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“Don’t Say Gay. We Say Dumb or Stupid”: Queering ProspectiveMathematics Teachers’ Discussions

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ABSTRACT

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Many prospective teachers make assumptions about their students before they actually begin teaching. Many of these assumptions can be rooted specifically in students' races, cultures, classes, religions, genders, and sexual orientations. In order for prospective mathematics teachers to challenge these biases, some mathematics teacher educators have provided tasks to support these prospective teachers in becoming aware of their own biases. I chose to analyze a group of five prospective mathematics teachers discussing topics of teaching for social justice to examine more closely the kinds of biases they carry, and more specifically, how those biases came about in their conversations. My analysis also involved looking specifically at whether or not these prospective mathematics teachers were challenging their own as well as others' biases that came out during the discussions. The results of this study display the ways in which these biases were illuminated during the group discussions as well as the lack of prospective teachers challenging the biases that came out.

Keywords: queer theory, racism, sexism, homophobia, mathematics education, prospective teachers, group discussion

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PROLOGUE

> *There are homophobic and marginalizing implications of leaving much queer studies work to queers themselves*. (Dubbs, 2016, p. 4)
>
> *All children need curricular mirrors to see themselves reflected and thus feel safe in being themselves*. (Dubbs, 2016, p. 5)

As a White, heterosexual Christian, I benefit from a lot of systemic privilege. Further, I consider myself privileged in terms of my socio-economic status growing up and the opportunities I had as a child. I was able to accomplish many things in high school, especially in my mathematics and physical science classes. I began college by pursuing a physics major. Unlike high school, my mathematics classes in college consisted of a male-dominant population along with mostly male professors. As a woman, I felt isolated and alone when it came to collaborating on assignments and trying to learn the material. I did not feel that I had anyone I could relate to in my situation and was hesitant to reach out for help. Because I was not able to find comfort in asking people for help, I was failing most of my physics and mathematics classes. Therefore, I switched my major to mathematics education. Although the mathematics classes I was required to take still consisted of mostly males, my major itself was a more female-dominated one. Because of this, I was able to have a sense of community during my studies at college, which made a difference in my success as a student. I had a much higher GPA and was emotionally more stable when attending my classes because I felt I could better relate to and connect with the people around me.

Am I a success story? I would be writing my thesis in physics if only I had seen myself mirrored in the curriculum and the faces around me.

CHAPTER ONE: INTRODUCTION AND RATIONALE

Being smart in math means being fast.

Boys have the 'math' brain so girls are less capable at understanding math.

Only White students should be in honors math classes.

I doubt I'll have gay students when I teach.

These are biases I have either explicitly or implicitly heard when conversing with mathematics teachers. When discussing biases, I am referring to problematic assumptions being made regarding aspects of people's identities (e.g. race, gender, sexual orientation, religion, etc.). In hearing these biases, I began to wonder how teachers are reinforcing and challenging their assumptions when talking together. If a teacher said, "being smart in math means being fast," would someone else challenge that? Would I?

According to Sleeter (2001), many prospective teachers make assumptions about their students before they actually begin teaching, which can be rooted in students' races, cultures, classes, religions, genders, and sexual orientations. One possible outcome of these assumptions towards students is they can perpetuate a wider achievement gap (Lavy & Sand, 2015). Singham (2003) explained, however, that much discussion about how to eliminate the achievement gap focuses too much on what should be done with historically marginalized students, which then sends the message that historically marginalized students are the cause of this achievement gap. In this section I first discuss four reasons why these biases teachers have towards students are problematic. I discuss an alternate solution to reducing these biases about students that does not put the responsibility on historically marginalized students.

The first reason teacher biases rooted in a student's race, sexual orientation, gender, religion, classism, etc. are problematic is because teachers who have negative biases towards

students are more likely to believe their students are not capable of succeeding in that subject area (Cooper, 2003). Parks and Kennedy (2007) defined a "what is beautiful is good" (p. 937) phenomenon that many teachers fall into that describes how teachers believe students who are more physically attractive will be more successful in the class. Research has also shown that this phenomenon can occur with students' gender as well. Li (1999) supported this phenomenon occurring with students' gender by stating that many teachers believe mathematics is strictly a male domain, implying that boys are better at mathematics than girls. Because of these positive biases[1] towards males, many teachers will often have higher expectations for boys in terms of their performance in the classroom than girls (Li, 1999).

The second reason negative biases towards students are problematic is because these biases can directly impact students' motivation to want to excel in class (Cooper, 2003). Students were often able to sense low expectations from their teachers and in turn were less motivated to put forth their best effort into their school work (Parks & Kennedy, 2007). When students put forth less effort, they were more likely to perform worse in classrooms and were fulfilling the expectations that were originally placed on them by the teacher. Parks and Kennedy referred to this as a "self-fulfilling prophecy" (p. 938), meaning a student fulfills the original expectations the teacher set based on the teacher's biases towards that student.

The third reason biases are problematic is they can affect students' achievement. To summarize the results of Lavy and Sand's (2015) study, mathematics teachers who had positive biases towards boys meant that the male students performed better on exams throughout middle and high school. The boys were as well more likely to continue on to complete higher levels of mathematics and science courses in high school. Teachers from this study who had a negative

[1] When referencing positive biases, I am referring to assumptions made about people that unjustly benefit that population. In contrast, negative biases refer to assumptions made about people that put that population at a disadvantage. When using the word bias without a qualifier I am assuming the definition of negative bias.

gender bias towards girls in their classrooms meant that the female students performed worse on exams when compared to their male counterparts, and were less likely to continue forward with higher level mathematics and science courses in high school. Lavy and Sand's study showed an example of how positive biases towards a group of students (males) can have a positive effect on their achievement, but a negative effect on the other group of students (females). Along with how biases affect student achievement, Li (1999) claimed that when teachers had positive biases towards males in mathematics classrooms, males who did not succeed in the class were failing because according to the teacher's perception, the teacher failed to help them. When girls failed to succeed in the mathematics class, however, teachers perceived the reason as being that girls are not as capable as being successful in mathematics than boys (Li, 1999). These same teachers most likely believed that a female being unsuccessful in a mathematics class was because of the female's lack of effort and not because the teacher failed to help them (Li, 1999). Campbell (2015) also described how mathematics teachers underrated the abilities of low-income students, students with disabilities, students of color, multilingual students, and females. Underrating these abilities was largely due to the fact that White[2], male students' achievement is often the basis for what is considered "normal" in mathematics classrooms.

A fourth negative effect teacher biases can have towards mathematics students is it can prevent students from enrolling in higher level mathematics courses (Boaler, 2016). Boaler discussed how Latinx[3] and Black students were more likely than White students to retake an algebra class in high school that they had already passed in middle school the previous year. The

[2] I have chosen to capitalize Black and White when referencing races because I am discussing a specific group of people. By not capitalizing the words they simply represent the color of objects. To me, peoples' races are more than just the color of their skin and therefore should be capitalized.

[3] I am choosing to use the term Latinx rather than Latina/o to emphasize a more gender fluidity. I recognize as well that there were other ethnicities in Rico's classroom other than Latinxs, however, the PSTs more commonly reference Latinx because that was the majority of Rico's classroom population.

reason for this unnecessary repeat in an algebra class was due to the fact that teachers believed "some students do not belong in higher-level mathematics" (2016, p. 97) and chose to keep those students from advancing forward. Students unnecessarily repeating an algebra class has long-term effects by preventing these students from taking some upper level mathematics classes such as AP Calculus or AP Statistics, which can then directly correlate with how likely students are to graduate from college with a bachelor's degree (Singham, 2003).

As mentioned above, many involved in the discussion of mathematics achievement discrepancies assume, whether explicitly or implicitly, this discrepancy falls on historically marginalized students. In other words, many assume it is the responsibility of historically marginalized students to be the ones to minimize this discrepancy in achievement. Parks and Kennedy (2007) instead consider how teachers themselves can minimize mathematics achievement discrepancy by reducing their biases towards students. Parks and Kennedy, however, hypothesized in their study that preservice teachers would be less biased about superficial features such as race, gender and physical appearance than more experienced teachers. The reason for this hypothesis was because many prospective teachers were required to enroll in diversity courses to support teachers in understanding the detrimental effects negative biases have towards children in the classroom. Although the prospective teachers were exposed to the effects of negative biases, it was not a guarantee, however, that all would implement these values into their teaching (Parks & Kennedy, 2007). To summarize, simply being exposed to the negative effects of biases was not enough to reduce them for the PSTs in this study.

In this thesis, I consider how prospective teachers (PSTs) were revealing their biases and supporting and/or challenging the stated biases of others. Although teacher biases can extend to all subjects, I have specifically chosen to consider mathematics classrooms because many fail to

consider mathematics classrooms as a place where social issues exist (Kumashiro, 2004). The context in which these biases came about in this thesis was a book discussion group. The book was intended to provide PSTs with an opportunity to illuminate and examine their own biases. Therefore, I consider whether or not this assignment was actually providing this kind of learning opportunity. Characterizing the nature of how biases are revealed during these conversations can support teacher educators in knowing what kinds of learning opportunities are needed for prospective teachers to create classrooms in which all children are safe to learn.

CHAPTER TWO: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Literature Review

There were four major themes that came about in the literature that relates to practicing and prospective teachers' biases towards their students and what effects these biases have. The first two themes describe types of biases teachers and textbooks have towards students respectively. The third and fourth themes relate to ways teachers can combat and minimize the biases they hold towards students. I then discuss three main criteria that define what it means to use critical pedagogy. Finally, I briefly review some research on prospective teachers engaging in discussions about critical pedagogy.

The first theme that was represented in the literature is what stereotypes practicing and prospective teachers carry about their students in the classroom. One example of a stereotype practicing teachers have is towards LGBTQ students. Snapp et al., (2015) stated that "teachers are more likely to address LGBTQ slurs in class than to include the contributions of LGBTQ individuals in classroom lessons" (p. 256). The teachers in this study were only disturbed by the derogatory comments made towards students and not from the lack of representation LGBTQ students have in classrooms.

Sleeter (2001) claimed that prospective teachers have several preconceived notions about the potential students they will be educating. One specific example that supports this first theme from the literature mentioned earlier is Sleeter's (2011) study that displayed how some prospective teachers believe African American students all have an "attitude" in the classroom. Prospective teachers predict this "attitude" as being something that will detract from the learning environment of the other students. This negative bias prospective teachers have towards African American students affects how teachers think these students will behave in the classroom.

The second major theme that came about in the literature is what kinds of stereotypes textbooks are making towards students. Montano and Quintanar-Sarellana (2012) explained how English Language Learners (ELL) from their study were not seen as valuable because English was not these students' first language. The textbooks specifically from Montano and Quintanar-Sarellana's study were demeaning ELL students' native language by not having it valued in the text the way the English language was. As stated by Montano and Quintanar-Sarellana, "textbooks used in secondary ELL classrooms perpetuate a deficit view of ELLs. The textbooks fail to acknowledge [the students'] cultural and linguistic capital and demean the first language and culture of the students" (2012, p. 17). In other words, because these ELL students did not share the same culture and language as those who dominated society, these students were seen as less valuable. It is important to note, however, that representing all languages spoken at a school in textbooks would be unrealistic to accomplish and is not necessarily the solution to this problem addressed in Montano and Quintanar-Sarellana's study. It is important, however, to consider the implicit messages being communicated to ELL students through the use of textbooks.

Another example to support the second major theme in the literature comes from Hottinger (2010) and how girls were not viewing themselves as having an identity as mathematicians because of the biases mathematics textbooks had towards females. She claimed that how mathematics textbooks are positioning girls in story problems has an effect on how girls in classrooms view themselves as mathematicians. In her study, Hottinger specifically described the differences between how boys and girls were positioned as subjects of mathematical story problems. Boys who were the subject of story problems had already solved the mathematical problem, and it was the reader's job to interpret the boy's solution strategy (Hottinger, 2010).

Also, boys were solving these story problems in new and innovative ways. The portrayed boys as being active learners of mathematics. Girls who were the subject of mathematical story problems, however, were not able to solve the problem. It was the reader's job to help the girl solve the problem. Girls being viewed as helpless when solving mathematical problems supports the idea that these mathematical textbooks from Hottinger's study were positioning girls as passive learners of mathematics.

The third theme that came about in the literature is how positive representation of historically marginalized students can help reduce biases teachers and other students have towards marginalized students. Snapp (2015) explained how biases can be significantly reduced when students are taught positive aspects regarding LGBTQ people. More specifically, when students learned about positive aspects of LGBTQ lives, students were able to see LGBTQ people in a more positive light. Britzman (1995) claimed as well that representing gays and lesbians in authentic and positive ways serves as a potential remedy for hostility towards gays and lesbians and for their self-esteem. Britzman, however, recognized that representation alone is not going to change the ignorance people have towards gay and lesbian identities, but it is sufficient in making some change.

Another example that supports this third theme deals with African American students and their representation in classrooms. Sleeter (2001) explained when African American students were being represented and appreciated in the classroom these students were able to contribute unique perspectives to the class discussions. African American students were then more likely to participate because of the appreciation they received in the classroom. It is important to note as well that Sleeter's results were not necessarily specific to mathematics classrooms.

These last two examples concerning people who identify as LGBTQ and African Americans display how positive representation can help students and teachers reduce the negative biases they both have towards these historically marginalized groups. Pienta and Smith (2012) argued an example of how a lack of representation can have negative consequences regarding historically marginalized students. More specifically, Pienta and Smith explained how women in textbooks are not seen as engaging with the mathematics and science. Because of this lack of representation of women, girls are then less likely to pursue mathematics or science as careers because the number of role models they have is limited (Pienta & Smith, 2012). This lack of representation also then perpetuates the negative bias that women are not seen as mathematicians or capable of doing mathematics because they are less likely to pursue a career in STEM.

