesson. These actions demonstrated the participation that I perceived Hannah and myself engaging in as Social Justice educators, thereby eliciting my figured world of *Teaching Math for Social Justice*. The active language that I used here was important given the lack of direct action that was communicated in the first lesson. Through this exchange and the learned experience from the first lesson, Hannah was more prepared for student comments during the lesson.

During the second lesson, Hannah has an opportunity to respond to a wide variety of answers to the question of why BYU's ratio of male to female tenure-track faculty is so high. Particularly in Hannah's second section, students answered that the ratio can be explained by BYU's traditional or family values. Characterizing BYU as traditional or centered on family values was directly invoking the figured world of *Church*, which was a shared culture for the entire class. Hannah responded that within the Church and BYU we have a patriarchal culture or system. In the reflection interview, I asked Hannah about her choice to re-voice the student's thinking in terms of patriarchy instead of tradition. My choice to ask Hannah about this word choice stemmed from my surprise that Hannah was willing to call the Church a patriarchy, due to the negative connotative weight this word often reflects on the Church. Hannah justified her use of the word "patriarchy" by saying:

Personally, I like that word better than traditional. So especially in section two, that's why I chose to use that term instead of traditional, I guess. I don't know what it is about "traditional", something about it, feeling like you can't do anything about it, maybe? (Navy: Mmm). Um, because it's tradition. So it's always gonna be that way. But if, when you say, like, patriarchal, like that describes the way currently is, but doesn't mean it's gonna, can, has to stay that way. (RI2)

Hannah echoed my warning from our lesson planning to disrupt student wording that implies a fixed status quo. Hannah's preference for the word "patriarchy" to "traditional" perhaps indicates that Hannah's position within the figured world of *Church* is more progressive than the background interviews suggested. She balked at the word "tradition" because it connotes that "you can't do anything about it" (RI2), whereas the word "patriarchal" she felt communicated a

capacity for change. Her language is significant given the similarity to my earlier comment during the planning. Hannah chose to re-voice the student comment in a way that moved the class to consider wording that had more of a capacity to change. Thus, Hannah's choice indicated her participation as a *Social Justice* teacher who sought to have students look for ways to combat injustice. Hannah was potentially more comfortable to disrupt comments regarding women (as a woman) than comments about race (as a White person). Thus, Hannah's position within her figured world of *Femininity* was orchestrated during her enactment of this lesson. This excerpt shows that through the collaborative planning experience, Hannah was better equipped to notice and disrupt student messaging that the inequality explored was permanent.

During the two lesson planning experiences, Hannah and I anticipated various ways students may respond to the social justice questions. In the first lesson, I mentioned a racist line of thinking but fell short of actually asking Hannah how we can plan for her to respond to a common stereotype of Polynesian people. In the enactment, Hannah felt unprepared to react to the student comment that Hawaiians should invest more. Thus, the lesson may have left student's prejudices undisturbed. By contrast, in the second lesson I more clearly outlined the student's thinking that could communicate sexist conclusions. While Hannah taught the second lesson, she was able to quickly address student responses that could suggest that the ratio of male to female faculty is permanent. Our identities as White women meant that during this Social Justice teaching and planning experience, our positions within the figured worlds of *Gender/Femininity* and *Race* were negotiated as we planned with each other and as Hannah taught the lessons. The two social justice lessons in this study may present the possibility that Hannah and I are able to improve as being able to negotiate ourselves within TMSJ planning. However, perhaps a third

lesson not centered on our marginalized identities would exhibit the same weaknesses in planning as the first lesson.

Discussion

Research Question 1 Discussion

The purpose of this study is to understand what figured worlds are evident in two mathematics teachers as they prepare to teach mathematics for social justice. To answer this question, I created a list of figured worlds that are present in the lives of Hannah and myself (see Tables 4 and 8). Not all of these figure worlds were invoked while planning and enacting the social justice lesson. In this section I will describe these results that are similar across both participants and then the differences between Hannah and myself.

Comparison of Figured Worlds

Hannah and I both surfaced many more figured worlds than were expected. Some of the variety of figured worlds was expected due to the nature of the questions. For example, the figured worlds of *Race*, *Family*, and *Teaching Math for Social Justice* were elicited from pointed questions about the participants' upbringing, memories of race, and description of TMSJ. However, many other figured worlds surfaced without a specific prompt from the interview questions. Hannah and myself both discussed our religious, political, and gender identities, without those being specifically elicited through the questions of the interview. Participation in figured worlds like *Church*, *Politics*, and *Gender* may be enduring positions (Johnson, 2016) in that the participants utilized these aspects of their identities beyond the localized context of talking about teaching mathematics for social justice. Thus, specifically addressing political and religious identities may create learning opportunities to integrate new knowledge with these identities for prospective critical educators.

Hannah and I also share many figured worlds, although our conceptions of those figured worlds are slightly different. Hannah and I both describe a figured world of *Family*, *Race*, *Class*, *Politics*, *Church*, *Friendship*, *Marriage*, *School*, *BYU*, *Mathematics*, *Teaching*, *California*, and *Utah*. These figured worlds are similar and shared in many ways. For example, our shared membership in the figured world of *California* colors our mutual participation in the figured world of *Utah*. We then both recognize each other as having similar perspectives and experiences within the figured world of *Utah*, which informs our interactions. In other instances, although we both participate in figured worlds of the same name, some of these figured worlds do not create significant overlap in interaction and recognition. For example, Hannah and I both described our *Family* figured worlds, and while there are common experiences being daughters and sisters, our experience and positionality within our immediate *Family* figured worlds are quite different. For example, Hannah's position as a younger sibling allowed her to theorize on a hypothetical discussion with her older brother about antiracism, while my position as the oldest sibling did not surface discussing antiracism with my brothers. Since we are not part of the same family, we interact in different iterations of the larger figured world. So, while we share positions within the same figured world, our interactions within that figured world are sometimes limited.

In both of our figured worlds of *Race*, Hannah and I engage in White discursive moves (Haviland, 2008). Hannah and I both engage in safe self-critique (Haviland, 2008). For example, Hannah safely and facetiously calls herself a racist and I attribute my younger self's attitudes toward racism and shy away from a current example. I engage in asserting ignorance or uncertainty (Haviland, 2008) in my description of why my younger self held those prejudices at such a young age. Hannah engages in the discursive move of letting others off the hook (Haviland, 2008) by saying that her mom is "doing a lot better" (HI1P1) despite naming

derogatory remarks and jokes to people of Color. In planning the first lesson, Hannah and I also changed the topic (Haviland, 2008) and created a discursive space between mentioning a stereotype about Polynesians and then actually planning for what to do if those arguments surfaced in the lesson. Furthermore, Hannah concluded that her students were not “lame” about the lesson, avoiding saying that her students racist. Hannah and I both engaged in these White discursive moves as we explained our background and also how we discussed our planning and reflecting on TMSJ.

