# CRITICALLY CONSCIOUS MATHEMATICS MENTORING: A PRAXIS STUDY WITH MENTOR TEACHERS WORKING FOR JUSTICE

By

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## ABSTRACT

The ways in which mentor teachers, as school-based mathematics teacher educators, support prospective teachers during the student teaching experience of teacher preparation has been largely unexplored. In the limited instances when the work of mentor teachers has been researched, the focus ignores the various approaches mentor teachers employ to support prospective teachers' development as educators working for social and racial justice. Due to this gap, the field has not theorized nor documented the ways in which mentor teachers, who are already working for racial justice in their classrooms, can support prospective teachers to develop these skills and dispositions. Developing these skills and dispositions involves creating space for prospective teachers to evaluate their own beliefs, engage in dialogue that challenges what is considered normal in society, and examine how classrooms further marginalize students. Through developing these skills and dispositions, prospective teachers develop critical consciousness.

In this dissertation study, I propose that mentor teachers are key to the development and support of preservice teachers' critical consciousness in mathematics, a subject that has been historically used to gate keep and justify racial hierarchies. This dissertation is grounded in praxis-oriented research (Lather, 1986) with the goal of theorizing and documenting mentoring for critical consciousness in mathematics teacher education. Theoretically, I build a case for the role of mentoring for critical consciousness as a way to disrupt the exclusionary forces in mathematics education by drawing on the work of educative mentoring (Feimen-Nemser, 1998; 2001) and critical mathematics consciousness (Kokka, 2020). Bringing together these two constructs, I propose the construct of *critically conscious mathematics mentoring* as a way for mathematics teacher educators to identify and document the essential elements of the practice of mentoring for critical consciousness. Empirically, this study then seeks to amplify the

perspectives of mentor teachers and how they describe critically conscious mathematics mentoring as a way to disrupt the exclusionary practices in mathematics classrooms. Finally, the empirical aspects of the study are used to refine the theorization of critically conscious mathematics mentoring.

This work contributes to the field of mathematics teacher education in two distinct ways. First, this study provides a new theoretical lens to examine mathematics mentor teachers' practices. Second, it illuminates the various approaches mathematics mentor teachers in diverse schools describe employing in their role in the work of preparing future teachers to enact justice-oriented pedagogies.

To my former high school students.
Although I was tasked with the job of being your math teacher,
you all taught me so much more, and I carry you with me wherever I go.

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To my amazing advisor, Dr. Sandra Crespo, this literally would not have happened without you. You have pushed me to be a better scholar, educator, and community member. So many times I have caught myself giving the same advice you have given me in how to think about my work. I hope to be able to do justice to your advice. Additionally, the flexibility you have given me to be a scholar, a mother, and an educator has been invaluable. So many times when I was overwhelmed by life you were there to be my cheerleader and find ways to make this journey possible for me. Without you, I would have quit and gone back to teaching after my first year. You helped me find my voice in the academy and know that I had something worthy of being said. I hope you know this is just the beginning, and I plan to be calling you for years when I need advice or feel overwhelmed.

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math teacher education classroom. Part of this work is because of your profound respect for the teachers you work with and making sure their voice is being elevated in the work. As I wrote this dissertation, I constantly thought about your work with teachers and if Skylar, Sam, and Dana would feel the same respect that you give the teachers you work with.

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# CHAPTER 1: INTRODUCTION

***"I'm from** straight long blonde hair, Abercrombie and Fitch clothes*
*and bullies pointing out every flaw.*
***From** "this house better be Better Homes and Garden Clean"*
*and "Your best better be the best"*
***I'm from** the second pew on Sunday mornings, making sure every song*
*and every prayer is said loud enough to hear."*

*(Frederixon, 2010)*

The journey of graduate school has been one giant reflection on how my own lived experiences have impacted the types of topics and methodologies I seek to use in my research. My understanding of how my positionality, as a white woman, has impacted my experiences has been a long road. Along this journey, I have encountered numerous examples of how white supremacy was (and is) evident in my life from a young age. As evidenced in the excerpt from the poem I opened with, the idea of working hard and being "good" was an integral part of my childhood. The poem was a class assignment during my undergraduate studies modeled after George Ella Lyon's poem (1999). In examining my positionality, I have realized how deeply the ideas of white supremacy culture, specifically perfectionism and there being only one right way (Okun, 2021), was ingrained into my experience. Although the poem highlights how these aspects of white supremacy culture appeared in my home life, white supremacy culture has been intertwined with my schooling (and teaching) experiences as well.