The fourth and final theme that emerged from the literature consists of teachers being more critical of the classroom setting. More specifically, teachers should consider being critical of 1) their biases towards students and 2) the resources they use in classrooms (e.g. textbooks). To address the first part of the theme, Sleeter (2001) described how novice teachers who are simply exposed to teaching a wide range of students are not able to dismantle the preconceived stereotypes they bring to the profession. Essentially, teaching experience alone is not sufficient to eliminate biases towards students. Teachers must become aware of the stereotypes they hold about their students as well as challenge these stereotypes in order to reduce these biases. To address the second part of the theme regarding teachers being critical of textbooks, Foster (2012) stated that textbooks are what "provide opportunities for teachers to engage in a critical analysis of the economic, political, and social realities outside and within the classroom" (p. 3). What Foster claimed is those who are a part of the dominant culture determine what material is being

included in these resources. It is important for teachers then to be critical of the kinds of messages these textbooks and other resources are conveying about the students to question what stereotypes are being perpetuated about students.

Some of the studies reviewed here described specific biases teachers might have towards historically marginalized students as well as the need to be critical of the resources perpetuating these biases. Further, some of these studies focus on (mathematics) classroom materials or discussions while others focused on teacher learning. In this thesis, I expand the understanding of representation and opportunities to elicit and examine biases by describing the nature of conversations among mathematics prospective teachers. Specifically, these conversations were focused on discussing a book centered on positive representations of people of color and offering teachers strategies for how to use mathematics as an opportunity to be critical of certain social structures that have historically marginalized certain groups of people. Central to the book was a theme of critical pedagogy, and teaching mathematics for social justice, specifically. This pedagogical practice is built on the theoretical backdrop of culturally relevant pedagogy which I now describe.

According to Ladson-Billings (1995), culturally relevant pedagogy is founded on three main principles: Teachers must guide students to 1) experience academic success, 2) develop cultural competence, and 3) develop the skill of being critical of the social structures around them. The only difference between culturally relevant pedagogy and critical pedagogy, according to Ladson-Billings (1995), is critical pedagogy focuses more on individual empowerment rather than a collective one. I would argue then that critical pedagogy is grounded upon those same three principles discussed. As well, critical pedagogy refers to teaching strategies that focus on

how positions of power based on race, gender, sexuality, class, etc. affect learning (Morrow & Torres, 2002).

The first principle academic success describes is how teachers must support students in being successful in class. A critical pedagogical approach would then require that teachers attend to individual student's academic needs to help students obtain this academic success (Ladson-Billings, 1995). An example of attending to individual student's academic needs would be to value students' specific skills and abilities to encourage students to express their thoughts in the classroom. If students are feeling valued and represented positively in the classroom by their teacher, then they are more likely to be academically successful (Ladson-Billings, 1995).

The second principle of a critical pedagogy is that teachers must establish cultural competence within the students. Ladson-Billings (1995) described one criterion of cultural competence as teachers needing to implement aspects of the students' cultures into the classroom. The National Education Association (n.d.) builds on that definition by also claiming that an aspect of cultural competence means being aware of one's own cultural identity so that one can better understand the varying community and familial norms each student will be accustomed to. An example of implementing aspects of students' culture would be encouraging students to use their home or first language to organize and make sense of the ideas being discussed. Translating those ideas into the standard English used in schools can follow, but having students use their native language can be a way for students to make better sense of their ideas in class while having their native language valued in the classroom.

The third principle of critical pedagogy is teaching students to become critical of the social structures around them, which involves teachers preparing students to be actively critiquing social norms and structures that continue to perpetuate social inequities. An example

of teaching students to be critical of social structures would be to have students in a mathematics classroom determine whether mortgage lenders are racist when approving loans. Students might use mathematics to consider what groups of people are being approved for the highest amount with the best interest rate. Rather than calculate meaningless numbers, students can use mathematics to be critical about how the housing market is structured, and consider if mortgage lenders are indeed racist. To summarize, a critically centered pedagogy encompasses teachers needing to implement academics in a way that is meaningful for all students, validating all students' cultural identities, and helping students develop skills to become skeptical of the social structures around them.

After discussing in-depth the three characteristics of a critically centered pedagogy, I now discuss how specifically prospective mathematics teachers might benefit from learning about and be exposed to this particular type of pedagogy. One benefit prospective mathematics teachers might gain from learning more about culturally responsive teachers is a better understanding and awareness of their own cultural identity. Experiencing critical pedagogy firsthand will theoretically allow prospective teachers to understand how the social and familial norms they are accustomed to play a part in teaching mathematics to a diverse population of students. Another benefit prospective mathematics teachers might gain from learning about critical pedagogy is an understanding of how they might benefit from certain social structures around them. Understanding one's privileges is necessary for prospective teachers to then engage their students in this kind of critical thinking.

As noted earlier, prospective and practicing mathematics teachers have biases and prejudices that manifest themselves in subtle and overt ways in classrooms and impact student learning. Teacher education programs can design learning opportunities to support teachers in

understanding and changing their own biases. These kinds of learning opportunities may take different forms such as projects to learn about marginalized communities (Aguirre et al., 2013), activities going to places in which teachers are in the minority, separate multicultural education classes, or book clubs (Johnson, 2013). Although diverse in nature, these assignments or courses typically have some commonalities including opportunities to develop openness (or a willingness to learn about other people's cultures and identities), increasing self-awareness or self-reflection by providing teachers with tools to illuminate and interrogate their own biases, and allowing for intercultural experiences (Garmon, 2005). Researchers have investigated the impact of a range of learning opportunities and characterized the ways in which teachers talk about race (Haviland, 2008) and teaching mathematics for social justice (Johnson, 2013) among other topics. This thesis will add to present research by increasing understanding of the nature of the conversations that teachers (particularly prospective mathematics teachers) have about social justice and equity in mathematics classrooms.

Theoretical Framework

Queer Theory[4] in mathematics education is an emerging theoretical perspective. In relation to prospective mathematics teachers and their conversations with each other, Queer Theory will help understand the assumptions PSTs were making about other people's experiences as well as their own collective experiences as learners and teachers of mathematics. The use of Queer Theory will assist in dissecting these assumptions along with the implications behind them and how these assumptions were perpetuated or challenged. Therefore, in this section, I cover a diverse range of ideas in order to support the reader in understanding the definitions that will undergird the rest of the study. First, I discuss Queer Theory and some of its

[4] I am choosing to capitalize Queer Theory because it represents the lens I am using throughout this thesis and therefore to me is a proper noun.

historical development in order to contextualize and define this theoretical perspective that, fundamentally, resists definitions. Next, I describe the ways in which Queer Theory is a perspective that focuses on more social identities than people's sexual orientation or gender identity in order to show why Queer Theory is sufficient for supporting the analysis in this thesis. Further, I argue for the use of Queer Theory in education, particularly teacher education, as a way of analyzing and thinking about prospective teacher discussions. I conclude by defining the main constructs mobilized in the analysis of this thesis, namely *confirming, challenging, and changing*.

Queer Theory: An overview. When mentioning the word "Queer Theory" most people cannot help but visualize gay and lesbian experiences in their minds. Many people are greatly offended by the word *queer*, especially when people feel the word is being directed towards them. For some people, queer experiences (i.e. gay and lesbian experiences) are unnatural which turns the word "queer" into some kind of slur or derogatory remark. For some, the use of Queer Theory can be viewed as a noun that describes a person's identity. Britzman (1995), however, claimed that "the queer and the theory in Queer Theory signify *actions* not actors" (p. 153). That is, when Queer is linked to the word Theory, its use signifies a verb rather than a noun linked to a person's identity. Using Queer Theory as a verb leads to a definition of Queer Theory as "offer[ing] methods of critiques to mark the repetitions of normalcy as a structure and as a pedagogy" (Britzman, 1995, p. 153). To "queer" something means to offer criticisms of social norms in a society and question why such social structures are in place as well as who has the power to maintain said structures. Thinking of Queer Theory as a verb, however, does not mean it is a prescribed list of actions to be performed in every possible scenario (Britzman, 1995).

Having a list of prescribed actions to perform when using Queer Theory would imply that Queer Theory itself can only be applied to a fixed setting.

Although Queer Theory is not exclusive to homosexuality, painting a picture for how homosexuality has been viewed historically in different cultures shows that society defines sexuality and determines the type of sexuality that is acceptable and appropriate during any moment in time. That is, what is defined as "normal" (or what aspects of society maintain power) has shifted over history. Sullivan (2003) claimed there is no true account for what homosexuality, bisexuality or heterosexuality entails because these identities are understood differently based on the experiences, culture and history surrounding them. For these reasons, the way society views same-sex desire today is not any more of a correct interpretation than in previous time periods and different cultures because experience and time have an effect on these definitions. An example of differing definitions in homosexuality is considering whether a:

> classical Greek adult, married male who periodically enjoys sexually penetrating a male adolescent [has the] same sexuality with the Native American (Indian) adult male who from childhood has taken on many aspects of a woman and is regularly penetrated by the adult male to whom he has been married in public and socially sanctioned ceremony? (Jagose, 1996, p.8)

This quotation is displaying how specifically homosexuality can be socially acceptable in different societies but take on different meanings; homosexuality in the classical Greek community is accepted between a married adult male and a young boy, and in the Native American community homosexuality is accepted between a married couple where one partner has taken on more stereotypically female attributes. Therefore, it is difficult to define strictly

what it means for a person to be a homosexual across the globe when societies are defining it in different ways.

Today's definition of homosexuality describes either a romantic or sexual attraction towards a person of the same sex. Today's definition coincides with the word sodomy, which describes anal or oral penetration with a member of the same sex. Until about the late 1800s in Britain, sodomy was perceived as any unnatural sexual practice that included oral sex and sex with the use of contraception (Sullivan, 2003). During this time period, sex was considered "unnatural" if its purpose was not for procreation. The idea of sodomy became so extreme at one point that people were being executed not just for having sexual relations with members of the opposite sex but as well because they were "transgressing gender norms" (Sullivan, 2003, p. 3). That is, people were performing their gender contradictory to the way society deemed as acceptable. For example, Katherina Hetzeldorfer was drowned in 1477 not only because she had a relationship with another female, but because she dressed and performed similar to how a man would dress and perform during this time (Sullivan, 2003). In 1781, however, a law was passed that stated people could no longer be executed based on conflicting gender performance, but could be executed based on same sex penetration.

In the 19th century, a shift in the definition of homosexuality occurred when society defined homosexuality as an illness and no longer a punishable crime (Sullivan, 2003). Homosexuality was now addressed with medical attention to find a cure. Viewing homosexuality as an illness lead to the mentality that homosexuals were born ill and were seen as lesser than the "healthy" heterosexuals.

Up until this point historically, it has been argued that biology and nature played the largest role in determining a person's sexuality. British sexologist, Havelock Ellis, argued that

homosexuality did not need to be regarded as harmful but more of a small abnormality similar to color-blindness. Viewing homosexuality as a small abnormality implied that Ellis did believe some biology (nature) had a hand in determining a person's sexuality; however, he also argued that a person's upbringing (nurture) had an impact as well (Sullivan, 2003). For these reasons, Ellis did not believe homosexuality was an illness or illegal, but believed that the potential for children becoming homosexuals could be reduced or completely eradicated if children were nurtured in the right environment.

Painting this picture for how homosexuality has been viewed historically shows that through time and different experiences the definition for homosexuality is constantly changing. That is, what society has once claimed as being normal or aberrant is susceptible to change. For example, homosexuality was once viewed as unnatural and, therefore, a religious sin which lead to homosexuality being a punishable crime. Homosexuality was then viewed as a curable illness and, therefore, no longer something unnatural. Eventually, homosexuality was seen as a result of biology and a person's upbringing. Sullivan (2003) argued that none of these definitions of homosexuality are correct or absolute truth because these definitions have been constantly revised throughout time. The definition of homosexuality is seen as truth at a given moment by a particular culture, but based on this review of homosexuality, these definitions are constantly varying based on what society is valuing at the time.

Queer Theory: A theory for all identities. The purpose for painting this historical picture of homosexuality is to show that the definitions of homosexuality are all based on what the dominant culture of a group bounded geographically is valuing at that time. The use of Queer Theory calls for a questioning of all norms that are established in a society while recognizing these norms exist only because society has deemed them as valuable. The focus of Queer Theory

includes all aspects of a society that are considered normal and acceptable by being critical of who determined what was acceptable as well as who is benefitting from these social norms. Someone using the lens of Queer Theory is critical of those who are positioned in such ways to have the power to establish and maintain these social norms as well as who is positioned to benefit from these norms. Here, I detail evidence with respect to gender and race about which identities are considered normal and are associated with social power.

Butler (1990) claimed that a person's gender identity is achieved through performed actions. If a person's gender identity is female, she is typically performing in a way that society accepts as the feminine way to act. For example, society has defined one way to be feminine as wearing high heels and a dress. If a female were to wear such clothing, society would deem her appearance appropriate because she is performing her femininity in an acceptable way to society. On the other hand, seeing a male wearing high heels and a dress causes a discontinuity in his gender identity according to society because he is not performing as appropriately male. A female wearing high heels is one example of how a definition society has used to describe femininity (wearing high heels and a dress) is only appropriate for the female gender to perform. When a male chooses to take on this definition of femininity by wearing heels and a dress, however, he is seen as problematic to society.