Hannah’s Figured Worlds

Hannah’s perspective of marginalization can have a potential impact on how she enacts TMSJ. Hannah’s conception of marginalization was described by exploring her *Race* and *Sexuality* figured worlds. In both of these figured worlds, Hannah’s language suggests that being White-passing or straight-passing excluded that individual from marginalization. Introspection on what marginalization still looks like or can feel like for those still passing was not present in Hannah’s description. Although Hannah exhibited this when describing her husband’s White-passing experiences, Hannah also includes this phenomenon for herself as a straight-passing bisexual woman. Because of these perspectives, Hannah may not interrogate the invisible identities of her students, assuming that her perception of their marginalized and privileged identities are shared by how all of society interprets that student’s marginalized and privileged identities. Thus, Hannah may only plan for and account for students’ visible or passing identities when teaching mathematics for social justice. This assumption could lead to unintended harm or further marginalization if students’ full identities are not appreciated or anticipated. Since Hannah was positioned as the expert in her classroom and students within our planning, it is not possible to determine if this surfaced within the two social justice lessons.

Hannah's figured worlds of *Friendship* and *Femininity* were not depicted in the in-depth narratives above, but these figured worlds (and their intersection) were pertinent to preparing to enact TMSJ for this study. First, my relationship with Hannah is not a close friendship. But, Hannah did not characterize herself as commonly having close friendships, particularly female friendships. So, our lack of proximity was not marked for Hannah as it is typical for her interactions with classmates and peers. Also, Hannah's teacher identity within the figured world of *Teaching* suggested that she hopes that students will consider her to be friendly and approachable. Considering that Hannah's friendships are not typically close, acquaintance relationships with students fit within her *Friendship* figured world. Furthermore, in the second lesson Hannah asked her female students the impact of having a female professor, and cited herself as an example. Her decision to include herself unintentionally limited the question, funneling students to consider how Hannah as a teacher impacted them. Since Hannah did not describe herself to typically have close female friendships and she desired to have friendships with her students, this question frustrated her attempt to have female students consider the impact of women in advanced degrees for them personally. Thus, her figured worlds of *Friendship* and *Femininity* also impacted her enactment of TMSJ.

Finally, Hannah's figured world of *Race* illustrates how Hannah came to be willing to engage in TMSJ. Hannah described intense passion for racial justice and for White people to understand systemic racism and oppression. Her passion led her to author herself in innovative ways, like when she disrupted her father's view that one is rarely both a faithful member of the Church *and* an advocate for racial justice. Her background in orchestrating herself as a teacher and defender of social equity prepared her to be willing to enact TMSJ in her own classroom. However, Hannah's implicit identification of racists as people older than herself, coupled with

her perception of her students as similar in age and experience as herself, limited her ability to plan for and identify students thinking or reacting in racist ways. Although Hannah's figured world of *Race* motivated her enactment of TMSJ, it also hindered her ability to anticipate racially charged comments from her Millennial/Gen Z students.

Navy's Figured Worlds

My figured world of *Community* is closely connected to my figured world of *Race* and of *Advocacy*. Specifically, my conception of my *Community* is somewhat defined by being made up of White people. Then, my figured world of *Advocacy* is closely connected to *Community*; I consider the causes and people in my *Community* as allies and rationale for *Advocacy*. In this study the main student audience are White and members of the Church who I could consider to have kinship within the figured world of *Community*. My planning and preparation for TMSJ may then overlook the needs and considerations of those I would consider outside of my *Community*, like the few students in this study who are not White and members of the Church. Although I consider TMSJ to be also important for different communities than my own, my language about TMSJ indicated that I may believe that those communities would be better served by TMSJ enactment that comes from a member of their community. Thus, my narrow meaning for *Advocacy*, specifically within a racialized *Community* figured world, may limit my preparation in TMSJ.

My figured world of *Advocacy* also intersects with my figured world of *Teaching*. I see my role as an advocate and activist to manifest in how I chose to utilize curriculum in my Mathematics and English classrooms. Although some may balk at the prospect of teachers using their role to also be an activist, Spencer (2015) hopes that our understanding of teachers will encompass individuals with social critique. She writes "Why have we brought people into the

field of teaching who have no social critique?” (Spencer, 2015, p. 226). Spencer questions if teachers ought to perpetuate a system that “labeled them as skilled, proficient, excellent, mathematically able” (Spencer, 2015, p. 226). Her critique of teachers lacking social analysis is reminiscent of Freire’s (1970/2008) writings in *Pedagogy of the Oppressed*. By linking my role of teacher with my role as an advocate, I was more ready to engage in critical pedagogy like TMSJ.

Research Question 2 Discussion

The second question for this study is to examine the identity work (orchestration or negotiation of figured worlds) of Hannah and myself as we prepare to teach mathematics for social justice. Here I will review the identity work that emerged from the decisions as we planned these two lessons, and the complications with characterizing this identity work.

Hannah and I negotiated and orchestrated our various figured worlds in ways that complicate a generalization that we completely prioritized or completely rejected TMSJ. Holland et al. (1998) illustrated identity work through the example of a lower-caste woman who was barred from entering a household but requested to attend a research interview on the top floor. The woman, forbidden to enter the house but constrained to attend the interview, created her way to satisfy both demands by climbing up the side of the house to reach the top floor balcony for the interview. Similarly, Hannah wanted to prioritize both enacting a TMSJ task and fulfilling her mathematics goals and obligations. Through inventive planning, Hannah was able to satisfy both demands by integrating her mathematical goals into the TMSJ context. However, we also fell short of meeting our TMSJ goals with fidelity by our commitment to research-based mathematics instruction taking priority over clear social justice rationalization for decisions. Also, our TMSJ enactment failed to directly plan for and disrupt problematic reasoning that were

not aligned with our own marginalized identities. Our orchestrations and negotiations while preparing to enact TMSJ were complex and varied.