## A Journey to the Dissertation

To open this dissertation, I draw on memory work (Barros et al., 2022; Keightley, 2010) as a form of storytelling of my own experiences to create a bridge between my experiences and the connection to theory (Milner & Howard, 2013). In the following text, the italicized text is my written memory. Through these memories, I demonstrate how whiteness as normative (Delgado & Stefancic, 2017, p. 86) white privilege (Delgado & Stefancic, 2017, p. 89), and color-evasive

ideologies (Annamma et al., 2017) permeated my experiences. By this analysis, I will not only be able to examine my own journey and experience, but also consider how these experiences have shaped the work I am doing in my dissertation.

**Recognizing Whiteness (Spring, 2010)**

> *As my classmates file out of the classroom, I find myself deflated again. Our instructor came for us hard today telling us it is our job to modify the curriculum and make changes to help make it so it represents the students we teach. It isn't that I don't agree with her, I just don't know where to start. Last spring in TE 250, we had to read a list of privileges that white people don't ever have to think about. I remember getting to "26. I can choose a blemish cover or bandages in "flesh" color and have them more or less match my skin" (McIntosh, 1989) and being shook. I had never before thought about how because I am white Band-Aids always match my skin tone. I remember wondering what else I had never considered due to being white. Over the course of that semester, we talked a lot about bringing students lived experiences into the classroom. I loved the idea; but when I raised the question of what does this look like in math classes, I was told "well I don't know but it is possible".*

As a third-time Spartan--I completed the teacher preparation program, the MATC, and now the CITE program, I have always credited my experiences at MSU with a lot of my education and ability to articulate my journey to my racialized identity. Prior to TE 250, I did not even understand what it meant to have white privilege. I didn't understand all the unearned privileges I had throughout my life due to my skin color. However, after that class I was ready to jump all in and use the language provided to me. I wanted to create that community I found in my 11th grade English class. I thought focusing on justice in my class was a way to do that. Despite this desire, I hadn't done any of the work required to confront my whiteness. I was sure if I just did a few racial justice lessons, I would be creating that community I so deeply desired. Through this approach to teaching, I was embodying white imagination (Matias et al., 2014).

Matias et al. (2014) theorized white imagination as "(1) teacher candidates were emotionally (dis)invested in racial justice; (2) students recognize that they are white but did not push themselves beyond acknowledgement; (3) students resonated in 'white guilt'; and (4) there was an overall engagement and endorsement of hegemonic whiteness" (p. 293). When I read this piece, it was as if Matias et al. had interviewed me during this time. I recognized my whiteness and claimed I wanted to incorporate social justice education into my classroom, but I was not doing the work to figure out how to do that. I was content sitting in my comfort of knowing the language and stating I was against racial injustice.

> *I sit back in my chair until everyone has left and I tentatively approach my instructor. I tell her how I am feeling lost. As the words come tumbling out, I find myself telling her all about my English class; the sense of home he created in that room; the way he pushed us to challenge the dominant conversation. I tell her how I really want to be able to do the same thing with my students and I see how modifying curriculum is part of that, but I just don't know what that looks like in math. I brace myself for the same answer I received last year, but instead the response I get is "I am not an expert on how to do it in math class, but I have a book I can give you called Rethinking Mathematics. It is all about how to bring social issues into math classrooms". I am floored. Not only could she direct me where to look, but she also was going to give me the resource I so desperately needed and wanted.*

Bartell (2011) argues teachers need to reject a color-evasive approach and have "explicit discussions of how race functions in school and in society" (p. 58). The instructor modeled what this would look like for me. In our classroom space, she pushed our all-white class to challenge the idea that our experiences as white people are the norm (Delgado & Stefancic, 2017). In doing so, my instructor pushed me to consider and name how race is impacted in our schooling. Additionally, for me personally, she provided me with *Rethinking Mathematics: Teaching Social Justice by the Numbers* (Gutstein & Peterson, 2013) and let me modify a course project to figure

out how to use the lessons in that book. This allowed me to consider how a mathematics classroom could be a space for explicit conversations about race.