Another example of how gender performance is affected by what society values is how lesbians were once defined as being a male trapped in a female's body (Sullivan, 2003). Lesbians were viewed as more masculine than heterosexual females. Margaret Gibson (1998) discussed how in the nineteenth and twentieth centuries masculine intelligence was viewed as superior to the feminine counterpart. Because in the nineteenth and twentieth centuries lesbians were viewed as being more masculine than heterosexual females, Gibson made the claim then that lesbians'

intellect was necessarily superior to the heterosexual female. Gibson's claim presented a disturbance in the standards of society because homosexual women were viewed as degenerate compared to heterosexual women. The role of lesbians caused tension in society because their sexuality was viewed as lesser than heterosexuals; however, lesbians' masculinity implied their intelligence must be greater than heterosexual females. People, however, did not assume lesbians had equal intelligence to White males, and instead compared lesbians as having a similar intelligence to non-White or lower-class males. Comparing lesbian, female intelligence to the intelligence of non-White or lower-class males illustrates how society valued upper- or middle-class, White male intelligence over all other identities. Because of this kind of appropriation, females were viewed as having lesser intelligence even if they performed in a more masculine way.

Just as I have described the parallels in evolving definitions of "normal" for homosexuality and gender, these ideas continue to run in parallel when examining particular issues in STEM fields. For example, a person might use Queer Theory to consider why there are so few women in STEM fields. Many would argue that this underrepresentation is because women are not as "good" at mathematics or science as men. Pienta and Smith (2012) argued, however, that few women enter STEM fields because young girls are not seeing positive female role models in STEM related positions. Perhaps for example, women are not being properly represented in certain textbooks because women are not being portrayed as engaging in "scientific pursuits to improve the world" (Pienta & Smith, 2012, p. 34). Someone using the lens of Queer Theory would then look at who is positioned in society to have the power to not use positive female role models in textbooks to help young girls want to pursue STEM related careers. Young boys benefit from girls not being represented in textbooks because these boys are

able to see positive male role models in textbooks, and are, therefore, more likely to see themselves as achieving a career in STEM.

In addition to these perspective on gender identity and gender representation, the use of Queer Theory can extend to an analysis of topics about race. Again, there are parallels with the evolving definitions of homosexuality and gender identity. The present day definition of race describes people who have common ancestry. Theorists, Soibhan Somerville, Linda Alcoff and Tim McCaskell argued that the concept of race, however, is not something that has always existed in Western culture (Sullivan, 2003). Charles Linnaeus was one of the first to propose four main races in the world: 1) White Europeans, 2) Red Americans, 3) Yellow Asians, and 4) Black Africans (Sullivan, 2003). Along with these four racial categories, Lennaeus assigned character traits to each of the four categories: White Europeans are gentle and inventive, Red Americans are obstinate, Yellow Asians are melancholy and covetous, and Back Africans are indolent and negligent (Sullivan, 2003). Based on this early notion of racial categories, three fundamental ideas on race have developed: 1) a person's race can be determined by physical traits, 2) psychological traits such as intelligence, morality and character are specific to a person's race, and 3) these physical and psychological traits are the reason for cultural differences between races (Sullivan, 2003).

An example parallel to gender discrepancies in STEM fields also exists when looking at racial discrepancies in mathematics. There are many people who believe African-Americans and Hispanics are inherently worse at mathematics than White people because of their race. In Herrnstein and Murray's (1994) *The Bell Curve*, they proposed that African-Americans and Hispanics perform worse in mathematics due to their "inferior cognitive function" (Beasley & Fischer, 2012, p. 428). Taking on a Queer Theory lens would then require being critical of the

way mathematics classroom are structured to put these students of color at a disadvantage, rather than assume the grade discrepancies are based on race. In Steele and Aronson's (1995) study they found that when African-Americans were aware of the stereotypes placed against them in mathematics these students performed worse on exams, whereas African-Americans who were unaware of these stereotypes performed equally to White students. Using a Queer Theory lens then helps to see that discrepancies regarding performance in mathematics classes are not due to race and partially due to the stereotypes placed on these students of color.

Within this section I have discussed how Queer Theory can be used to be critical of not just sexuality, but gender and racial identities as well. Adopting a Queer Theory lens allows the norms of society to be illuminated in ways that clarify who is positioned to have power and/or privilege and what we can do to challenge this inherent privilege.

Queer Theory in (mathematics) education. At this point I have discussed how sexuality, gender and race are three facets of a person's identity that are defined based on what society values at the time. These definitions do in fact change throughout time as society places value on new aspects of these identities. In this next section, I extend the idea of definitions of identities changing throughout time to an educational setting.

There has been a wide range of research that has written about Queer Theory in subjects that include English as a second language education, language arts, music education, social studies and even science (Rands, 2009). Schools are places where systems of privilege and oppression operate and whose effects are visible. Although officially desegregated by race, many public schools are districted in ways that maintain schools that are largely racially segregated. Further, other systemic privileges are evident in schools including heterosexual privilege, Christian privilege, and male privilege. As an extension to schools, teacher education

environments are another area where these systems of privilege and oppression are apparent; therefore, teacher education contexts are suitable to analysis through the lens of Queer Theory.

Although Queer Theory is a lens used in teacher education already, often times people view mathematics as a fairly unbiased and neutral subject that is the least affected by social factors (Kumashiro, 2004). People may decide then that there is no need to "queer" mathematics (Kumashiro, 2004). Critical mathematics educators, however, have observed that "what and how we teach [math] are influenced by social factors and do have hidden messages that often reinforce oppression" (Kumashiro, 2004, p. 95). For these reasons, there is a strong need to take on the lens of Queer Theory in terms of the preparation of mathematics teachers.

Definitions of Confirming, Challenging, and Changing

The purpose of this thesis is to characterize how prospective mathematics teachers are making taken-as-shared assumptions collectively and how they challenge (or not) these assumptions when discussing their thoughts on a book about teaching for social justice. More specifically, the assumptions I examine focus on homophobia, sexism, racism[5], religion, and classism and how these prospective mathematics teachers describe what it means to teach for social justice. In this section I discuss three main definitions to address how these assumptions operate in a group discussion. These definitions include *confirming, challenging, and changing* as shown in Figure 1. These definitions were informed by Queer Theory, which supports fluidity and rejects rigid binaries, hence the reason Figure 1 demonstrates a spectrum across all three words. These definitions were also largely informed by Howard's (2006) perspective on White identity development.

[5]Although these prospective teachers may not necessarily be making homophobic, sexist or racist claims, I have chosen to use these terms specifically instead of sexuality, gender, or race respectively because the latter terms do not capture the systemic oppression that is involved with these identities.

Figure 1. Spectrum representing the fluidity between confirming *to* changing*. The arrows at either end of the spectrum represent the extension of more extreme confirming of one's biases as well as continual progress towards changing one's own biases.*

What it means for a PST to be *confirming* in a conversation means they[6] are making assumptions about a group of people based on race, gender, sexual orientation, religion, or classism, or an assumption about what it means to teach for social justice. There are two ways in which *confirming* can be manifested: through 1) emotional responses during a conversation and 2) PST's actions in a conversation. The main way a PST could respond emotionally while *confirming* in a group discussion is by having a sense of comfort in these conversations. That is, the PST is not confronting anything necessarily problematic to them and, therefore, is uninterrupted in their way of thinking. Some examples of how a PST could *confirm* in a conversation is by claiming that their perspective is right or is the only one, ignoring other perspectives in a conversation, recognizing their own personal experience as applicable and valid for all individuals, making consistent assumptions similar to another person in the group, or assuming their claims are factual. All of these are examples of *confirming* in a group discussion because these actions reinforce the heterosexual, White, masculine, Christian, upper class superiority that exists.

[6] Rather than using "she or he" to reference singular gender ambiguity, I am choosing to use the word "them" or "they" to eliminate the gender binary that is associated with she or he. Although them and they are grammatically used for plural pronouns, I feel it captures the fluidity of gender better than the binary she/he.

Table 1. Associated emotions with confirming.

Emotional Responses
Comfort
Neutrality
Mild happiness

Table 2. Associated actions with confirming.

Actions
Seeing perspective as correct and the only one
Ignoring other perspectives
Recognizing personal experience as applicable to all people and best for all people
Assuming claims are fact

What it means for a PST to *challenge* in a conversation means they are having discomfort when taking part in discussions regarding people's race, gender, sexual orientation, religion or classism, or when discussing teaching for social justice. Similar to manifestations of *confirming*

in a conversation, *challenging* in a conversation can be demonstrated through 1) emotional responses during a conversation and 2) PST's actions in a conversation. Some examples of emotional responses when a PST is *challenging* during a discussion about a particular topic could be feeling threatened by differences other than their own experience or even fear, avoidance, anger, defensiveness, shame, or confusion. This sense of *challenging* in group discussions could also be manifested through actions taken during a conversation. For example, some actions a PST could take is showing hostility towards a topic being discussed, passing judgement or firmly disagreeing. Although these examples are revealing a tension within the PST, *challenging* is still problematic because, similar to *confirming*, it reinforces the heterosexual, White, masculine, Christian, upper class superiority that exists. Rather than a PST acknowledging the discomfort they may feel as a way for them to self-reflect on their own biases, *challenging* means to resist that discomfort and continue to claim that their perspective is correct.

It is important to note as well that because of the nature of the spectrum from Figure 1, there are two possible outcomes that result when a PST *challenges* biases. The first outcome could be a PST *challenging* some PST's bias, which could then ultimately lead the original PST to further question the implications of this bias. For example, the PST could question who stands to benefit from this bias. This kind of *challenging* through questioning who stands to benefit from this bias, who is the assumed privileged population, etc. would perpetuate the PST towards the *changing* end of the spectrum. The second possible outcome from a PST *challenging* would be if they further cement themselves in their own biases through their disagreement with another's bias. An example of this response through *challenging* could be disagreeing with a PST's claim; however, in the attempt to redirect, the PSTs might both end up with problematic

assumptions. This type of *challenging* would then lead the PST towards the more *confirming* end of the spectrum.

Table 3. Associated emotions with challenging.

Emotional Responses
Fear
Avoidance
Anger
Defensiveness
Shame
Threatened by differences
Confusion

Table 4. Associated actions with challenging.

Actions
Showing hostility
Passing judgement
Firmly disagreeing

What it means for a PST to *change* in a conversation means they are having a fundamental shift in assumptions they hold regarding certain populations when taking part in

discussions regarding people's race, gender, sexual orientation, religion or classism, or teaching for social justice. *Changing* is vastly different from *challenging* in regards to dismantling systems of oppression such as racism, homophobia, sexism, etc. Similar to previous definitions, *changing* in a conversation can be demonstrated through 1) emotional responses during a conversation and 2) PST's actions in a conversation. Some examples of emotional responses when a PST is *changing* during a discussion about a particular topic could be feeling a new appreciation or respect for other populations or a sense of empathy towards people. This sense of *changing* in group discussions could also be manifested through actions taken during a conversation. For example, PSTs could challenge heterosexual, White, masculine, Christian, upper-class dominance in a conversation. They could also try and learn from other people's experiences from other cultures, religions, etc. PSTs could take moments to self-reflect on their own experiences and how those might differ from others. PSTs who are *changing* might consider acknowledging those populations who are oppressed, shift their underlying assumptions about those populations and advocate for them. *Changing* then requires that a PST feel a sense of tension and discomfort that then interrupts ingrained assumptions they hold towards people. *Changing* then is a step towards PSTs challenging or dismantling the heterosexual, White, masculine, Christian, upper class superiority that exists.

Table 5. Associated emotions with changing.

Emotional Responses
Appreciation
Respect
Empathy

Table 6. Associated actions with changing.

Actions
Challenging social structures
Acknowledging oppression
Self-reflecting
Advocating
Fundamentally shifting underlying assumptions

The importance of these three definitions of *confirming*, *challenging*, and *changing* is to help me as the researcher be able to identify when and how prospective teachers are making assumptions that elicit certain biases. How these definitions are used in the analysis are described in a subsequent section.

Research Question

As reviewed, prospective teachers have biases that are communicated implicitly and explicitly to students. These biases can have negative consequences for students' performance or achievement. The effect of biases can be mediated by critical pedagogy in which teachers present academics in a way that is meaningful for all students, validates all students' cultural identities, and helps students develop skills to become skeptical of the social structures around them. Therefore, prospective teachers who are learning to teach using critical pedagogy or discussing pedagogical practices in alignment with critical pedagogy will reveal their biases during these discussions. A Queer Theory perspective provides me, as a researcher, an opportunity to consider how biases are being *confirmed* and *changed* in a localized discussion about critical pedagogy. My study then is centered around the following research question: How do prospective mathematics teachers *confirm*, *challenge*, and *change* each other's biases in their discussions about *Reading and Writing the World with Mathematics*?

CHAPTER THREE: METHODOLOGY

Context, Participants, and Data Collection

The purpose of this study is to observe how prospective mathematics teachers are *confirming* or *changing* in their discussions about *Reading and Writing the World with Mathematics*. Specifically, there are five total participants; four females and one male. Three of the female participants were White and one was bi-racial (half Native Hawaiian/half White). The bi-racial participant self identifies as half Native Hawaiian. The male participant was White. Each of the participants were enrolled in a mathematics education methods course at a mountain west university. In this methods course each of the five participants were required to read the book *Reading and Writing the World with Mathematics* by Eric (Rico) Gutstein. The purpose of the given assignment was to provide the students with an opportunity to think about schooling from the perspective of a critical pedagogy and illuminate and examine their biases. Critical pedagogy refers to teaching strategies that focus on how positions of power based on race, gender, sexuality, class, etc. affect learning (Morrow & Torres, 2002).