Our negotiations depict an evolving conceptualization of TMSJ. Through our discourse, we were negotiating what it means to be a social justice teacher and what mental actions and clarifying questions we want to pursue for students to reach our goals. For example, at the beginning of the coplanning experiences Hannah did not consider planning a whole-class discussion regarding the tasks' social justice questions like she would a whole-class mathematics discussion. By the second lesson Hannah expected that we would plan student's anticipated reactions and comments and how those could be sequenced in the lesson. I also put forth the suggestion that we would make explicit social justice goals, which is not a practice I had tried previously. Through our exposure to experiencing TMSJ and through artifacts like Berry et al.'s (2020) book on TMSJ lessons, we figured together what it means to participate within the figured world of *Teaching Math for Social Justice*.

However, our differing perspectives and priorities demonstrate how we figure ourselves as social justice teachers differently. I placed emphasis on communicating a clear narrative about injustice and disrupting racist or sexist patterns of thinking. Hannah, on the other hand, seemed to figure herself as a social justice teacher as it related to students critically examining problems and thinking carefully about the context for the mathematics.

Our differences in how we figured ourselves as TMSJ educators may be attributed to ill-defined figured worlds that were not fully understood from the background interviews. For example, Hannah may have a *Math Teaching* figured world, *Quantitative Reasoning* figured world and *Advocacy* figured world. Furthermore, her *Problem Solving* figured world may encompass her *Teaching Math for Social Justice* figured world.

Hannah's background interview did not illuminate a *Math Teaching* figured world. Hannah discussed her *Teaching* identity as it related to other teachers and then her *Mathematics* identity, but rarely both in tandem. Hannah's prioritization of her mathematical goals may indicate a position within an existing *Math Education* figured world that was previously unearthed in the previous interviews. The new figured world of *Math Teaching* may be a subset of her *Teaching* figured world and in tension with her participation in the *College Algebra Team* figured world.

Next, Hannah's discourse about quantities as a final answer and within a ratio seem connected to *Quantitative Reasoning* (Thompson, 1990; 2011; Moore et al., 2009; Moore, 2019). The College Algebra curriculum is informed by research on quantitative reasoning and classes within BYU's Mathematics Education program also educate on that same research. Although it is possible that Hannah and I share the figured world of *Quantitative Reasoning*, neither of us demonstrate that as a clear figured world in our background interviews. So Hannah's figured worlds of *College Algebra Team*, *Graduate Program*, *Critical Information Consumption*, and *Teaching* that she is orchestrating in previously described instances may all be attributed to a figured world that was unexplored during the background interviews—Hannah's role as a *Quantitative Reasoning* instructor.

While the background interviews did not surface a consistent advocacy or activism figured world for Hannah, Hannah's actions during the second social justice lesson suggest that her *Church* figured world does create that space for her. In the background interview, Hannah describes bearing testimony to her father that she does not find conflict between racial activism and her faith. In the second lesson, Hannah is confident in describing the Church as a patriarchy, which can be interpreted as an intersection between her *Church* and *Femininity* figured worlds.

Her *Church* role or identity was not further probed in the background interviews, but it is possible that this figured world provided leverage for her to act as an advocate or activist.

However, it is unclear if Hannah’s participation in *Teaching Math for Social Justice* is distinct or separate from her participation in the figured world of *Problem Solving*. Her excitement to dive into Kaluhiokalani’s (2022) task is perhaps more aligned with Hannah’s goals and position within the figured world of *Problem Solving* than *Teaching Math for Social Justice*. If Hannah viewed this task as an opportunity to engage in problem solving instead of examining injustice, then Hannah is orchestrating her participation in the *College Algebra Team* in tension with her participation in the figured world of *Problem Solving* instead of TMSJ. Figure 6 shows those two figured worlds as described in the background interviews.

Figure 6.

Comparison of Hannah’s figured worlds of Problem Solving and TMSJ

<p>Hannah’s Figured World of Teaching Math for Social Justice</p>	<p>Hannah’s position as a novice TMSJ teacher. Her interactions with other teachers, researchers, and her practice of TMSJ proceeded from her construction of this cultural world. Artifacts of this cultural world include TMSJ tasks and published papers and books about the practice.</p>	<p>Hannah’s Figured World of Problem Solving</p>	<p>Hannah positioned herself as a problem solver. She viewed other people as incompetent at problem solving and that she could acculturate others into the practice and cultural world of problem solving. She also took a graduate course on Problem Solving, which expanded her cultural world of problem solving.</p>
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Hannah positioned herself in our shared *Social Justice Planning* figured world as willing and hopeful to incorporate TMSJ in her class. However, the positions of power within that figured world may have presented a stronger desire than without the intervention via this study.

My position as researcher within that figured world could have limited Hannah's perceived ability to reject incorporating a TMSJ context in her plan. Since I am also the participating teacher in Hannah's thesis study, Hannah may have viewed her participation in the study, and therefore her enactment of TMSJ, as an even exchange for my participation for her. However, apart from this study Hannah did incorporate a TMSJ lesson during her previous semester and asked one of the College Algebra curriculum writers why there were not more TMSJ contexts in the text. Hannah's future outlook on TMSJ may give insight into her actual commitment to TMSJ.

During the last reflection interview, I asked Hannah if she would continue to enact in TMSJ in the future. Hannah's response highlights the importance of the joint planning space for her enactment of TMSJ. She said that if she were to teach College Algebra the next year, she would keep the lessons that we had planned together and do them again. However, she was reluctant to plan new social justice lessons. She then told me:

Adding them in myself though always feels a little daunting. Like I feel like I need another partner to really bounce those ideas off of. Like having you is really useful. Um, otherwise I'm like, I don't know if I'll anticipate everything. Like it's better when you have more minds kind of thinking about something like that in order to anticipate all the different student responses and really come up with like the right words for your questions so that you don't like elicit the wrong thinking or not like wrong thinking, but like, I don't know, just like students misinterpreting what you meant by a question, kind of thing. Um, yeah, so like, yeah, coming up with, like, new tasks and social justice-y context feels a little more daunting just by myself. (RI2)

Hannah repeats that the prospect of planning social justice lessons on her own would be “daunting” (RI2). Despite having engaged twice in social justice planning, Hannah felt that without another partner or collaborator she would not be able to plan TMSJ lessons effectively. Her hesitancy suggests that her conception of the figured world of *Teaching Math for Social Justice* either requires collaboration or she does not trust herself and her own socio-political awareness to plan for this effectively. Hannah values our *Social Justice Coplanning* figured world (as evidenced by her saying that “having you is really useful”) and feels that the *College Algebra Team* would not provide sufficient support for her to collaborate on Social Justice pedagogy. Due to Hannah’s positions within the figured worlds of *Teaching Math for Social Justice* and her novice position as a mathematics teacher, Hannah is reluctant to plan TMSJ lessons on her own.