**Uncertainty in Challenging Whiteness (Spring 2013)**

My journey to understanding my whiteness did not end when I graduated from Michigan State University. Although I had come to recognize my own whiteness and was taking steps to create explicit conversations about race in my classroom, I had not fully interrogated my whiteness or understood the power it had on my students. I taught at a very racially, ethnically, and culturally diverse school, for eight years. In those first few years, I heard the deficit language and rhetoric that surrounded the school. I knew it did not match the amazing and loving community I witnessed, but I was unsure how to challenge the way whiteness was appearing both in myself and the people who spoke about the school.

> *The bell rings and students rush out of my third floor classroom. Even with the windows open, the heat on this late May afternoon is heavy in the classroom. The south facing windows do nothing to help keep the heat at bay as the afternoon sun comes flooding in. A doctoral student from MSU, Frances Harper, is coming to do a post-interview with me. Last summer I had been connected with her by a former professor to participate in a workshop she was doing around teaching math for social justice. Since then we designed a lesson together about using the diversity of children's books to talk about variables and now I participated in her "pre" dissertation study about a project I did on credit cards with my preAlgebra students.*

Although I was unsure about how to challenge the negative narrative about my school, I worked hard to create spaces in my classroom for students to challenge injustice. Through my work with Frances, I was taking a step towards pushing back on how whiteness was replicated in the mathematics curriculum. Instead of utilizing a neutral approach to mathematics (Felton, 2010), I was working to design lessons that allowed my students to think critically and act on the challenges they faced (Harper & Orr, 2015, 2020).

> *Frances asks me about the project; what I think went well and what I struggled with. I share with her that I was excited to create a lesson that allowed my students to be the experts. The class I teach is the lowest track math class in the school, and often my students feel like they are dumb because they are in this class. I was excited that this project let them share their expertise with other students and have a moment in the spotlight for excellence. Additionally, I share that I was worried about the lack of authenticity in this project. The mathematics of credit cards is more complicated than a simple exponential function, so we had to modify the mathematics to make it work. Additionally, I share my concern that I wanted students to ask and share their families experiences with credit cards, but I didn't want anyone to be put in a position where they had to explain poor credit. In the end this concern led me to cut the authentic part where students talked to their families about credit cards.*

Despite my work to create lessons which pushed my students to think critically about their experiences, I still replicated whiteness in many of my actions. In their analysis, Frances (Harper) and her colleagues (2021) were very generous in their analysis of my hesitancy to discuss students' personal experiences with credit cards. They described how I put the emotional labor onto my students in processing any feelings they had around debt collection (Harper et al., 2021, p. 15). Jones (2020) extends whiteness as property (Harris, 1993) to argue that white teachers' fear prevents them from discussing issues of justice in their social studies classrooms. This parallels what I see reflected in my early days in the classroom. I was fearful of possible consequences for me as a teacher if students or parents complained; I was fearful of not knowing how to navigate the conversations; I was fearful of replicating deficit notions of my students' communities. Instead of fighting these fears and having the justice center lesson originally planned, I let my fears get in the way of my students' learning.

Luckily my journey is one of intervention. These interventions did not just happen from adults. My students were one of the biggest drivers in me moving past the fear I experienced. One of the joys of high school students is they see things and aren't afraid to call out the issues they see. I will never forget the moment a young Black girl looked me in the eye and said, "Mr.

G only ever calls on the white boys, what is the point". These moments drove me to push through my fear and do right by my kids. Doing right by my students meant creating spaces where they could explore mathematics, connect their learning to their community, and feel that sense of care that I felt in my English classroom.