The participants in this study met together three times over the semester outside of class to have discussions about what they read in the book. Before each of the discussions, the instructor of the course sent the group a set of questions to help prompt their discussion. Some examples of these prompting questions include: 1) In what ways is teaching mathematics like teaching other subject areas? In what ways is it different? 2) What mathematical work do you think lends itself to teaching mathematics for social justice? 3) Did you find the student and parent perspectives helpful for considering whether you might use tasks that teach mathematics for social justice? Why or why not? (For a full set of the provided discussion questions, see the Appendix.) During these discussions the five participants were not asked to systematically go around and share their thoughts and notes on the section of the book they read. Rather, the

participants were asked to use the given discussion questions as guidance for the kinds of topics to discuss about the book. A different person for each of the three sessions was designated as the leader whose responsibility was to keep the discussion going if there was ever a lull. Each of the three book club discussions were audio recorded by the participants themselves; no researcher or instructor was present during the actual discussions. The audio-recordings were later submitted to the instructor of the methods course as part of an assignment.

The data for this study are the three recorded discussion sessions and their transcripts. Transcripts were word-for-word but eliminated the "ums" and "likes" that were extraneous to meaning. Transcripts were made and verified by listening again to the full recording after the transcript was complete. The act of listening to the transcriptions allowed me, as the researcher, to interpret their emotional responses associated with their discussions with each other. Specific sections from the transcript are displayed in the results section of this thesis and have been reduced to the main ideas of the conversation to be presented to the reader more easily. Any places where the transcript was reduced will be indicated with an ellipsis followed by a brief summary of what was omitted in brackets. The PSTs represented in the transcripts throughout this thesis are labeled A, B, C, etc. Person A in one transcript, however, may not necessarily be the same speaker in another transcript. The purpose for this labeling was to show the different speakers throughout each of the transcription chunks, however, this thesis is not focused on *who* exactly is making what claims, and therefore it was not necessary to differentiate each of the participants across all transcription chunks.

Reading and writing the world with mathematics. The book *Reading and Writing the World with Mathematics* by Eric (Rico) Gutstein is a book about his experience implementing a critical pedagogy in his own mathematics classroom. In this book, Rico described mathematical

projects he presented to his students that dealt with some sort of injustice in the world. Some of these projects were based on racism, discrimination, socioeconomic status, and educational opportunities. The purpose of these projects was to help students investigate a social issue in the world that Rico's students could relate to on a personal level. An example of such a project was when the students were asked to compare two different world map projections; the Mercator Projection and the Peters Projection (Gutstein, 2006). The purpose of this task was for students to use mathematics to discuss what messages each of these maps were sending based on how the maps were distorted. More specifically, students were asked to compare the actual area of 1) Mexico and Alaska, 2) Greenland and Africa, and 3) India and Scandinavia with the students' estimated areas portrayed on each of the two map projections (Gutstein, 2006). An interesting finding from the students was that in actuality Africa is much larger in size than Greenland, however the Mercator Projection distorts Greenland in such a way that it looks larger than Africa. Many students were upset with this finding because growing up students had seen the Mercator Projection taught most often in their classes. Because of how much students were exposed to the Mercator Projection, the students felt deceived that they were being taught incorrect representations of the countries in the world. Students were especially bothered by the fact that they never questioned (or were supported in questioning) the maps they were being shown in school. One student even said in response to this project, "I feel that we didn't get the right info and that we were tricked [into] thinking some countries were bigger than others when it wasn't even true. And this makes me think what else are they lying to us about" (Gutstein, 2006, p. 82). This project was one that helped students be more critical of the knowledge they had been previously taught in school.

The title of Rico's book is *Reading and Writing the World with Mathematics.* He provided two more definitions that describe what exactly it means to "read" and "write" the world with mathematics. First, Rico defined *reading the world* as "understand[ing] the sociopolitical, cultural-historical conditions of one's life, community, society, and world" (Gutstein, 2006, p. 4). This quotation is describing reading the world as recognizing the ways in which society functions, who is power in society, and what norms are established for an individual to successfully function in that society. *Writing the world* means "effect[ing] change in it" (Gutstein, 2006, p. 4). By reading the world one can understand how the world functions, and by writing the world one can make decisions to try and change who is in power in society.

Knowing Rico's definitions of reading and writing the world helps to understand what he meant by *reading and writing the world with mathematics*. To read the world with mathematics means to use mathematics to understand relations of power, understand how privileges are granted to only some individuals, and to understand discrimination between people of other races, classes, genders, sexualities, etc. (Gutstein, 2006). To write the world specifically with mathematics means to use mathematics to then "change the world" (Gutstein, 2006, p. 27).

Rico argued that mathematics can be used as a tool to uncover hidden injustices (i.e. racism) even when "those in power want [injustices] to remain concealed" (Gutstein, 2006, p. 187). His purpose for using a more critical pedagogy was to help his students recognize the power mathematics has in uncovering these injustices. Rico claimed the more mathematical tasks students engage in that are themed around representing the inequities in the world, the more students' assumptions about people in the world will be challenged. The more students' ideas are being challenged, the more they will feel obligated to respond and take action towards these challenges. Overtime, students will slowly redefine themselves in relation to the world around

them, and how they will choose to respond to future experiences (Gutstein, 2006). Rico's purpose then for presenting mathematical tasks that focus on injustices in society to his students was not just to help students increase their mathematical abilities, but also to allow students to be confident in their abilities to make changes in the world.

Data Analysis

After transcribing the book club discussions, I used discourse analysis based on multiple perspectives (Herbel-Eisenmann & Otten, 2011; Herbel-Eisenmann, Johnson, Otten, Cirillo, and Steele, 2015) by developing a set of questions to interrogate the data through three phases. Particularly, I examined the book club discussions for evidence of prospective teachers strictly *confirming* in their discussions, *challenging* some aspect of the discussion, or *changing* during the discussion. It is important to address that each of the phases of coding were up to my discretion. It is possible that my interpretations of the data could be different from another researcher's perspective. Although I did my best to remain as unbiased as possible, it is obvious my bias could not be ignored. More specifically, my White, Christian, heterosexual, middle class, female perspective shaped my interpretations of the data. Because the results of my study are not meant to be generalized for all prospective mathematics teachers, this threat to validity is minimized.

Phase 1: Chunking the data. I began Phase 1 by first determining the intervals of time when an idea was discussed between the group for two or more conversational turns, where a conversational turn refers to a change between speakers about the same topic. I refer to this process of determining these intervals of time as "conversational chunking." I then began to look for any conversational chunks that were exclusively about mathematics or mathematics teaching and learning and removed those conversation chunks as there are other research studies that have examined these topics (e.g., Davis, 1997; Thompson, 1984). Conversations were labeled as on

the topic of the definition of mathematics if a person explicitly or implicitly suggested the definition of mathematics is a: 1) set of axioms, 2) socially constructed set of principles, 3) God-given truth, 4) tool for understanding social issues. Some phrases that might indicate the topic was about the definition of mathematics include: "math is a set of theorems we use to make connections in the world", "math is something humans discovered", "math exists because humans created it", "God gave us math", or "math helps us understand the world". Conversations were labeled as on the topic of mathematics teaching and learning if a person explicitly or implicitly references: 1) a classroom setting, 2) teachers, 3) students, or 4) schools. Some phrases to indicate the topic was about mathematics teaching and learning might include: "that's not what teachers do", "that's not how schools work", "students aren't capable of learning that", or "these conversations don't seem appropriate for a math class".

I then looked at each of the remaining conversational chunks and determined whether the topic of conversation was about a social system of oppression such as: homophobia, sexism, racism, religion, classism, etc. Another topic of conversation would also include teaching for social justice. Although this is not a social system of oppression, the PSTs are enrolled in a course specifically surrounding this topic, and therefore is likely to come out in their discussions. Conversations were considered to be on the topic of a social system of oppression if the conversation was about a person's identity, social interactions, social structures, and so on. Conversations were considered to be on the topic of teaching for social justice if the PSTs specifically mentioned teaching for social justice in some way. I only noted a chunk as being on this topic if it was explicitly stated rather than something I inferred. It is important to note that if these conversational chunks were also relating to mathematics or mathematics teaching and learning I kept these in the data set because they are also about a system of oppression.

Phase 2: Interrogating questions. I began Phase 2 by reviewing the intervals of conversational chunks I defined in Phase 1 and asked four main questions to interrogate the data; 1) What phrases and/or grammatical structures communicate *expectations* of how to perform in the group or *ambiguity* with how to perform? 2) What phrases and/or grammatical structures communicate *certainty* or *uncertainty*? 3) What phrases and/or grammatical structures communicate *binaries* or *spectrums*? and 4) What phrases and/or grammatical structures communicate *categories* or *fluidity*? As I went through the chunks and asked these four questions I made note of what answers came about in response to these questions. The reason for asking these four specific questions relates back to my theoretical framework. More specifically, these dualities and comparisons are inherent in Queer Theory. For example, one focus of Queer Theory is to dismantle rigid categories and consider more fluidity in people's identities, ideas, etc. Therefore, these four questions are focused on more rigid ways of thinking such as expectations, certainty, binaries and categories in comparison to more flexible ways of thinking such as ambiguity, uncertainty, spectrums and fluidity.

Phase 3: Categorizing confirming, challenging, and changing. Phase three involved me grouping together the notes I took from Phase 2 regarding the answers to those four interrogating questions. I specifically grouped together responses relating to instances of PSTs strictly *confirming*, *confirming* and somewhat *challenging*, *challenging* with some *confirming*, strictly *challenging*, and instances of them *changing* throughout the discussions. The purpose for looking at all five categories was to create more of a spectrum when it came to categorizing how the PSTs were *confirming*, *challenging*, or *changing* to better align with my use of Queer Theory (see Figure 1). Again, Queer Theory's purpose is to challenge rigid categorizing, and although I still have categories, I felt the spectrum would align better with this theory.

Table 7. Interrogating questions for three phases of data analysis

Phase of Analysis	**Questions Used to Interrogate Transcript**
Phase 1 *Chunking the Data*	• When are PSTs having sustained conversations about one idea for two or more conversational turns? • Is this sustained conversation exclusively about mathematics or mathematics teaching and learning? • Is this sustained conversation on the topic of homophobia, sexism, racism, religion, socioeconomic status, or teaching for social justice?
Phase 2 *Interrogating Questions*	• What phrases and/or grammatical structures communicate *expectations* of how to perform in the group or *ambiguity* with how to perform? • What phrases and/or grammatical structures communicate *certainty* or *uncertainty*? • What phrases and/or grammatical structures communicate *binaries* or *spectrums*? • What phrases and/or grammatical structures communicate *categories* or *fluidity*?
Phase 3 *Categorizing confirming, challenging, and changing*	• How are these phrases and/or grammatical structures displaying the PST *confirming* some idea? • How are these phrases and/or grammatical structures displaying a PST *challenging* some idea? • How are these phrases and/or grammatical structures displaying the PST *changing* some idea?

CHAPTER FOUR: RESULTS AND DISCUSSION

Results

In discussions about *Reading and Writing the World with Mathematics*, prospective mathematics teachers have opportunities to experience a range of emotions as well as engage in a full range of actions (described earlier). Here, I illustrate the points along the continuum of *confirming* /*challenging*/*changing* with evidence from these discussions. First, I describe the *confirming* end of the continuum--reporting what my analysis revealed about the phrases and/or grammatical structures communicated about expectations, certainty, binaries, and categories. I also describe the content of these conversations with respect to homophobia, sexism, racism, religion, socioeconomic status, or teaching for social justice. Next, I describe the *challenging* section of the continuum by reporting on what my analysis revealed about the phrases and/or grammatical structures communicated here about expectations, ambiguity, certainty, uncertainty, binaries, spectrums, categories, and fluidity. I also describe the content of these conversations with respect to homophobia, sexism, racism, religion, socioeconomic status, or something else. There was no evidence of the prospective mathematics teachers *changing* so that end of the continuum is not illuminated by the data; however, the possible reasons for this lack of *changing* and its implications will be discussed. Finally, I describe the distribution of *confirming* and *challenging* across the three discussions the students had including the content of these conversations with respect to homophobia, racism, religion, socioeconomic status, or something else. It is important to note that there were no instances of sexism that occurred when analyzing the data. I discuss my own speculations as to why this might be in Chapter 5 of this thesis.

Confirming. Across the three book club discussions, there were sixteen data chunks of the total 47 that were at the *confirming* end of the continuum (see Figure 2). My analysis revealed that these chunks generally had the following characteristics: declarative statements,

affirmations, rigid binaries and categories, and assumed expectations within the group. In this section, I will contextualize some of these characteristics by illustrating them with particular data chunks. The data chunks presented here were chosen to represent each of the discussions. Also, these data chunks were the ones that were robust in what they revealed about the phrases and grammatical structures used in *confirming*. Further, these data chunks represent a range of the content discussed (i.e. homophobia, sexism, racism, religion, socioeconomic status, or teaching for social justice).