Pointed investigation into Hannah’s apparent figured worlds would help to better define how Hannah authors herself as a mathematics teacher and as a social justice mathematics teacher. But, our decisions while preparing to TMSJ demonstrate complex identity work. We negotiated our simultaneous participation in various figured worlds, some with “overpowering, but not hermetically sealed” (Holland et al, 1998, p. 18) constraints, (like the expectations of the College Algebra team) to author ourselves as teachers for social justice.

CHAPTER FIVE: CONTRIBUTIONS, IMPLICATIONS, AND LIMITATIONS

Teaching mathematics for social justice disrupts the narrative that mathematics is value-free and emotion-free. In order to include social justice mathematics tasks in their class, teachers must make accommodations to their typical practice. Novice mathematics teachers express trepidation to try TMSJ since they have low confidence in their ability to establish a learning environment that would support student learning about social justice through mathematics (Johnson, 2013). The preparation for novice mathematics teachers to engage in TMSJ has been largely uncharted from the teacher's personal standpoint. In order for teachers to be willing to try TMSJ, what aspects of their identity do they need to negotiate?

To study teachers' identity work, I used Holland et al.'s (1998) figured worlds framework. Using this theoretical lens, my study answers the following questions:

1. What figured worlds are evident in two novice mathematics teachers preparing to teach mathematics for social justice?
2. What does identity work (orchestration or negotiations of figured worlds) look like for two novice mathematics teachers while planning to teach mathematics for social justice and reflecting on these practices?

This study showed the variety and number of figured worlds evident for teachers and how those figured worlds are negotiated or orchestrated in intricate ways for teachers to figure themselves as teachers for social justice.

In this chapter, I outline the contributions my study makes to the field of mathematics education. I then outline implications for both researchers and practitioners. Lastly, I identify the limitations to my study and give suggestions for future research that will address these

limitations and deepen researchers' understanding of teachers' identity work to teach mathematics for social justice.

Contributions

This study makes several contributions to the field of mathematics education. These contributions inform research on TMSJ, on the theoretical framing of figured worlds and identity work, and the practice of lesson study.

First, this study makes contributions to the research on TMSJ. Although other research has documented that prospective and novice teachers are hesitant to try TMSJ (Simic-Muller et al, 2018; Johnson, 2013), few studies have examined this trepidation. The results of this study contribute some reasons why new teachers may be hesitant to prepare for these lessons. One of the initial hurdles of the lesson planning was to determine what units or lessons within the scope and sequence of the College Algebra curriculum would be best for implementing a social justice task. Even with our collective experience with this specific College Algebra curriculum, Hannah and I had difficulty matching the social justice tasks with the mathematical goals for the day. Novice teachers may be willing to implement social justice tasks, but may be unaware of how the mathematics of the course can provide opportunities for such tasks. Also, Hannah expressed that she valued the collaborative social justice planning environment. She was uncertain if she would have a collaborator on future lessons and was therefore hesitant to plan a social justice lesson by herself. Novice teachers may feel unsupported in preparing to TMSJ without a partner to plan with. Other TMSJ interventions have allowed teachers to work together on planning lessons (Bartell, 2013; Harper et al., 2020), but the planning groups served as a method for comparison. These studies did not highlight the importance of a co-planner in overcoming hesitant to engage in TMSJ.

Although TMSJ studies have often come from White teachers and researchers (Gutstein, 2006; Esmonde, 2014; Harper, 2017; Stephan et al., 2021), few TMSJ enactments have been placed in a generally homogenous White student population. Another contribution of this study is how White teachers, even when planning for a predominately White audience, still must engage in careful identity work to carefully plan a social justice lesson. Preparing to TMSJ presents a quandary for anticipating for and reacting appropriately to microaggressions. Although research has cautioned about the possibility of teachers inadvertently presenting the microaggression (Bartell, 2013), the results of this study illustrate the difficulty for teachers to appropriately plan for these instances. A final TMSJ contribution of this study is that a teacher can enact a social justice lesson without extensive and comprehensive sociocultural understanding. The background interviews and subsequent descriptions of figured worlds demonstrate that Hannah and I did not have robust and exhaustive sociopolitical understanding. However, we were able to plan and enact two social justice lessons in Hannah's classroom. Although the limited sociopolitical understanding we did exhibit was crucial to motivate and further our TMSJ preparation, Hannah's students were able to experience social justice questions in their mathematics class despite a lack of broad understanding.

Second, this study makes contributions to the theoretical framework of figured worlds and identity work. Although figured worlds has been utilized to chart TMSJ previously (Esmonde, 2014), figured worlds has not been utilized as a framework for teachers in the discipline. This study then contributes a different approach to charting identity within the research of TMSJ. Another contribution of this study's analysis of figured worlds is the use of language or discourse as a cultural artifact. Although others have used words or phrases as a figured world artifact (Esmonde, 2014; Esmonde & Langer-Osuna, 2013), the original

understanding of an artifact is a physical or tangible artifact that mediates or invokes a figured world. This study uses the words and language of participants as evidence for the existence and invocation of a figured world.

This study also contributes a novel approach to charting figured worlds for participants. Instead of inferring figured worlds from group dynamics, this study observed individuals and then inferred the figured worlds present in those individuals' lives. Even when the figured world was in common between the participants, this study examined the differences in conceptions of that same figured world. For example, the results of this study illustrate how two different participants of the societal figured world of *Race* can have differing identifiable persons, artifacts, and characterizations of that same figured world. A contribution of the results is the fidelity to the participants' conception of their figured world instead of a positivist description of a figured world. Through commitment to the participant's words and perspective, researchers can avoid overstating the involvement and invocation of a figured world a participant may or may not share a common understanding of with the researcher.

Another theoretical contribution of this study is the conception of what identity work means in terms of the figured worlds theory. Although Holland et al. (1998) illustrate identity work anecdotally, they do not record how the identity work was determined analytically and then theoretically. The theoretical framing and analytic plan of this study puts forth a method to determine the orchestration of an individual's constellation of figured worlds through the consideration of decisions. The theoretical conception and analysis of identity work is another theoretical contribution of this study.

Finally, this study contributes to the research on lesson study and collaborative lesson planning. Although some studies have examined the roles planners can inhabit while planning

jointly (Lenski et al., 2018; Mihans et al., 2008), this study also analyzes the positions of power and roles that are present in a collaborative planning experience. The roles of an experienced teacher, a novice, and the notions of sole or shared leadership are reaffirmed from this study. This study also further demonstrates that some participants of a collaborative planning environment are only involved due to the balance of power between participants and instigators of the collaboration, like receiving credit for a class (Archer, 2016; Baldry & Foster, 2019) or feeling obligated to participate in a research project (as in this study). The results of this study further contribute to the sociopolitical research of the practice of collaborative lesson planning.