**Whiteness while Mentoring (Spring 2017)**

> *You aren't supposed to have favorite students, but my fifth/sixth hour block is my favorite. The kids in this class are a combination of sophomores I have known since they were in eighth grade and juniors who I either taught last year or know well from athletics. It is just a class that vibes. Although they get loud and silly, they are like one giant family: arguing, hugging, crying. Even when they are making me so frustrated I want to scream (like the time a group of boys thought my class was the perfect time to figure out the new football jerseys for next year), I would go to bat for anyone of them in a heartbeat.*

As the students in my classroom taught me so many things, I want to share this space with future teachers and support seeing how mathematics classrooms can be the community I dream of in TE 250. As I served as mentor teacher for future teachers, I sought to support them in challenging their white imaginations (Matias et al., 2014) as well as model for them the ways in which teachers can engage in caring relationships (Bartell, 2011) with their students. In some ways this isn't very different from why many folks become mentor teachers (van Ginkel et al., 2016).

> *This radical love my students and I share unfortunately isn't extended to the intern (a white-woman), the intern in my classroom. When she is "leading", these kind, loving students can become defiant. One day after school, while meeting with her field instructor (a white-woman who additionally was her methods instructor), we were debriefing what happened in class that day during her observation. At some point during the debrief she reveals she is scared of a specific student (a Black Samonan junior who is a offensive lineman on the football team). I was literally floored. I would not be surprised if I was told my jaw hung open. This student was one of the sweetest students in the school. My memory is hazy about what happened following this statement. However, in follow up conversations with her field instructor, when I expressed concerns*

> *about how she is building relationships and interacting with students, I was reassured it was being addressed. As the year went on, this was a continued conversation in all of our meetings. I was advised to provide her opportunities to be alone with the students, so she would have to figure out how to manage the class on her own.*

White women experiencing fear from their students of color is not new (Coffee et al., 2017). Even at the time, as a teacher not well versed in literature, the shock was not from the fact my intern was afraid of a student. I had been confronted many times with comments from people trying to find out if I was afraid where I work. The shock came from the way she so easily admitted it, the way it brushed under the rug as if understandable in the field instructor's mind, and the way the conversation moved on as if it was just an issue with her not knowing the student. In these moments, I faced a dilemma documented in the mentor teacher literature, that I am a teacher of children (Clarke et al., 2014). As Rajuan et al. (2007) described, the dilemma of being a mentor teacher and a teacher of children arises from "conflict of dual loyalties to student teachers and to the pupils they teach" (p. 239). I had to decide between making sure my student was not being actively harmed by a teacher who was willing to state she was afraid of him and between my desire to make sure the intern in my classroom was prepared to have her own class in the future.

**Letter to Frances (Fall, 2019)**

After eight years at my school, I made the challenging decision to leave the classroom. Although I loved my students and my colleagues, the district was not pushing me in ways I had intellectually hoped for. Additionally, I routinely saw the ways the public school system was failing the students I cared so deeply for. I never intended to engage in research, I came to graduate school in order to work with future teachers to support them in learning ways to subvert

systems in order to support their students through what I have now learned is called creative insubordination (Gutiérrez, 2016).

> *Dear Frances,*
>
> *I want to thank you so much for the experience I had as a participant in your study. I am taking qualitative methods this semester. From the course readings and our class discussions on the problematic nature of research, I realize that the experience I had with you is not the norm. Throughout the entire process of your research, I never once felt like I was just being observed, but I felt truly like we were working together to better my teaching for my students.*
>
> *I recently was sharing my experience in your dissertation with my qualitative methods professor. I shared with her that I had never read your dissertation or any of the pieces that have come out of that work (beyond the presentation you shared with me). She asked me to unpack why, and I realized I was a little scared to read them. I think I was scared that this experience that was so impactful on me would be represented in a very sterile way or that I had done things that were problematic and you never shared that with me (causing me to continue to perpetuate harm in my classroom). I think either of these things would have deeply hurt me because I found our relationship so meaningful. Throughout the entire year, I felt like you saw me and what I wanted to do in my classroom.*

Although I had no desire to initially engage in research, the program still required me to engage in research methods. It was in these courses I first learned the problematic and extractive ways research has been conducted (Tuck, 2009). Although my own experiences as a participant in research was humanizing (Paris, 2011; Winn & Ubiles, 2011), I learned that is not the experience shared by many. Additionally, as I read research articles, I saw the ways participants were positioned and/or critiqued. As I engaged with these pieces of literature, I couldn't help but wonder if the articles were written with the idea that participants would ever read the articles. This is not to say there is no room for critique; however, when I engage in critique, I hope to do it in the ways

Louie (2017) and Harper et al. (2021) engage in critique by turning the critique to the system instead of the individual.