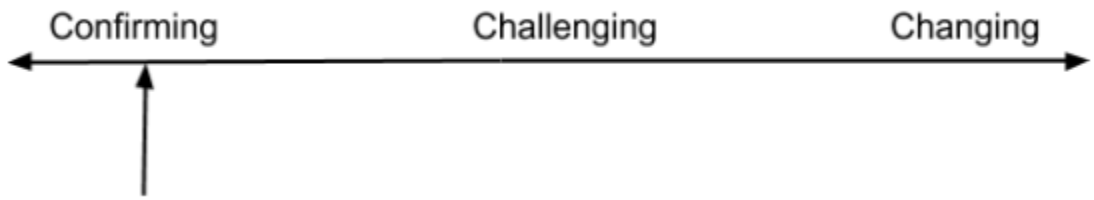

Figure 2. The following section discusses data chunks on the confirming *end of the spectrum.*

Discussion 1. Chunk 1. Early in the first book club discussion, PSTs were talking about how so far in Rico's book most of the mathematical concepts being discussed were statistics-based. The group grappled with how they felt statistics fit into mathematics education classes and whether it constituted as "real" mathematics. In terms of conversations about statistics, this conversation was also focused on the statistical concept, correlation, and more specifically in regards to whether there is a correlation between Latinxs being more likely than other races to be pulled over by police officers because of their race. Therefore, this discussion was about *racism*.

> **A**: A lot of it is correlation like the whole thing about pulling over Latinos. I mean it's very high correlation, it could be very strongly related, but it could also be that Latinos are more likely to make these mistakes. Does that make sense?

B: Because of some cultural misunderstanding maybe.

A: Exactly, there could be all these different factors or maybe...I don't know I mean maybe Latinos are more likely to drive when cops are in a certain area like these are very unlikely, but they should still be factored in.

There were several instances in this data chunk that supported the students' overall conversation as being one that is a part of the *confirming* end of the spectrum. One example of why this data chunk belongs under *confirming* is when one of the PSTs stated "It could be very strongly related, but it could also be that Latinos are more likely make these mistakes." This statement is an example of a PST categorizing Latinxs as a group of people who are more likely to make mistakes when it comes to obeying traffic laws. Another PST responded to this by saying that Latinxs being pulled over because they are more likely to make mistakes could be due to some "cultural misunderstanding." This particular PST is categorizing all Latinxs as not being a part of the dominant culture in the United States.[7] It is subtle; however, there is still an assumption being made that Latinxs are not a part of the culture, which is placing blame on Latinxs for being pulled over. In each of these scenarios the PSTs seem to be assuming that Latinxs are more likely to be pulled over for some other reason other than their race.

In this particular instance it seems as though the PSTs were hesitant to accept that racism really could be the reason behind Latinxs being pulled over more often by the police. The evidence to support this comes from the PSTs making statements such as "it could also be that Latinos are more likely to make these mistakes." This statement is problematic because the PSTs are assuming that this group of people is more likely to break the law because of their race. The PSTs also claim that Latinxs might be getting pulled over more often because of a "cultural

7 Although the PSTs use the term "America", I will use "United States" because America can reference Canada, the United States, Mexico or even South America. When the PSTs are saying "America" they are specifically talking about the United States, and therefore I am choosing to make that distinction.

misunderstanding," or in other words the PSTs are assuming that Latinx culture could result in them inadvertently breaking the law. This last statement is particularly problematic because the PSTs are making the assumption that Latinxs are not a part of the culture in the United States and, therefore, make mistakes. It is possible that the PSTs are assuming Latinxs are immigrants and not actually United States citizens. These statements are a clear indication that the PSTs were altogether avoiding the fact that Latinxs are more likely to be pulled over by the police because of racial profiling. The PSTs were putting the blame on Latinxs and not on the police who are the ones pulling them over.

Discussion 2. Chunk 1. Early in the second book club discussion PSTs were discussing briefly about what it would look like to teach for social justice in a mathematics classroom. The PSTs were grappling with how much teaching for social justice needed to be integrated in a mathematics classroom as well as what it would look like to do so. The PSTs discussed a potential example of teaching for social justice in terms of homophobic remarks being make by students. For these reasons, this data chunk was categorized as *social justice* and *homophobia*.

> **A**: Do we need to be teaching social justice in every single moment in our classrooms? … [The PSTs go on to briefly discuss how Rico's students did appreciate sometimes his use of non-abstract mathematics contexts.]
>
> **B**: Yeah but at the same time there's more than just social justice. I could be interested in other things too or maybe there's a couple kids who said they didn't like math maybe it was too heavy on social justice and maybe they would have appreciated more if they did a baking problem or something.
>
> **C**: Just going along with what both of you have said I think you can teach social justice in the way that you teach students not necessarily with problems like he [Rico] was doing

but in your relationship with them [students]. If a student says 'that's so gay', you say 'don't say gay. We say dumb or stupid.'

D: Or nothing at all.

B: Or something positive.

C: You correct that in the classroom. You don't let that attitude or those comments slide.

D: That's social justice.

There were several instances in this data chunk that justified its need to categorize it along the *confirming* end of the spectrum. The first example is when one PST made the claim that "you can teach social justice...not necessarily with problems...but in your relationship with them." It is possible this PST is expressing certainty that teaching for social justice involves the relationship a teacher has with the student. It is also possible this PST is claiming that mathematics is not an avenue for teaching for social justice. The first interpretation of the PST's comment is problematic because the PST is making the assumption that all that is required to teach for social justice means having a relationship with the students to be able to correct their problematic language. The second interpretation of the PST's comment is also problematic because the PST is not viewing mathematics as a way to be critical of social injustices in the world, even though Rico's book provided this PST with several examples with how mathematics could be used to teach social justice.

Another example of this certainty was when two PSTs made the claim at the end of the chunk about teaching for social justice as about not letting homophobic comments slide in the classroom environment. In this instance it is clear that the PSTs' understanding of what it means to teach for social justice is to simply replace problematic language. For example, the PSTs expressed how if a potential student were to say "that's so gay" in the classroom they would

correct that student by saying "we say dumb or stupid" instead. One PST then concluded at the end that "that's social justice." This understanding is problematic because this instance would then be communicating to the potential student that the meaning of gay then is "dumb" or "stupid." Rather than just replacing problematic, and in this case homophobic, language, teaching for social justice would mean discussing the implications behind using the word "gay" in that context. It would also include discussing how that use of "gay" would degrade those who identify as specifically gay as well those along the LGBTQ spectrum.

There were two examples across this data chunk in regards to making strict categories. The first example is when a student made the claim that "there's more than just social justice" in regards to the kinds of mathematical lesson that should be taking place in a classroom. In this instance, one interpretation could be that the PST is implying that there are categories of different kinds of problems to be solved in mathematics classrooms--there are social justice problems and there are baking problems. Another possible interpretation could be the PST implying that there are more important subjects than teaching for social justice. In other words, social justice is one subject to learn about, but students must also learn mathematics, history, science, etc. The implication behind the first interpretation is problematic because it is as if the PST is viewing the importance of mathematics in terms of baking as equally as important to the mathematics involved in better understanding unjust social structures. The implication behind the second interpretation is problematic because the PST is categorizing teaching subjects as not being able to use mathematics, history, science, etc. as a way to understand unjust social structures.

The third example regarding a PST to creating strict categories was when they made the comment about correcting a student if a student ever said "that's so gay" in a classroom. The

PST's solution to that comment would be to correct the student by saying "we say dumb or stupid" instead. This suggested rephrasing is categorizing the meaning of "gay" as something that is dumb or stupid. It is important to note that one PST responded by suggesting that they as the teacher could also respond by saying "something positive" rather than saying "dumb" or "stupid." Although this type of response might seem like a form of *changing* the group discussion, I feel it is not an instance of the PST *changing*, but rather a recommended modification. The reason for this is because this comment is not taken up by anyone else in the group and is left stagnant. Therefore, this contribution is more someone recommending another idea rather than *changing* a bias.

Discussion 2. Chunk 2. The second data chunk from the second book club discussion was about Rico's frequent discussions about racism in his mathematics classrooms. More specifically, the PSTs were concerned about whether or not too many discussions about racism will perpetuate an almost "reverse racism" towards White people. There were some PSTs who were grappling with this balance of presenting the concept of racism without turning the students (with the majority being Latinxs) against White people. Because of this information, this particular data chunk is about *racism*.

A: Do you think he is encouraging racism in his students toward White people? That's just a thought; just a general question.

B: I've always been White so I've never really been able to say anything about that.

A: Do you feel like these students will come out with a skewed perception of White people and be racist towards them?

B: It's possible.

C: Is it skewed if he's showing them numerical evidence though?

D: But did you read what he's writing to these kids in these letters? That's what really irked me cause he's not just presenting facts he's like 'that's absolutely racist' and I was like, whoa whoa whoa.

… [The PSTs briefly discuss an instance in the book when a student had asked Rico to answer some questions. The PSTs were bothered by Rico not explicitly telling the student that his answers to her questions were his opinions and not necessarily fact.]

A: I was just wondering cause like it's not good to show them that White people are racist, but then still perpetuate racism towards White people.

… [The PSTs briefly discuss an instance they had with a past professor who was facilitating discussions about teaching for social justice, but was explicit when telling the students that his goal was not for everyone to hate White people.]

C: There's the balance of trying to help them [students] see the racism that's there, and I think that's what he [Rico] is trying to do, but I can see what you mean about the potential side effect where they start to go into reverse racism.

There were several examples from this particular data chunk that justify its need to be along the *confirming* end of the continuum. The first example being when a PST wondered about whether Rico was encouraging racism towards White people. The grammatical structure used by this PST was in the form of a question. It is more obvious that declarative statements specifically oftentimes express certainty. Asking questions does not always obviously express that same certainty, however, there is an underlying implication that the PST was viewing racism as hatred toward a group of people rather than understanding the oppression that corresponds with racism. Although it is subtle, this student was *confirming* the idea that racism does not relate to oppression. *Confirming* the idea that reversing racism can exist occurs as well when several other

PSTs made comments such as “It’s [reverse racism] possible,” “will students come out with a skewed perception of White people and be racist towards them,” “perpetuate racism towards White people,” and “start to go into reverse racism.” These are all instances where PSTs were *confirming* the idea that reverse racism is possible because there were several conversational turns that involved them making declarative statements about this topic.

Another instance where a PST was *confirming* through a declarative statement was when a PST stated that “I’ve always been White so I’ve never really been able to say anything about that.” The antecedent to the PST’s use of “that” I am assuming could be about racism in general or more specifically racism towards White people. Therefore, one interpretation of the PST’s comment could be the PST making the claim that because they are White, this topic of racism does not seem to apply to them. It is possible this PST feels as though they cannot contribute to the conversation or answer the question because to them being White means not understanding racism. Because of this declarative statement then, this PST is *confirming* the idea that White people are not able to be involved with discussions about racism. It is possible as well that since the PST is not on the receiving end of the racist behavior, they may feel it is not their responsibility or even right to engage in discussions about racism.

A second possible interpretation of the PST’s comment could be the Catch 22 White people feel when talking about racism. More specifically, this PST might feel that if they say racism does not exist then they could be accused of being racist for not acknowledging the existence of racism. Alternatively, if the PST admits to the existence of racism, then that would imply White people are in fact racist. The only option this PST feels then is to not engage in this conversation to avoid being a possible racist.

Both interpretations of the meaning of this PST's comment are problematic because first they are displaying the privilege this PST has by being able to avoid talking about racism. White people as a whole are not oppressed in terms of their race and therefore may not be exposed to racism frequently. When being exposed to discussions about racism, White people can become uncomfortable. It is a privilege then for White people, and specifically this PST to be able to disengage from the conversation to escape the discomfort when being exposed to discussions about racism. Another reason both interpretations of the PST's comments are problematic is because by choosing to not engage in discussions about racism, the PST is possibly then not taking any responsibility for participating in and perpetuating racist ideologies.

Discussion 3. Chunk 1. Towards the end of the third book club discussion there was a particular data chunk where these PSTs were discussing how it is problematic for teachers to not teach their students about unjust issues going on in the world. One PST also mentioned that because of their religious faith they, as future teachers, have a lot of strength in discerning when and how to influence students for the better. For these reasons I categorized the subject of this data chunk as *religion*.

> **A**: At the end [of a website discussing mathematics problems Rico has used that are based around social justice] it was like 'it is unjust and unright for people to not teach these things.
>
> … [The last speaker could not remember their train of thought and needed to be reminded by the other PSTs the topic they were on.]
>
> **A**: You need to be teaching those kinds of things [problems relating to social justice] rather than the other things because...it's bad.

B: And I really think some of these questions are questions we're never going to find the answer to, and one thing each of us have really been blessed with is that we have the Spirit with us. Like we can have the Spirit with us to guide us in what we need to do in the moment if something arises or how we need to influence our students.

C: That's a good point.

D: Amen.

C: Amen. [*collective laughter*][8]

An example from this data chunk that displays PSTs *confirming* is when one PST claimed that all PSTs in this group discussion are "blessed" because they have the "Spirit" with them. The grammatical phrase the PST was using here was a form of categorizing. More specifically, a possible interpretation could be that the PST was categorizing the group as being unique teachers because they have a particular set of religious beliefs that give them an advantage. More specifically, this PST was *confirming* the idea that because of their beliefs, these PSTs have a "Spirit" to discern better the needs of their students.

This specific instance from the results section displays how the PSTs believe they were exempt from learning about the diverse lives of their future students (e.g. student's race, religion, sexual orientation, etc.) because of the PSTs' religious beliefs. Evidence of this comes from when the PSTs discussed how they are unique teachers because they have the "Spirit" with them to be able to discern the needs of their students better. Because the PSTs agreed with this claim and an entire book club discussion itself ended after this moment, I conclude that the PSTs were using their religious beliefs to excuse them from having to actually learn about racism for example and how that might be prevalent in the classroom. Based on this conversation I infer

[8] I wanted to note specifically here that the PSTs ended this conversation with laughter, thus the description in brackets.

that the "Spirit" is what they believe will guide them to do the right thing and, therefore, learning about racism is not necessary. It is also possible then that the PSTs might also believe that those who are of other faiths who do not have this "Spirit" are not exempt from learning about racism in the classroom. Further, their discussion of the "Spirit" invokes (for those with the shared religious beliefs) an external participant who has irrevocable authority (Johnson, 2016). That is, the discussion is no longer just supported and sustained by those present in the discussion but also granted a higher level of approval by the non-present divine actor (Johnson, 2016).