Implications

This study implies new directions for research and teacher educator practice in the field of preparing teachers to TMSJ.

Implications for Research

Although there is much research on teacher's and student's identity (in mathematics education, see Darragh, 2016) and other research using figured worlds as a framework (Holland et al., 1998; Esmonde, 2014; Esmonde & Langer-Osuna, 2013), this study is novel in its figured world identity work approach. This study demonstrates what can be learned about teachers' innovation and hesitation in implementing new or unfamiliar practices through investigating teachers' identity work in the process. Furthermore, using the framework of figured worlds provides an opportunity for researchers to consider the positions of power and authority that inhibit teachers or give teachers access to new practices. Thus, future research using identity work and figured worlds can afford new insights.

Next, researchers should be careful to not limit the possible identities that can be surfaced in a project analyzing a participant's identity. The results of this study surfaced more figured

worlds than were elicited explicitly from the interview protocol and were more numerous than anticipated. Researchers that intend to look for specific identities within the data may be ignoring important identities that can be surfaced. Instead, a constant comparative analytic method or other methods that allow for emerging themes such as the discourse analysis used in this study will be more appropriate to attend to the important identities surfaced by the participant.

Finally, the data collection for this study proved to have important consequences for similarity across the data. The original plan for my own interviews was to write in a journal or write answers to the interview questions. However, having Johnson interview me proved to be valuable to provide a similar format between the studied participants' data. For example, both Hannah and I employed White discursive moves (Haviland, 2008) in our discussions of race. Without being able to hear and transcribe my speech to these questions, I would not have noticed the similarity and differences in our racial discourse. Maintaining the format for data collection, even if one of the participants is the researcher, is valuable for analysis.

Implications for Practice

This study also informs the work of teacher educators. First, the practice of observing a lesson instead of simply relying on the teacher's reflection of the lesson (as was also seen in Bartell, 2013) was imperative for truly understanding the practices and habits of the teacher. Although Hannah reported that the whole-class discussion was an accurate reflection of the class's group discussion, my observations of Hannah's lessons helped me question if Hannah had completely monitored student reactions to the task. Novice teachers may be particularly vulnerable to not having a well-rounded perception of their lesson. Particularly in the case for teachers attempting to TMSJ, teacher educators ought to be hesitant to completely rely on the self-reporting of the teachers new to the practice on student reactions. In the case of Bartell's

(2013) study, teachers may inflict unintended harm on minoritized students and not leave aware of their impact. Teacher educators may hesitate to rely on teacher reflections.

Next, the results of this study determine that teachers have many figured worlds that they participate in simultaneously. Teacher educators can be mindful of the multiplicity of the figured worlds their prospective or practicing teachers engage in and how these figured worlds conflict or coexist. Teacher educators can support preservice and practicing teachers to navigate their figured worlds as they make decisions. Support can be facilitated by providing teachers opportunities to explore their own figured worlds and how those may or may not impact their decisions or by scaffolding teachers' exploration of their decisions and what figured worlds were manifest in their decisions. However, teacher educators should be mindful that not all figured worlds that teachers participate in will have equal weight. Some enduring positions (Johnson, 2016) may require extra attention or relevance to engage in critical pedagogy.

Finally, the findings of this study can inform what practices can help teachers prepare to teach mathematics for social justice. First, Hannah stated that a collaborative planning environment, specifically having a partner to brainstorm ideas, was vital to her engagement in TMSJ. So, providing experiences for partnerships to plan a TMSJ lesson instead of individual teachers planning TMSJ may provide the reassurance and balanced space for teachers to confidently continue forward in their plan. Also, providing opportunities for teachers to consider what it means to anticipate and plan for a social justice discussion may be crucial for teachers to be prepared. Hannah and I were prepared to consider a wide variety of mathematical responses to questions, but outside of the context of mathematics teachers may be inexperienced to anticipate a wide range of student thinking. Recognition that the ability to anticipate a variety of student responses does not necessarily transfer between contexts can be valuable in helping teachers

prepare to engage in critical pedagogy. These supports can alleviate trepidation and anxiety to engage in TMSJ.

Limitations and Directions for Future Research

One limitation of my study is that there were only two participants—only one participant other than myself. The study of teachers’ identity work to TMSJ can be expanded to include more teachers and a greater variety of teacher backgrounds. For example, this study perpetuates the limitation of only addressing White teachers enacting TMSJ. Exploring the preparation and identity work of teachers of Color as they teach mathematics for social justice can provide new insights into the similarities and differences in preparing for this practice in various contexts. Another variation that can provide valuable insight is to study how expert teachers engage in TMSJ. Both teachers who are expert in teaching mathematics but novice to TMSJ and teachers who are expert in the practice of TMSJ (for example, Gutstein, 2006) are valuable populations to further study. Their decisions, planning, and preparation can be valuable to novice teachers, like those in this study. My study was limited to teachers who were both novice in the practice of teaching mathematics and novice in the practice of TMSJ, which did not yield a robust description of what can or ought to be done to prepare to teach mathematics for social justice. The participants of this study were a limitation and future research can expand the population of who can be studied preparing for TMSJ.

An unavoidable limitation of my study is that I could not complete a full analysis of all the figured worlds and decisions presented by the data. Future research can more thoroughly analyze the data and provide a clearer depiction of the relevant figured worlds and prioritization of figured worlds in the planning of social justice mathematics lessons. Particularly since the figured worlds considered at length to answer the first research question were not the relevant

figured worlds in the negotiation analyzed for the second research question, this study does not create a thorough description of the identity work and important figured worlds for the participants.

Conclusion

This study attempted to characterize the identity work teachers engage in as they prepare to teach mathematics for social justice. Teachers' identity work, or the orchestration or negotiation of their simultaneous figured worlds, helps illuminate the hesitations or misgivings teachers are presented with if they chose to engage in TMSJ (or not). This study highlights the difficulties presented through a teacher's positions to prepare thoughtfully and fully to teach a social justice mathematics lesson. Researchers can further examine how the results of this study compare to the experiences of experts and teachers of Color for social justice. Teacher educators can provide support for teachers to understand their own complex identities that they bring to their classroom experience and provide scaffolded experiences to prepare them to engage in TMSJ pedagogy in their future classrooms.