> *Today, I finally sat down to read the pieces. I was moved to tears by how accurately you represented me, the students, and the hard work we did together. I am not sure if it was because of my personal relationship to the study, but I have never been moved that deeply by research. You told our stories in a beautiful and compelling way. I hope to one day conduct research in the humanizing way that you made me feel throughout the entire process. I also hope to one day be able to share stories in the beautiful way you shared mine.*
>
> *I just wanted to let you know this and how powerful of an impact you have had on my life. Hopefully we can catch up more in depth soon and continue our work together.*
>
> *Sheila*

As I moved through my doctoral program and engaged in a variety of different research opportunities (Bieda et al., 2021; Chong & Orr, 2023; Orr & Bieda, 2023; Orr & Crespo, 2022), I sought to engage in humanizing research practices (Paris & Winn, 2013) which not only centers the voices and experiences of the people with which I work, but I also seek to engage them in a collaborative critique of systems as we work together to challenge systems of oppression in mathematics education.

**Disrupting Whiteness as a mathematics Teacher Educator (Spring, 2023)**

> *The rage that filled me as I drove to work was something I had not felt in a long time. There was an incident at a local high school earlier this week where during a fight following a basketball game with Everett High School a gun fell out of a Black student's backpack. The white parents were up in arms and called an emergency meeting of the school board to address school safety and the white students walked out of school to have their demands addressed. As Big Sean pumps through the stereo, I just think about my colleagues and what they are going to say at our meeting today. The false empathy and calls for action without understanding the racial history between the two cities, the narratives around the kids from Everett, and the way the language of equity and justice has been given lip service to only be weaponized against those fighting for justice. As I pull up to*

*Erickson, I follow up a text saying "Girl, let them say something about safety in this field instructor meeting"*

*I am so proud of myself. The inside of my cheek may be rubbed raw from biting it to stop myself from speaking, but I have let a lot go today. I look at my watch and the meeting has run 5 minutes over, but the things being shared are interesting, so I stay. Then I hear it, "what is happening at the school right now is scary…"*

The experiences documented here are not surprising. The marginalization of Black students in schools is well known (Carter Andrews et al., 2019; Howard, 2013; Love, 2023), and the way white rage (Anderson, 2016) has manifested across school board meetings is well documented (Thomas-Woodard et al., 2024). However, the way these discourses were reified in a meeting centered on supporting prospective teachers to engage in justice-oriented teaching is disturbing. I have written elsewhere with colleagues about the support provided to doctoral students to prepare doctoral students to engage in justice-oriented pedagogies (Halvorsen et al., 2023). Despite this work, whiteness still is pervasive in the space (Robinson et al., 2022).

*April 2024*
*So today I found a note in my mailbox, granted I never check my mailbox, but it is from January. I will admit I was not the kindest when I called out the comments about East Lansing and raised concerns about how we should consider who gets to feel safe in schools and why would a kid feel so unsafe in school that he needed a gun. However, I would not change what I said for a minute. It needed to be said and something I have been working on is naming injustices and not just leaving it to my colleagues of Color. The note ends with "Please refrain from projecting on others the worst things and consider apologizing. Such grandstanding smacks of a white savior complex".*

*The note has me angry thinking about the way they are weaponizing antiracist language to silence someone who spoke up and center a white male's feelings. The way they used unkind and asked me to apologize to my white male colleague tells me that it's not about advancing justice. If they were interested in advancing justice and critiquing me, they would've centered the folks of Color in the room and wondered how my comments made them feel.*

I end my journey with this memory not to applaud myself for speaking up, make myself the victim for receiving an anonymous note, or to villainize the notes author, but to remind us that stories of action need to be told and exclusionary practices need to be disrupted. This work cannot be done from the offices on university campus, but it needs to be in community with those who are living the work each day. If I was not from Lansing, maybe this memory would not be so salient. However, I knew the kids, the teachers, the community, and it felt raw. It was the discourses from early in my career being recycled but this time by folks who are doing equity work.