Another example of PSTs *confirming* in this data chunk is when several of them ended this conversation with two "amens" and then with laughter. These individual and group responses are an example of the group having a clear expectation for how to communicate with each other. Because this group just had a discussion about their beliefs in terms of how to influence students in the classroom, several of the PSTs felt it appropriate to jokingly end with the salutation "amen" to participate in the same religious Discourse (Gee, 1989). This instance was an example of *confirming* because these few PSTs were taking for granted the fact that all members of the group would appreciate and understand this religious reference.

Challenging. Across the three book club discussions, there were five data chunks out of the total 47 that were at the strictly *challenging* end of the continuum (see Figure 3). It is important to note that all five of these chunks are only from the second book club discussion. My analysis revealed that across all five chunks generally had the same characteristics as the *confirming* section, namely: declarative statements, interjections, rigid binaries and categories. In this section, I will contextualize some of these characteristics by illustrating them with particular data chunks. The data chunks presented here were chosen to represent each of the discussions and because they were robust in what was revealed about the phrases and grammatical structures

used in *confirming*. Further, the only topic that arose in all five data chunks was racism, and therefore, the specific chunks discussed in this section represent topics surrounding racism. Although some similar characteristics arose with this section when compared to *confirming*, the main differences between these data chunks are the emotional responses that also arose. These kinds of intense emotions are defining features of what it means to *challenge* and, therefore, will be discussed in more detail with each of the given data chunks.

Figure 3. The following section discusses data chunks on the challenging *part of the spectrum.*

Discussion 2. Chunk 1. The first data chunk from the second book club discussion is again on the strictly *challenging* part of the spectrum displayed in Figure 3. More specifically, this data chunk involves a few PSTs discussing Rico's claims that when a certain school rejects an applicant of color it is important to consider that racism could be a factor. Therefore, I categorized the topic of this data chunk as *racism*.

A: Oh like the kid when he's talking about going to Whitney Young Magnet School or whatever.

… [PSTs have brief discussion about how the school was on the news recently]

A: Oh, but when he was like, 'so-and-so should be able to get into the school and it's not fair. It's racist. Yes, it's racist.' I was like whoa, let's not just throw that out there.

B: Yeah.

In this particular data chunk, the example of a PST *challenging* occurred when the PST said "Whoa, let's not just throw that out there" in regards to claiming the situation as being racist. The first indicator of *challenging* occurred with the interjection "whoa" followed by the declarative statement "let's not just throw that out there." These two grammatical structures communicate that the PST was *challenging* this claim that something is racist and that claiming the school as racist is not appropriate for this situation. It is clear as well that this PST was defensive towards Rico's assertion and this defensiveness is a sign of *challenging*.

Discussion 2. Chunk 2. The second data chunk from the second book club discussion involves the PSTs discussing Rico's claim that certain situations are racist and still exists on the strictly *challenging* part of the spectrum. Therefore, I categorize this chunk as being about *racism*. This data chunk also portrayed distinct emotional responses to these claims that show these PSTs are *challenging*.

A: Oh and the thing about when they lose the kid's application.

B: I was getting really mad when I was reading that.

C: He's so quick to like the banks are racist, this is racist, this is racist and even like…

B: I mean he's entitled to his opinion, but the fact that he's…

C: I feel like he's making it worse for these kids.

B: And he's just shoving that onto the children."

In this data chunk there were a few instances that display PSTs *challenging*. The first being when the PST claimed they were "getting really mad" when they were reading a portion of Rico's book. This explicit statement of them being mad is a clear indication of this PSTs *challenging* Rico's claims as it indicated their emotional response directly.

Another instance of a PST *challenging* is when the PST claimed that they feel like "he's making it worse for these kids." In later data chunks, it can be deduced that by "making it worse" referred to Rico making it harder for his students who are students of color by pointing out certain things that are racist. This PST was *challenging* Rico pointing out racist institutions to these students of color because they feel as though this is making the lives of these students harder as they become more aware of racism. There was a dissonance occurring with this PST in their clear disagreement with Rico's methods.

The third instance of a PST *challenging* in this specific data chunk occurs when the declarative statement was made about Rico "shoving that onto the children." This was an example of a PST *challenging* based on the judgement that was being made again towards Rico's methods of pointing out certain institutions that are racist. The PST is *challenging* Rico pointing out to students of color when societal structures or individuals are racist.

Challenging/Confirming. Across the three book club discussions, there were 12 data chunks out of the total 47 that were between the *challenging* and *confirming* part of the continuum (see Figure 4). In the strictly *challenging* section there were only data chunks from the second discussion, therefore, I have chosen to also include 12 instances that were part of the *challenging* / *confirming* part of the spectrum to include more examples of *challenging* from the other two book club discussions. Although these 12 data chunks have instances of both *confirming* and *challenging*, I will be strictly focusing on instances of *challenging* to expand those instances across all three discussions. My analysis revealed that all 12 chunks generally had the same characteristics as the *challenging* section, namely: declarative statements, interjections, rigid binaries and categories. In this section, I will contextualize some of these characteristics by illustrating them with particular data chunks. The data chunks presented here

were chosen to represent each of the discussions and because they were robust in what was revealed about the phrases and grammatical structures used in *confirming*. Further, the topics that arose in all 12 data chunks were racism, religion, and classism. Therefore, the specific chunks discussed in this section represent topics surrounding either racism, religion, or classism. These data chunks were categorized as *challenging* with some *confirming* because they consisted of characteristics similar to *confirming* while also having characteristics of *challenging*, namely emotional responses. These kinds of intense emotions are defining features of what it means to *challenge* and, therefore, will be discussed in more detail with each of the given data chunks.

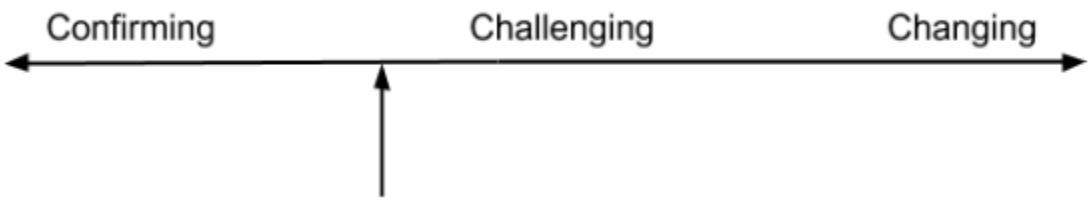

Figure 4. The following section discusses data chunks located in between the challenging *and* confirming *part of the spectrum, while solely focusing on instances of* challenging.

Discussion 1. Chunk 1. The first data chunk from the first book club discussion comes from the part of the spectrum described in Figure 4. This chunk is in regards to the PSTs discussing Rico's use of mathematics to help the students make decisions about eliminating some of the liquor stores in the area. There was a distinct disturbance with the context of liquor stores from a PST, which leads me to believe this disturbance comes from the strong religious background of this PST (and most likely the other PSTs as well considering the consumption of alcohol is forbidden by the religion in which the PSTs participated). Because of this, I categorize this data chunk as *religion*.

A: You know like these are facts. It's proven. So I think he gave them like one example where he had...Oh, trying to get less liquor stores out of the area.

B: Oh, yeah.

A: And so they like used math and I thought that was cool.

B: Yeah.

A: But I wanted it to be more math-based instead of are you talking about liquor stores the whole time in class or are you talking about the math?

B: Exactly.

From this data there is one main instance where a PST was *challenging*, and it occurs when the PST questions why Rico was talking about "liquor stores the whole time in class" versus talking about the mathematics. This is an example of a rigid binary because the PST is most likely assuming that in this class either mathematics is being discussed or the context of liquor stores along with the social issues associated with the existence of liquor stores. This PST is not conceptualizing the fact that Rico is using mathematics to understand how many liquor stores are in the area, but rather is categorizing the two topics as being mutually exclusive and unrelated. Through this rigid categorization of mathematics and topics surrounding liquor stores, the PST is *challenging* because they feel the "mathematics" is what should be emphasized. It is possible then that this PST is *challenging* the lack of mathematics used in Rico's class when discussing the context of liquor stores. Based on the next PST's response of "exactly" it is evident that at least two PSTs of the five are *challenging* during this discussion.

Discussion 2. Chunk 3. I now discuss a third data chunk from the second book club discussion that occurred between the *challenging* and *confirming* part of the spectrum. This data chunk involved the PSTs discussing an experience they had observing a mathematics teacher. This mathematics teacher they observed was telling her students who were speaking Spanish to stop because she could not understand them. The PSTs were *challenging* her response and

discussed a different way of approaching speakers of a different language. For these reasons, I categorize this chunk as *racism*.

> **A:** In the class we observed today there were some students speaking in Spanish and she said, "Don't speak Spanish. I don't know Spanish!" I mean she's a good teacher, but some of the comments she said in class and to us goes against everything we've learned.
>
> **B:** Maybe she could've said something like, "Hey share with us."
>
> **A:** Or, "Teach me what you're saying!" I know maybe they were trouble students, or talking out of turn. There can be something done about that, but I think the way we go about handling things...we can make a difference in our individual classrooms as long as we are constantly learning ourselves and bettering our own teaching.

In this data chunk, there were a few PSTs *challenging* the way the mathematics teacher addressed students who were speaking Spanish in a classroom where English is predominantly used. One PST was *challenging* based on their judgement of the mathematics teacher by saying "I mean she's a good teacher, but some of the comments she said in class…" along with other PSTs giving suggestions as to how the mathematics teacher could have handled the situation better. Their disagreement with the observed mathematics teacher is evidence of them *challenging* her reaction to the Spanish speakers. Although this instance might not seem problematic at first glance, it is important to note that one PST tried to justify the mathematics teacher's mistake by saying, "I know maybe they were trouble students." This statement is an example of the PST categorizing Spanish speakers as trouble students, which is highly problematic that this assumption came out. To summarize, the PSTs were *challenging* the mathematics teacher's responses to Spanish speakers, but in turn made problematic assumptions about the kinds of students that were the ones speaking Spanish.

Discussion 3. Chunk 1. There are two data chunks I discuss from the third book club discussion that display instances of the PSTs belonging between the *challenging* and *confirming* part of the spectrum. The first data chunk involves the PSTs discussing, again, their frustration with Rico's tactic of pointing out institutions and societal structures that are racist. One PST is curious to know whether Rico's pedagogical methods of using mathematics to discover racism is used in predominantly White classrooms. For this reason, I categorize the following chunk as being about *racism*.

> **A**: Is there any kind of research that talks about this being presented in a White classroom? Cause these are all minorities. All these students are minorities and so obviously they're going to see this as racism...because they are the minority. And he [Rico] kind of fuels that fire with 'White people are awful!'
>
> **B**: Which we're not.

This data chunk displays one PST *challenging* based on their statement about how Rico "fuels that fire" in his students who are people of color. The PST was declaring how Rico was making his students angry by pointing out racist institutions. The same PST related Rico pointing out racism as being synonymous with claiming that "White people are awful." These critical statements were evidence of this PST *challenging* Rico's methods of teaching his students about racism.

Another example of a PST *challenging* in this data chunk was in response to the first PST describing how Rico is claiming "White people are awful" by saying "Which we're not." This response displays the PST as being defensive towards the accusation that White people are awful. It is important to note that this accusation, however, is not one that Rico actually made,

but is rather an interpretation made by the PSTs. Because the PST is defensive, this statement is an indication of them *challenging*.

Discussion 3. Chunk 2. The second example of a data chunk from the third discussion displays the PSTs discussing Rico's critique of the racist institutions particularly in the United States of America. The PST's response to these critiques involved justifying why the United States is in fact a great country. Some justifications of why the United States is a great country is because the Gospel (of the Church of Jesus Christ of Latter Day Saints) was only able to be established in the United States according to the PSTs' religious beliefs. Another reason the PSTs tried to justify why the United States is a great country is how Rico's students who are people of color (or their parents) chose to move to the United States for better economic growth and to leave the problems with their associated country. Because of these specific justifications, I categorized this data chunk as involving *religion*, *classism*, and *racism*.

> **A**: Kind of at the end I was thinking something...a section he had I was like this guy hates America. Sometimes when, I don't know, I don't think he hates America, but I love America too. I don't know what I'm trying to say. This is the land of opportunity, and I think that it is. In a lot of ways we have this American dream, which isn't as successful as we like to believe it is, but I think that you know there's a lot of really great things that abound here in the U.S. Obviously this is where the gospel...it was the only place on earth where the gospel could come forth. I think he does have a point that there are a lot of things that are unjust in our country as well. And in our world.
>
> **B**: I felt like there was a lot of negativity. Maybe it was just this last section because the kids were all hounding on America. And I was like, hold on you guys came here. Because obviously you saw something better than what you had.

C: Or your parents did.

B: Yeah just I don't know I was kind of like wait I'm confused because you're kind of contradicting yourself to harp on America, but then you're here and you're doing better than you were in Mexico. But I mean I get what they're saying and I guess what I wanted to hear more was the whole world was unjust and we as a people are corrupt and we need to fix it. Yeah there's poor people here and there's poor people in Africa there's poor people in Europe. It's not just like what is America doing over there?! You know? Everyone else has got it together!

A: Well and the poor people in America really for the most part are very wealthy compared to the poor people in other parts of the world.