REFERENCES

- Anderson, B. [@anderbrooke]. (2021, May 18). *Oh great. We've reached the point in Natalie Cline's slideshow where she teaches us that anti-racism and CRT is the AntiChrist.* #UTed #UTpol [Tweet]. Twitter.
<https://twitter.com/anderbrooke/status/1394834063488290818?s=10>
- Apple, M. W. (1992). Do the standards go far enough? Power, policy, and practice in mathematics education. *Journal for Research in Mathematics Education*, 23(5), 412-431.
<https://doi.org/10.5951/jresematheduc.23.5.0412>
- Archer, R. (2016). Lesson study in initial teacher education: Students' positioning analysed through the lens of figured worlds. In G. Adams (Ed.) *Proceedings of the British Society for Research into Learning Mathematics* 36(1) (pp. 13-18) <http://www.bsrlm.org.uk/wp-content/uploads/2016/09/BSRLM-CP-36-1-03.pdf>
- Baldry, F., & Foster, C. (2019). Lesson study partnerships in initial teacher education. In P. Wood, D. L. S. Larssen, W. Cajkler, & N. Helgevold (Eds.), *Lesson study in initial teacher education: Principles and practices* (pp. 147-160). Emerald Publishing Limited.
- Bartell, T. G. (2013). Learning to teach mathematics for social justice: Negotiating social justice and mathematical goals. *Journal for Research in Mathematics Education*, 44(1), 129-163.
<https://doi.org/10.5951/jresematheduc.44.1.0129>
- Bartlett, L., & Holland, D. (2002). Theorizing the space of literacy practices. *Ways of Knowing Journal*, 2(1), 10-22.
- Battey, D., & Leyva, L. A. (2016). A framework for understanding Whiteness in mathematics education. *Journal of Urban Mathematics Education*, 9(2), 49-80.
<https://doi.org/10.21423/jume-v9i2a294>

- Beaulac, J., Kristjansson, E., & Cummins, S. (2009). Peer reviewed: A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease*, 6(3).
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2722409/>
- Berry, R. Q., Conway, B. M., Lawler, B. R., & Staley, J. W. (2020). Lessons to explore, understand, and respond to social injustice. *Mathematics Teacher: Learning and Teaching PK-12*, 113(9), e34-e36.
- Calabrese Barton, A., Kang, H., Tan, E., O'Neill, T. B., Bautista-Guerra, J., & Brecklin, C. (2013). Crafting a future in science: Tracing middle school girls' identity work over time and space. *American Educational Research Journal*, 50(1), 37-75.
<https://doi.org/10.3102/0002831212458142>
- Carlson, M., Oehrtman, M., & Moore, K., (2020). *Precalculus pathways to calculus: A problem solving approach*. (8th ed.). Rational Reasoning, LLC.
- Chokshi, S., & Fernandez, C. (2004). Challenges to importing Japanese lesson study: Concerns, misconceptions, and nuances. *Phi Delta Kappan*, 85(7), 520-525.
<https://doi.org/10.1177/003172170408500710>
- Darragh, L. (2016). Identity research in mathematics education. *Educational Studies in Mathematics*, 93(1), 19-33. <https://doi.org/10.1007/s10649-016-9696-5>
- DiAngelo, R. (2018). *White fragility: Why it's so hard for White people to talk about racism*. Beacon Press.
- Eick, C. J., & Reed, C. J. (2002). What makes an inquiry-oriented science teacher? The influence of learning histories on student teacher role identity and practice. *Science Education*, 86(3), 401-416. <https://doi.org/10.1002/sce.10020>

- Esmonde, I. (2014). "Nobody's rich and nobody's poor... it sounds good, but it's actually not": Affluent students learning mathematics and social justice. *Journal of the Learning Sciences*, 23(3), 348-391. <https://doi.org/10.1080/10508406.2013.847371>
- Esmonde, I., & Langer-Osuna, J. M. (2013). Power in numbers: Student participation in mathematical discussions in heterogeneous spaces. *Journal for Research in Mathematics Education*, 44(1), 288-315. <https://doi.org/10.5951/jresematheduc.44.1.0288>
- Feistritzer, C. E. (2011). *Profiles of teachers in the U.S., 2011*. Washington, DC: National Center for Education Information.
- Fernandez, C. (2002). Learning from Japanese approaches to professional development: The case of lesson study. *Journal of Teacher Education*, 53(5), 393-405. <https://doi.org/10.1177/002248702237394>
- Frankenstein, M. (1983). Critical mathematics education: An application of Paulo Freire's epistemology. *Journal of Education*, 315-339.
- Frankenstein, M. (2001). Reading the world with math: Goals for a critical mathematical literacy curriculum. *The Australian Association of Mathematics Teachers Inc.*, 53.
- Freire, P. (1970/2008). *Pedagogy of the oppressed*. New York, NY: Continuum International Publishing Group.
- Gee, J.P. (2011). *An introduction to discourse analysis: Theory and method*. (3rd ed.). Routledge.
- Geertz, C. (2008). *Thick description: Toward an interpretive theory of culture*. Routledge.
- Gonzalez, L. (2008). *Mathematics teachers as agents of change: Exploring teacher identity and social justice through a community of practice*. (Doctoral dissertation). Available from ProQuest Dissertations & Theses database. (UMI No. 3325435)

- Gonzalez, L. (2009). Teaching mathematics for social justice: Reflections on a community of practice for urban high school mathematics teachers. *Journal of Urban Mathematics Education, 2*(1), 22-51. <https://doi.org/10.21423/jume-v2i1a32>
- Gutiérrez, R. (2013). Why (urban) mathematics teachers need political knowledge. *Journal of Urban Mathematics Education, 6*(2), 7-19. <https://doi.org/10.21423/jume-v6i2a223>
- Gutstein, E. (2006). *Reading and writing the world with mathematics: Toward a pedagogy for social justice*. Taylor & Francis.
- Harper, F. K. (2017). Coming to understand the big issues: Remaking meaning of social justice through mathematics across the school year. In A. Chronaki (Ed.) *Mathematics education and life at times of crisis* (Vol. 2; pp.513-521). Proceedings of the 9th International Conference of Mathematics Education and Society-MES9.
- Harper, F. K., Maher, E. M., & Jung, H. (2020). Whiteness as a stumbling block in learning to teach mathematics for social justice. *Investigations in Mathematics Learning, 13*(1), 5-17. <https://doi.org/10.1080/19477503.2020.1827662>
- Haviland, V. (2008). Things get glossed over: Rearticulating the silencing power of Whiteness in education. *Journal of Teacher Education, 59*(1), 40-54. <https://doi.org/10.1177/0022487107310751>
- Herbel-Eisenmann, B. A. & Otten, S. (2011). Mapping mathematics in classroom discourse. *Journal for Research in Mathematics Education, 42*(5), 451-485. <https://doi.org/10.5951/jresematheduc.42.5.0451>
- Hill, D. (2017). *White awake: An honest look at what it means to be white*. InterVarsity Press.
- Holland, D., Lachicotte W., Jr., Skinner, D., & Cain, C. (1998). *Identity and agency in cultural worlds*. Harvard University Press.