### Towards a Dissertation

The memories I share in this introduction shape the way I enter the work of this dissertation. I seek to center the voices of those working to challenge inequities and engage in justice-oriented pedagogies. I seek to be in community and have the folks I work with leave the experience with the feelings I had leaving my experiences with Frances. Finally, I seek to think about how we support prospective teachers in learning to engage in justice-oriented pedagogies.

## Rationale for The Study

For many, math is more than how it is often represented in schools (e.g., letters, numbers, formulas); it is a way of experiencing joy (Gutiérrez, 2017), a way to reconnect oneself with the world (Abreu, 2022), and akin to a piece of art (Lockhart, 2009). Unfortunately, this joy and beauty are not experienced by all. For many youth, especially youth of Color, math classrooms are a site of trauma (Matthews, 2018), an extension of the carceral state (Bullock & Meiners, 2019), and a tool of white supremacy (Martin, 2009). Louie (2017) describes this as the culture of exclusion in mathematics classrooms. As mathematics education has worked to disrupt this culture of exclusion, an examination has been brought forth on how to prepare teachers to enact

justice-oriented pedagogies (Aguirre & Zavala, 2013; T. G. Bartell et al., 2019; Crespo & Harper, 2020; Felton et al., 2012; Gutiérrez et al., 2017; Kalinec-Craig et al., 2021; Parker et al., 2017).

Part of preparing prospective teachers to work for racial justice, Carter Andrews and Castillo (2016) argue the need to create space for prospective teachers to evaluate their own beliefs, engage in dialogue that challenges what is considered normal in society, and examine how schools perpetuate those beliefs to further marginalize large groups of students while advantaging others (Carter Andrews & Castillo, 2016). In doing this work, prospective teachers learn how to become "analytical of their own teaching beliefs and behaviors" (Gay & Kirkland, 2003, p. 181) which develops critical consciousness. Ramsay-Jordan (2020) extended this examination to understand how the preparation to engage in justice-oriented pedagogies extends into practicum experiences. She found that prospective teachers grappled with how to enact justice-oriented pedagogies in their practicum experiences.

Building on this work, Ramsay-Jordan (2022) proposes that mathematics teacher educators should consider the role of mentor teachers in supporting prospective teachers in enacting justice-oriented pedagogies. Additionally, the Association of Mathematics Teacher Educators (AMTE; 2017) highlights the importance of qualified mentor teachers who "are able to effectively use clinical settings to support candidates in teaching mathematics well and provide equitable support to each and every student" (p. 40). However, despite the recognition of their importance and calls to understand their role more, the field of mathematics teacher education has not theorized nor documented the ways in which many mentor teachers can support prospective teachers to develop these skills and dispositions in order to enact justice-oriented pedagogies.

In this dissertation study, I propose that mentor teachers are key to the development and support of preservice teachers' critical consciousness in mathematics, a subject that has been historically used to gate keep and justify racial hierarchies. Grounded in praxis-oriented research (Lather, 1986), the goal of this dissertation is to develop and refine a theoretical construct to represent ways of mentoring for critical consciousness in mathematics teacher education. First, I build a theoretical case for the role of mentoring for critical consciousness as a way to disrupt the exclusionary forces in mathematics education through proposing *critically conscious mathematics mentoring* as a way for mathematics teacher educators to identify and document the essential elements of the practice of mentoring for critical consciousness. Empirically, this study then seeks to amplify the perspectives of mentor teachers and how they describe their mentoring practice related to fostering critical consciousness. Finally, the empirical aspects of the study are used to refine the theorization of critically conscious mathematics mentoring.