The first example of from this data chunk that represented PSTs *challenging* was the comment, "This guy hates America. Sometimes when, I don't know, I don't think he hates America, but I love America too." The first sentence represents a declarative statement about Rico hating the United States by pointing out racism in the country. The second sentence displays uncertainty with the PST about how harsh their first comment was, however still displays a sense of defensiveness towards Rico's claim by saying how they "love America too." It is clear this PST is defensive towards Rico's critique of the United States and therefore represents an instance of *challenging*. The PST does not stop there and justifies why the United States is such a great country by explaining how it is the only country where their religion's gospel could be founded. This is another example of the PST *challenging* Rico's criticisms of the United States because they are having to prove Rico wrong through examples of positive aspects of the United States

Another PST participates in the same rhetoric of justifying why the United States is a great country by calling out Rico's Latinx students in that they "came here. Because obviously [they] saw something better than what [they] had." For context, this PST is responding to Rico's students feeling frustrated towards racism in the United States. This quote displays the PST *challenging* because they are shaming Rico's students for not being more grateful for the United States. This is problematic for a few reasons, with the first being that the PST is assuming that Rico's students are not from the United States. The second reason the PST's claim is problematic is because even if Rico's students are from a different country than the United States then they are assuming the country where the students were originally from is subpar. This sense of pride and judgement coming from the PST displays defensiveness towards any critique of the United States, and therefore is clear evidence of the PST *challenging*.

The second example of a PST *challenging* is similar to the previous example when the PST says, "I'm confused because you're kind of contradicting yourself to harp on America, but then you're here and you're doing better than you were in Mexico." In this quote the PST is shaming the students of color for not being grateful for living in the United States by assuming the country they came from is inferior. This quote is problematic because the PST is assuming Rico's students who are Latinx are from a different country, and specifically Mexico. In Rico's book he does describe how a majority of his students are Latinx, however the PST is making the problematic assumption that being Latinx is synonymous with being Mexican. As described in the previous example, this particular PST is also showing signs of *challenging* because of their judgmental comments about Rico's students. These judgmental comments are indicators of this PST being defensive towards any criticism of the United States, which again reinforces my claim that this PST is *challenging*.

A third example of a PST *challenging* from this data chunk involves a PST making the declarative statement and categorization that "poor people in America really for the most part are very wealthy compared to the poor people in other parts of the world." The context behind this comment involves this PST responding to another PST claiming that other parts of the world have poor people and that the United States should not be singled out by Rico. The PST who declared that poor people in the United States are wealthy compared to poor people across the world was making a categorization of people in the United States. To expand, this PST is claiming that because poor people in the United States have more wealth than other people in the world, then the United States is not as bad as what some people think. This is an example of this PST justifying why the United States is a great place to live because even those with a lower socioeconomic status can still have success. Similar to the previous two examples, this PST is justifying why the United States should not be critiqued by Rico and is therefore defensive of his critiques. Because of this response then it is apparent that this PST is *challenging*.

Discussion

The research question guiding this study is: how are a group of prospective mathematics teachers *confirming* ideas and *challenging* and *changing* biases during discussions of *Reading and Writing the World with Mathematics*? I first discuss how exactly the prospective teachers were *confirming* their ideas in their group discussions, namely, through their use of certain phrases and grammatical structures. I then discuss how the same group of prospective teachers were *challenging* in their book club discussions through their phrases and grammatical structures as well as through their emotional responses. Next, I discuss the lack of evidence for instances of prospective teachers *changing* biases during the group discussions along with my own speculations as to why this might be. I conclude with some discussion of specific examples from *confirming*.

Confirming. Referring back to the definition of *confirming*, a PST can *confirm* in a conversation by viewing their perspective as being the only perspective or the most accurate perspective. These contributions can be achieved through certain grammatical structures and phrases. An example of a grammatical structure that displays a PST *confirming* would be declarative statements. Declarative statements are typically trying to communicate something the speaker feels is truth or fact or not up for debate. An example of a phrase that communicates a PST *confirming* would be categorizing and describing something in particular. A PST might categorize mathematics, groups of people, or other topics. Declaring broad categories under which all sub-items might fall leaves no room for consideration or reflection on the categories themselves or the categorization of the sub-items, which, therefore, *confirms* both the categories and the sub-items. The same can be true for PSTs who classify certain topics in terms of binaries because they are associating that topic with a rigid definition that cannot be adapted.

Challenging. Referring back to the definition of *challenging*, a PST can be *challenging* by having any form of discomfort when taking part in discussions. Instances of a PST *challenging* can manifest through similar grammatical structures and phrases as *confirming* and through certain emotional responses. An example of a grammatical structure that displays a PST *challenging* would be declarative statements, which imply or make explicit that a judgement is being made. More specifically, a PST can display *challenging* when they make a declarative statement that passes judgement towards an individual, group of individuals, object, etc. This evidence represents *challenging* because passing judgement implies the PST is in disagreement with what is being said or done (by either another PST in the group, Rico, the book, etc.). Disagreeing in this case through a declarative statement implies *challenging* because the PST is not willing to consider another perspective. A second example of a grammatical phrase that

implies the PST is *challenging* is when a PST is presented with information that is not already categorized according to their schema. The PSTs usually expressed discomfort when categories they already had felt were mutually exclusive were presented as in a mixed state (by either other PSTs, Rico, or the book). For example, when Rico described his concept of teaching mathematics for social justice, the PSTs were *challenging* this description because it failed to fall into the separate categories of mathematics *and* social justice. Therefore, the PSTs showed how they were *challenging* by bringing their discrete mutually exclusive categories to the conversation, which did not allow for further challenging of the categories, those definitions, or the sub-items within the categories.

As mentioned, PSTs show that they are *challenging* through their emotional responses to certain ideas being discussed. An indication that an emotional response is being made is through a PST's voice inflection through the use of listening to the book club discussion recordings. Certain intonations can reflect a PST's passion for a topic along with the volume in which they are speaking. Generally, the louder and more animated a PST becomes, the more passionate it can be assumed that they are about a given topic. Another example of a PST *challenging* through an emotional response is through the use of interjections. An interjection is one that demonstrates emotion from the PST in an abrupt way. Throughout this data set, interjections are used to display an abrupt feeling of *challenging*.

Changing. Although *changing* is one of the ends of the spectrum in Figure 5, these five prospective teachers showed no evidence of *changing*. To reiterate, *changing* is different than *challenging* in that *changing* means acknowledging the existence of oppression, fundamentally shifting underlying assumptions about people, and working to dismantle power structures. These actions can be done through depictions of appreciation, respect and empathy for other people as

well as reflecting about oneself and preconceived notions one might carry about another group of people. Although not all instances have to occur in order for a PST to *change*, none of these actions in the three book club discussions occurred. My data, therefore, is consistent with other literature (Snapp et al., 2015; Sleeter, 2001), in that teachers (in my case prospective mathematics teachers) will enter classrooms with certain biases about their students. My study, however, is an example of how even in the event of trying to *change* prospective teachers through social justice conversations, these biases will still be prevalent. In other words, allowing PSTs to discuss these ideas without an external facilitator may not be enough to fundamentally shift these PSTs' perceptions of the world around them.

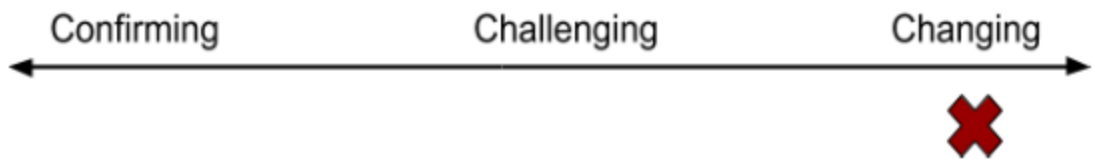

Figure 5. The PSTs displayed no instances of them changing *across all three book club discussions*

I have a few main reasons that I speculate might be the cause for no instances of *changing* to be present. The first reason no instances of *changing* could have occurred in any of the three book club discussions could be because of the kinds of people the PSTs associated with outside of their collegiate education. Of the four White PSTs in my study, it is possible that all four of them grew up in mostly White, middle class neighborhoods and associated with mostly White, middle class families. The one prospective teacher who was of Native Hawaiian descent, although not White herself, did in fact grow up in a town with the majority of the population being White and Christian. Although the entire group was not homogeneous in terms of race, because of the five PSTs' upbringings, it is possible they were never faced with much diversity, and that could have played a part in their rigid perceptions about racism, sexism, homophobia and classism.

Another reason for the lack of *changing* might be due to the fact that each of the five PSTs was attending a university with the majority of students being White, middle class, heterosexual, and Christian. These PSTs then were not exposed to a very diverse population, and were rather exposed to a majority of people (including professors) who had similar religious beliefs. Because of this, it is likely these PSTs were not being challenged in their thinking, but rather in constant harmony with the people they were associating with at school.

The third reason why I am speculating no instances of *changing* might have occurred is because of the course requirements these five PSTs were required to take for their mathematics education undergraduate degree. These PSTs were required to only take one class that discussed multicultural education in terms of issues surrounding racism, sexism, homophobia, and classism. So, in terms of formal classes, these students were not exposed to many topics surrounding teaching for social justice. It is important to note as well that the multicultural education course they were required to take was not specific to mathematics education, but rather education in general. Therefore, the five PSTs were not exposed to teaching for social justice in mathematics classrooms until their final semester of their program in the methods course surrounding my study. This lack of exposure to teaching for social justice could play a large part as to why no instances of *changing* occurred in my data set.

In summary, specific grammatical structures and phrases were found to be present in the discussions with *confirming* examples that were similar to the examples of PSTs *challenging*. However, how these structures and phrases operated in *confirming* and *challenging* were slightly different. Considering the *confirming* instances, several conclusions can be made about the PSTs' underpinning thoughts and ideologies. Additionally, examples of PSTs *challenging* had a component of emotional response. I have also elaborated on the possible reasons for the exclusion of examples of *changing* in my data.

CHAPTER FIVE: CONTRIBUTIONS, IMPLICATIONS, AND LIMITATIONS

According to Sleeter (2001), many prospective teachers have stereotypic biases towards students before they actually begin teaching, which can be rooted in students' races, cultures, classes, religions, genders, and sexual orientations. The problem with teachers carrying these biases about their students in mathematics classrooms is it can influence how the teachers teach, which can then often reinforce oppression (Kumashiro, 2004).

After synthesizing the existing literature, I have found that teachers as well as textbooks carry biases about certain groups of students, and that simply representing these groups of students more frequently in positive ways is not enough to eliminate these biases. Teacher education programs, however, are an option to help support teachers in illuminating and self-reflecting their own biases through projects, book clubs, or classes to learn about marginalized communities (Aguirre et al., 2013; Johnson, 2013).

Throughout this thesis I have used a Queer Theory lens, which has been beneficial for my research because it allows the norms of society to be illuminated how PSTs were making assumptions about other people's experiences as well as their own collective experiences in terms of mathematics teaching and learning. The use of Queer Theory assisted in dissecting these assumptions through the process of *confirming*, *challenging* and *changing*.

The research question my study has addressed is: how do prospective mathematics teachers *confirm*, *challenge,* or *change* their biases in their discussions about *Reading and Writing the World with Mathematics* within the topics of homophobia, sexism, racism, classism, religion and teaching for social justice?

Across my results, there were specific grammatical structures and phrases that revealed how the PSTs were *confirming* or *challenging* in their group discussions, while there were no

instances of the PSTs *changing* in any of the conversations. Considering these results allows me to draw several conclusions about the PSTs' underpinning thoughts and ideologies.

Contributions

There are several contributions my study makes towards practicing mathematics teachers as well as the mathematics education research community. The first contribution towards practicing teachers that comes from my study is the idea that having historically marginalized populations be a part of the topic of conversation is not enough to *change* or reduce prospective mathematics teachers' biases. This contribution is similar to research from others. When the PSTs in my study were discussing topics surrounding racism, homophobia etc. without external facilitation, no changes to their fundamental beliefs occurred. According to Marx's (2004) study, true *changing* occurs when she was present to facilitate and guide the conversation in a productive manor. More specifically, Marx claims that "teacher education students must be guided in an exploration of their own whiteness" (2004, p. 32). Although this quote is referencing race specifically, I argue this can be extended to identities encompassing religion, gender, sexual orientation, classism, etc., and that students must be *guided* into better understanding their own experience in relation to others. It is important to note that I am not claiming the assignment the PSTs in my study were given was not useful. The discussions themselves were guided by questions the professor of this class provided for the PSTs. My study has shown, however, that this assignment in particular was not productive for these particular PSTs in *changing* their biases and requires more facilitation for *changing* to occur.

The second contribution that arises from my study that is directed towards practicing mathematics teachers is that including a single person of color in a group discussion does not imply the *changing* of biases is going to occur. This relates to Rands' (2009) study in that simply adding a queer person (or in my study adding a person of color) to a group does not actually

facilitate productive *changing* of biases. My study included one Native Hawaiian female with the other four participants being White. It is clear that although there was a person of color in the book club discussions, there were no instances of *changing* that occurred. This finding is similar to the reviewed literature that simple representation of historically marginalized students is not enough to *change* the biases these teachers carry towards these historically marginalized populations.