- Johnson, K. R. (2013). *Illuminating the identities of mathematics teachers and mathematics teacher educators* (UMI No. 3592117) [Doctoral dissertation, Michigan State University]. Available from ProQuest Dissertations & Theses database.
- Johnson, K. R. (2016). Enduring positions: Religious identity in discussions about critical mathematics education. *Religion & Education*, 43(2), 230-245.
<https://doi.org/10.1080/15507394.2016.1147916>
- Kaluhiokalani, K. G. M. (2022) *Logarithmic unit that is culturally relevant to the people of Hawai'i*. [Unpublished master's project]. Brigham Young University.
- Larnell, G. V., Bullock, E. C., & Jett, C. C. (2016). Mathematics, social justice, and race: A critical race analysis of teaching mathematics for social justice. *Journal of Education*, 196(1), 19-29. <https://www.jstor.org/stable/26612602>
- Lenski, S. J., Rigelman, N. R., Bright, A. L., Thieman, G., & Ferner, B. R. (2018). What teacher educators learned about negotiating power relationships during lesson study planning. *Northwest Journal of Teacher Education*, 13(1).
<https://doi.org/10.15760/nwjte.2018.13.1.2>
- McIntosh, P. (2007). White privilege: Unpacking the invisible knapsack. In P.S. Rothenberg (Ed.) *Race, class, and gender in the United States: An integrated study* (6th ed., pp. 177-82) Worth Publishers.
- Mihans, R., Long, D., & Felten, P. (2008). Power and expertise: Student-faculty collaboration in course design and the scholarship of teaching and learning. *International Journal for the Scholarship of Teaching & Learning*, 2(2). <http://digitalcommons.georgiasouthern.edu/ij-sotl/vol2/iss2/16>

- Moore, K. C. (2019, January). Abstracted quantitative structures. In *Proceedings of the Forty-First Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*.
- Moore, K. C., Carlson, M. P., & Oehrtman, M. (2009). The role of quantitative reasoning in solving applied precalculus problems. In *Twelfth Annual Special Interest Group of the Mathematical Association of America on Research in Undergraduate Mathematics Education (SIGMAA on RUME) Conference, Raleigh, NC: North Carolina State University*.
- Moses, R., & Cobb, C. E. (2002). *Radical equations: Civil rights from Mississippi to the Algebra Project*. Beacon Press.
- Nelson, R. M. (2020, October) *Let God prevail*. Retrieved from:
<https://www.churchofjesuschrist.org/study/general-conference/2020/10/46nelson?lang=eng>
- Rothenberg, P. S. (2008). *White privilege*. Macmillan.
- Saito, E., & Atencio, M. (2013). A conceptual discussion of lesson study from a micro-political perspective: Implications for teacher development and pupil learning. *Teaching and Teacher Education, 31*, 87-95. <https://doi.org/10.1016/j.tate.2013.01.001>
- Simic-Muller, K., Fernandes, A., & Felton-Koestler, M. D. (2015). "I just wouldn't want to get as deep into it": Preservice teachers' beliefs about the role of controversial topics in mathematics education. *Journal of Urban Mathematics Education, 8*(2), 53-86.
<https://doi.org/10.21423/jume-v8i2a259>
- Skovsmose, O. (1985). Mathematical education versus critical education. *Educational Studies in Mathematics, 16*(4), 337-354. <https://www.jstor.org/stable/3482444>

- Spencer, J. (2015). Moving from the outside in, or what White colleagues need to do to get it right with their White students. In N. M. Joseph, C. M. Haynes, & F. Cobb (Eds.), *Interrogating Whiteness and relinquishing power: White faculty's commitment to racial consciousness in STEM classrooms* (pp. 223-240). New York, NY: Peter Lang Publishing.
- Stephan, M., Register, J., Reinke, L., Robinson, C., Pugalenthi, P., & Pugalee, D. (2021). People use math as a weapon: critical mathematics consciousness in the time of COVID-19. *Educational Studies in Mathematics*, 1-20. <https://doi.org/10.1007/s10649-021-10062-z>
- Thompson, P. W. (1990). A theoretical model of quantity-based reasoning in arithmetic and algebra. *Center for Research in Mathematics & Science Education: San Diego State University*.
- Thompson, P. W. (2011). Quantitative reasoning and mathematical modeling. In L. L. Hatfield, S. Chamberlain & S. Belbase (Eds.), *New perspectives and directions for collaborative research in mathematics education. WISDOMe Monographs* (Vol. 1, pp. 33- 57). Laramie, WY: University of Wyoming.

APPENDIX A

- Tell me about your experiences growing up.
 - Follow-up to get a little bit of detail about where the participant has lived and what their relationship is like with their family of origin (who they spent the most time with as a growing child and adolescent)
- What is the first memory you have about race?
 - Get details such as: who was involved in this experience, what kinds of impact did it have on them (how did they feel in the moment), what do they think about this experience now
- When did you know you are White?
 - Probe: From research about White identity development we know that typically White people transition from not thinking about their racial identity to considering that they do have a racial identity. It is possible that this experience was much later. Do you know when that was?
- If you had to list off identities that are important to you, what identities would you say?
 - Consider following up with: why are these the most important ones?
- Do you have identities that you consider less important to your everyday activity?
 - Consider following up: why are these less important?
- From your experiences reading, you know that some identities are marginalized and others are privileged. What are some of the identities you have in which you are marginalized? Privileged?
- Choose at least one of your marginalized identities. What impact do you think it has on how you interact with others?
 - Probe: generally in the context of all interactions, specifically in the context of interactions with other people from marginalized communities, specifically in the context of interactions with people who benefit from privilege in that same identity category (for example, how does being a woman impact your interactions with men?)
- Choose at least one of your privileged identities. What impact do you think it has on how you interact with others?
 - Probe: generally in the context of all interactions, specifically in the context of interactions with other people from marginalized communities, specifically in the context of interactions with people who benefit from privilege in that same identity category (for example, how does being a woman impact your interactions with men?)
- Can you describe any experiences you have had with a social or political issue that have had a significant impact on who you are?
- How does your understanding of who you are as a person influence your work as a teacher?
- What role model do you have for yourself as a classroom teacher? (Eick & Reed, 2002)