One contribution that is directed towards the mathematics education research community that comes from my study is understanding better what the field knows about prospective teachers working together on activities surrounding topics of social justice (racism, sexism, homophobia, etc.). Similar to Aguirre et al. (2013) and Johnson's (2013) studies, my study also contributes more evidence of how PSTs work together on projects to facilitate discussions surrounding social justice topics. Particularly, my study displays how just because prospective teachers are discussing topics about social justice does not imply they will challenge each other's assumptions and *change* their biases. The topic of discussion itself is not enough to *change* biases in conversations; there needs to be some sort of facilitating in order for *changing* to occur. An example of such facilitating could be a professor asking probing questions during a discussion to push the PSTs further into recognizing the implications behind their statements and biases. These questions might include but are not limited to: who stands to gain from the claim you just made, what are the implications of that statement, or how might a historically marginalized (Person of Color, Queer person, etc.) interpret that statement?

A second contribution my study provides to the research community is my use of Queer Theory as the theoretical framework for my study. More specifically, Queer Theory is not a lens that is frequently used in the mathematics education research community. My study has helped

the field recognize that in order to develop a richer understanding of the events that occur in mathematics classrooms, particularly ones dealing with social justice, new lenses are a valuable way to gain that understanding.

A third contribution my study provides to the mathematics education research community is that mathematics education settings do in fact include social factors and is not neutral, which is similar to Kumashiro's (2004) claim. My results have shown that discussions surrounding the teaching and learning of mathematics topics do in fact include racist, homophobic, etc. comments. My study then has shown that these social factors such as racism, sexism, homophobia, etc. matter in the context of mathematics teaching and learning, and should be considered more in the mathematics education research community. Therefore, more critical theories, such as Queer Theory, should be used as a lens in more mathematics education research. Although mathematics is seen as a neutral subject that is not affected by social factors, my study has shown that even mathematics discussions can have instances of racism, homophobia, etc. that are present.

Implications

The implications for my research extend to mathematics teacher educators as well as the mathematics education research community. One implication for mathematics teacher educators is for them to understand that representation of historically marginalized students' ideas in classrooms is not enough to facilitate changes in mentalities towards historically marginalized populations. In other words, mathematics teacher educators should not put the responsibility solely on historically marginalized students to *change* biases engrained in other prospective mathematics teachers. The reasons for this are 1) as seen from my study, a single historically marginalized voice may not be enough for productive conversations and *changing* to occur, and 2) according to Dubbs (2016), "There are homophobic and marginalizing implications of leaving

much queer studies work to queers themselves" (p. 4). This claim, I believe, can be extended to all historically marginalized populations in that it is not the responsibility of people who are marginalized to do all of the work in *changing* the biases of those who are not. A possible action a mathematics teacher educator could take would be to create assignments for prospective mathematics teachers to better understand the experiences of historically marginalized populations. Some examples of these tasks could be similar to Rico's tasks in *Reading and Writing the World with Mathematics*. The mathematics teacher educator could facilitate discussions surrounding these tasks to ensure the prospective mathematics teachers are being probed in productive ways (Marx, 2004).

Another implication for mathematics teacher educators is to support PSTs in having productive conversations without a facilitator. More specifically, it is important PSTs learn to discuss difficult topics of conversation while being able to *challenge* and eventually *change* their biases through their own recognition of problematic assumptions being made within the discussion. It is important to note based on my framework of *confirming, challenging,* and *changing* that in order to *change* biases one must first *challenge* them. In order to productively *challenge* biases, PSTs should learn to become mindful of the emotional responses they are having towards other's comments in discussions. One option for mathematics teacher educators to begin supporting PSTs in these conversational skills would be to have open conversations about what statements, readings, articles, events, and so on evoke a strong emotional disturbance for the PSTs. The purpose would not be to argue with the author or persons involved, but rather to simply discuss the emotional responses of the PSTs. Becoming mindful of these emotional responses can then possibly lead into further discussion about why that PST is having that kind of response and the implications behind it. Another option would be to support PSTs in how to

disagree in respectful and academic ways. Many White Christian people have been taught to avoid conversations about topics such as racism, sexism, and homophobia. Therefore, they are not experienced in having these discussions and might struggle to express disagreement with one another. This struggle might be particularly prevalent in the group of PSTs here who are also members of The Church of Jesus Christ of Latter-day Saints. In their church culture, people can sometimes believe that disagreement is a way to drive the Spirit out of a conversation which means that they would then be occupying space that was not considered holy. For these PSTs, an unholy space is a highly undesirable place to be. Anecdotal evidence from working with members of the Church, however, suggests that they can be taught how to have productive discussions in which disagreement allows them space to challenge and change their thinking. Further, scaffolding these discussions about disagreement can provide PSTs with opportunities to see that disagreement is not inherently bad and a holy environment can still be maintained. These in-depth discussions would hopefully assist these PSTs in moving towards the *changing* end of the spectrum and not revert back to *confirming* their biases.

Another implication specifically for the mathematics education research community that comes from my study is how the use of more critical lenses, such as Queer Theory, can illuminate problematic assumptions and social constructs that are present in mathematics education contexts (i.e. classrooms, discussions, etc.). For example, without Queer Theory I would not have been able to identify instances of PSTs *confirming* and *challenging* in their conversations through expectations, certainty, binaries and categories. A different theory would not consider the comparison of rigid binaries and fluidity across comments like Queer Theory allowed me to. The use of Queer Theory also allowed me to distinguish between a PST *challenging* a bias versus *changing* a bias. Without the use of this framework, a PST *challenging*

might have been sufficient for *changing*, but Queer Theory aided me in distinguishing between the two because of the fluidity that is inherent in this theory.

Limitations and Directions for Future Research

There are several limitations to my study that I address in the following section. The first limitation is that the findings from my study are ones that cannot be generalized to all prospective mathematics teachers. The reason for this is because my study only included five prospective teachers and only three discussions. These prospective teachers are all from the same university, the sample size was not randomized, and the group is homogeneous with respect to religion. The size and scope of a thesis study combined with limited ethically collected data contributed to the small sample size. One way to extend this type of study would be to conduct it at multiple universities with more diverse prospective mathematics teachers in terms of race, religion, sexual orientation, and so on.

Another limitation that came about from my study was the lack of addressing the genders of the speakers in my results section. Because of the use of Queer Theory as my theoretical lens, understanding the gender of each of the speakers would illuminate the power structures prevalent within the group discussions. The reason for not including this information, however, in my study is due to the fact that my research questions deals more with *how* prospective teachers are *confirming* their discussions collectively rather than what any one individual was doing (*who)*. Because of the nature of my research question then, this could be a possible reason why there were no instances of sexism in my results section. It is possible that more instances would have been prevalent if I was also looking into *who* was *confirming*. Another reason why instances of sexism did not occur in my results section could be due to the fact that there were four females and one male in the group. It is important to understand that just because there were more women in the group does not mean sexism can still not occur. According to Manne (2018),

women very much play a part in perpetuating sexist social structures. I, however, speculate that if there were more male participants in the group then it is possible more instances of sexism could have occurred.

The third limitation that came about in my study is that I did not gain a better understanding of the intentions of the PSTs. More specifically, since I was not present during their discussions, I was not able to press them further to gain a better understanding of their perspectives and intentions behind some of their problematic comments. I rather had to take what was said at face value from the recordings and interpret them to the best of my abilities. I recognize that probing their thinking in person would have allowed me again to gain a better understanding of what they were intending with their ideas. I do feel this limitation is minimized, however, based on the structure of my thesis, which was to uncover how the PSTs were *confirming*, *challenging*, and *changing*. This purpose, then, only requires that I analyze the impact of their statements rather than try and probe the PSTs for their intentions behind the statements. According to Marx (2004), a person's Whiteness and deeply rooted racism is what influences ideas, which can undermine good intentions. This relates to my study in that what these PSTs said during their discussions is a more accurate indicator of their ingrained biases, which has little to do with whether they had good intentions or not.

Conclusion

In this thesis, I considered how prospective teachers were revealing their biases and supporting and/or challenging the stated biases of others in a book discussion group. The book was intended to provide the PSTs with an opportunity to illuminate and examine their own biases. Throughout my analysis, however, it was discovered that this group of PSTs was not productive in the task of examining and challenging their own biases. I find it essential to guide prospective teachers in confronting their own biases so that they may then do something about it.

For this reason, I invite researchers and teacher educators to consider more effective ways to facilitate prospective teachers in challenging their ingrained biases.

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APPENDIX: BOOK CLUB DISCUSSION QUESTIONS

First Book Club Discussion Questions

- In what ways is teaching mathematics like teaching other subject areas? In what ways is it different? (p. x)
- Gutstein writes of the reconceptualization of the purpose of mathematics education. What purposes does math education have? (p. 11)
- What purposes does education have? (p. 11)
- Read math literacy question posed by Gutstein on page 5. "A significant question is...relate to the ways school educate students?" How would you answer this question? Do you agree with Gutstein? (p. 5)
- On pages 25-26, Gutstein presents a definition of reading the world with mathematics. What were or are your (initial) thoughts about this definition? (p. 25-26)
- Chapter 2 talks at length about the diagram on page 23. What ideas seem most relevant to your future practice? (p. 38)
- Read aloud sentences on page xi. "Neither Gutstein nor I are romantic...all of this--*is* struggling in society." How do you see the relationship between society and education? Why might people see them as separate? Why might people see them as related? (p. xi)
- What are your experiences with social activism? (p. 17)
- What is your reaction to the student quote at the start of Chapter 3? (p. 39)
- In what ways is the scene Gutstein described about racism? (p. 40)
- Gutstein talks about having to do a "quick fix" sometimes due to time constraints. Did this resonate with you? When you envision your practice and from your experiences

teaching in a variety of contexts (e.g., church, tutoring, teaching classes), how is your teaching similar to or different from the way that Gutstein describes his practice? (p. 42)

- What do the students' arguments on page 43 tell you about what students know about math content? About social issues?
- "In this latter project, reading the world with mathematics meant finding one's way through a murky swamp of confusing and potentially conflicting data (mathematical and textual); searching for clues; evaluating and posing questions from different perspectives; and eventually synthesizing the various positions and wayward data to produce a cohesive, coherent, well-argued essay to address the fundamental question: Is racism a factor, and if so, how?" (p. 59). What might have been Rico's mathematical goals for this task? How might he have determined whether or not his students met them? In what ways does Rico's quote about "reading the world with mathematics" resonate with you? In what ways does it feel problematic?

Second Book Club Discussion Questions

- Compare the quotes on 39 and 71. What do they help you to understand about what it means to read and write the world, respectively?
- Page 96: "My analysis suggests that a critical.....students' sense of justice." What is your reaction to these categories? Do you think that students feel this way after classes? Do you think they are unique to social justice teaching?
- Chapter 4 describes Rico's attempts to facilitate opportunities for his students to become agents of change. In what ways to do you feel it is your responsibility as a math teacher to provide these opportunities? In what ways do you find it problematic?
- What do you see as the relationship between cognitive demand and the tasks in Rico's book? What evidence do you have from the student work presented in Chapter 5 to support your assigned level of cognitive demand?
- P. 114. The students used the key on the Mercator projection to explain the areas of Africa and Greenland. What do you think about their solution? What do you wonder?
- P. 115. Rico says, "I believe that most of the credit for developing students' mathematical competencies lies with MiC, the fundamental curriculum that I used 75% to 80% of the time." What do you think about how often he uses these projects?
- What kinds of norms/expectations/routines might be established in teaching outside of social justice contexts that would help in teaching mathematics for social justice contexts?
- P. 120-121. Do you agree with the conclusions Rico makes about what skills, dispositions, and capacities students are developing in typical NSF curricula?
- P. 123. Rico's student, Carmen, wrote about how she loved problems in the "real world" as a vehicle for learning mathematics. Rico then writes, "In my classroom, the *only*

'problems in the real world' we studied were about social justice issues." Do you think that Rico and Carmen are using "real world" in the same way here?

- P. 127. In what ways is teaching mathematics for social justice important in White classrooms?
- P. 131 to 133. In what ways are these features of a social justice classroom in line with the norms (expectations/routines) you expect to establish in your classroom? In what ways are they in tension?

Third Book Club Discussion Questions

- P. 170. Adrian writes that there are three types of teachers: "Those who dictate their lessons, those who attempt to be your best friend, and a balance of the two." Do you agree with this claim? Why or why not? What kind of teacher do you think you are/will be?
- Was there a particular student in Chapter 7 that you found yourself agreeing with the most? The least? Why do you think you felt this way?
- In Chapter 7, the students talk about both what they felt they got out of Rico's class mathematically and with respect to social justice. Are you satisfied with their accounts of their mathematical development? Why or why not?
- In Chapter 8, Rico describes the parents' perspectives. What did these perspectives add to your understanding of teaching mathematics for social justice?
- Did you find the student and parent perspectives helpful for considering whether you might use tasks that teach mathematics for social justice? Why or why not?
- In what ways do you think student and parent perspectives would vary for other populations of students? On what are you basing your beliefs? What kinds of assumptions are you making about what other students and parents would value? How have you made those assumptions?
- P. 206. Rico talks about the importance of generating themes out of what the students' interests are. What role do you think this plays in students' investment? What are some strategies you could use to elicit these interests? How might you develop tasks around them?
- Consider the Freire quote on page 220: "Just as...social reality exists not by chance, but as the product of human action, so it is not transformed by chance. If humankind produce

social reality...then transforming that reality is an historical task, a task for humanity. (Freire, 1970/1998, p. 33)" (p. 220). What kind of work do you think is required to change the social reality? What kind of work is required to support a critical perspective of the world, instead of one that maintains the status quo? What role does a mathematics teacher play in that?

- What mathematical work do you think lends itself to teaching mathematics for social justice?
- Reflecting on the book as a whole: What moments in the book were most powerful to you? Why do you think those were most powerful? In what ways have your conceptions of mathematics teaching and learning changed or stayed the same?