- When you learn mathematics, is it different than learning science or history? (adapted from Eick & Reed, 2002)
- How do you decide what to teach and what not to teach? (Eick & Reed, 2002)
- What learning in your classroom will be valuable to your students outside the classroom environment? (Eick & Reed, 2002)
- How do you want your students to view mathematics by the end of the school year? (adapted from Eick & Reed, 2002)
- What do you see as the future of your students? (Gonzalez, 2008)
- What social or political issues do you think affect the lives of your students? What, if anything, do you do in order to address these issues? (adapted from Gonzalez, 2008)
- Are there directives from the school or local or state levels that influence the way you teach?
 - If they don't have anything specific, ask directly (if participant is an instructor at BYU): have you read the statement on Belonging from BYU? Or the BYU Aims and Mission Statement? In what ways do these statements impact your practice?
- Do you presently incorporate social or political issues in your teaching? (Gonzalez, 2008) If so, how? If not, why not?
- Can you please describe what teaching mathematics for social justice means to you?

APPENDIX B

- Can you tell me about an experience you had telling someone else about teaching math for social justice?
 - If they try to talk vaguely, ask: I'm looking for a specific experience. Maybe a conversation with your mom or your wife or a friend. Can you tell me about a specific instance?
 - If they talk about social justice in general for several experiences, ask: Can you tell me about an experience with telling someone about *teaching* math for social justice? And if not about specifically teaching math for social justice: can you tell me about an experience you had with talking to someone about how mathematics is not neutral?
- How did they respond?
- What do you think about what they say?
- How did what they say make you feel?
- Would you respond differently in the future?
- What factors influence how you respond?
- How did you decide what you will say or do in that moment?
- Would you respond differently to someone else?
 - Can you think of someone specific who shares characteristics like this person? Or someone who has less characteristics/identities in common with this person?
- What factors influence your new hypothetical response?
 - If the participant feels hesitant to discuss this, reassure them that differences and similarities are expected. We, for example, talk differently to parents versus spouses versus the people we sit next to at church and who each of those people are will also make a difference. Say directly if necessary: It is okay if you do not do the same thing with all people because not all people are the same.
- How would you decide what you will say or do in that moment?

APPENDIX C

- How do you think the lesson went?
- I noticed that (student reaction) . What made you decide (teacher action) ?
 - This may be repeated several times.
- If you were to teach this lesson again, is there anything you would do differently?
- Does this lesson change how you want to approach future lesson planning? If so, how?

APPENDIX D

Living in Paradise

1. When you graduated from high school, your parents took all the money from your grad party, \$1,500, and invested it in your name. The interest is being compounded **monthly** with an APR of 7%¹⁴

You were given full responsibility of the account when you turned 18 years-old, which means you can withdraw your money at any time.

- a) After working every month, you are barely able to break even with the cost of rent and other living expenses. The median house price in Hawai'i is around \$1,050,000 due to wealthy foreigners paying well over the asking prices. Thankfully, a 5% or 10% down payment is acceptable and common. Given the information above, how long would it take for your investment to reach 5% of the median house price?
- b) If you invest for the time you calculated, what factors may still inhibit you from purchasing a house?
- c) What do you think happens to local residents based on what you found in (a) and (b)?
- d) What are some things that could be done to help locals be able to buy houses in Hawai'i?
- e) Define a function g that represents how much money you will have t years after you invest, using the information from part (a) (**Define your variables**)
- f) Find g^{-1} , the inverse of g (**Define your variables**).
- g) How much would you have to initially invest to afford the down payment in ____ years?

¹⁴ Hannah changed this percentage from 10% to 7% before her lesson enactment.

APPENDIX E

The National Center for Education Statistics (nces.ed.gov) keeps careful records of the number of degrees awarded in the United States. The given table shows the number of PhDs awarded to men and women in the U.S. over time.

- Let $f(t)$ model the number of PhDs awarded to men in terms of the year, t .
- Let $g(t)$ model the number of PhDs awarded to women in terms of the year, t .

year, t	# of PhDs awarded to men in the U.S., $f(t)$	# of PhDs awarded to women in the U.S., $g(t)$	Ratio of PhDs awarded to men compared to women $h(t)$
1880	51	3	17
1890	147	2	73.5
1900	359	23	15.61
1920	522	93	5.61
1940	2,861	429	6.67
1960	8,801	1,028	8.56
1980	69,526	26,105	2.66
2000	64,171	55,414	1.16
2010	76,605	81,953	0.93

What is the value of $f(1940)$? $g(1890)$?

Let $h(t)$ be the function that inputs the year, t , and outputs the value of the ratio $\frac{f(t)}{g(t)}$. That is, $h(t) = \frac{f(t)}{g(t)}$. What is the value of $h(1880)$ and what does it represent in this context?

As t varies from 1890 to 1900, does the value of h increase or decrease? Why?

What must be true in this context if $h(t) = 3$ for some value of t ? If $h(t) = 1$?

Is it possible for the output of h to be less than 1 in this context? Explain.

Is it possible for the output of h to be negative in this context? Explain.

Must there be a maximum value for $h(t)$ in this context? Explain your thinking.

What historical events may have influenced this data?

Find an example where $f(t)$ and $g(t)$ increase but $h(t)$ decreases.

Create an example where $f(t)$ and $g(t)$ increase but $h(t)$ increases.

There are 293,250 total male U.S. tenure-track college faculty. There are 216,750 total U.S. female tenure-track college faculty. What is the ratio of male faculty to female faculty in the U.S.?

Based on this table, what is the ratio of male faculty compared to female faculty at BYU?

What needs to happen so that the ratio of male faculty to female faculty at BYU is 1?

What about 0?

What about infinity?

BYU Tenure-Track Faculty by Race and Gender

Race and Gender	Frequency
White Female	291
BIPOC Female	
Native American	3
Asian	14
Black	2
Hispanic	14
Pacific Islander	4
Not Declared	1
Grand Total Female	329
White Male	1,086
BIPOC Male	
Native American	4
Asian	19
Black	4
Hispanic	20
Pacific Islander	5
Not Declared	4
Grand Total Male	1,142
Grand Total	1,471