This work contributes to the field of mathematics teacher education in two distinct ways. First, this study provides a new theoretical lens to examine mathematics mentor teachers' practices. Second, it illuminates the ways in which mathematics mentor teachers in diverse schools describe their role in the work of preparing future teachers to enact justice-oriented pedagogies.

## Overarching Research Question

The goal of this study is to understand the perspectives of mentor teachers through conversations about supporting the development of prospective teachers' critical mathematics consciousness. Given the praxis-oriented nature of this dissertation, each portion (the theoretical and empirical) has their own research questions. The overarching research question guiding the inquiry of both the theoretical and empirical portions of the study is *how do mentor teachers*

*narrate the ways they support prospective teachers' critical consciousness in mathematics as a way to disrupt the exclusionary practices in mathematics education?*

## Overview of the Dissertation

This dissertation is organized to take the reader through the following journey: (a) set the stage for the proposed construct, (b) theorizing and empirically exploring the construct, and (c) connect the construct to the larger body of mathematics education research.

In this introductory chapter, I provided some background on myself and the rationale for this study. Additionally, I share the questions that guide this study and the significance to the field of mathematics teacher education. In Chapter 2, I synthesize the literature related to the culture of exclusion in mathematics education, critical consciousness in mathematics education, justice-oriented mathematics teacher preparation. In chapter 3, I describe humanizing, praxis-oriented research and how it shaped the methodology of this dissertation.

In chapter 4, I provide initial theorizations for *critically conscious mathematics mentoring* and the frameworks in which it is grounded within. Then in chapter 5, I describe the methodology for the empirical portion of the study to understand critically conscious mathematics mentoring in practice, including the context, and introduce the reader to the mentor teachers. In Chapters 6, 7, and 8, I share the ways each mentor teacher descridbe approaching critically conscious mathematics mentoring and how it disrupted exclusionary practices in mathematics education. In Chapter 9, I share the ways in which the mentor teacher's insights contributed to the refinement of the theorization of critically conscious mathematics mentoring and how it disrupts the exclusionary practices in mathematics education.

In Chapter 10, I provide a discussion of the results in terms of the potential contributions to praxis-oriented research and the way the field conceptualized mentor teachers' role within

social justice teacher education. Additionally, I will reflect on my positionality and how it informed the study. Finally, I share some closing thoughts as well as future directions for this work.

## CHAPTER 2: PRAXIS-ORIENTED DISSERTATION

> *"Human activity consists of action and reflection: it is praxis; it is transformation of the world. And as praxis it requires theory to illuminate it"*
>
> (Freire, 1970/2018, p.125)

Many have traced the construct of praxis back to the Greek philosopher Aristotle (Allsup, 2003; Carr & Kemmis, 1986; Fahy, 1996). Mattsson & Kemmis (2007) describe Aristotle's conception of praxis as not being focused on gaining theoretical knowledge but to put the knowledge into practice and being "understood as morally informed action aimed at achieving some ethical good" (p. 187). Additionally, scholars (Allsup, 2003; Mattsson & Kemmis, 2007) have linked the modern conceptualization of praxis to Marx's discussion of praxis. Mattsson and Kemmis (2007) noted that Marx described praxis as the "result of a practical-critical activity in which the person is a knowing subject" (p. 187). These conceptualizations of praxis have informed the work of Paulo Friere (1970/2018) who conceptualized praxis as "reflection and action upon the world in order to transform it" (p. 51). As the opening quote illustrates, praxis is more than just reflection and action; it involves critical theories and "is undertaken with a view to changing praxis for individuals and for groups" (Mattsson & Kemmis, 2007). This conceptualization of praxis rejects neutrality and objectivity; it instead centers a commitment to justice (Herbel-Eisenman et al., In press). In education, this view of praxis has been taken up from both a pedagogical and methodological perspective.

Pedagogically, in teacher education, praxis has been taken up as a way to examine the interplay of teaching theory and practice aimed at fostering critical consciousness and transformative learning. It involves teachers (both practicing and prospective) engaging in a continuous cycle of reflection and action to create meaningful and liberating educational experiences (Aronson, 2020; Hoffman-Kipp et al., 2003; Kemmis et al., 2020). In mathematics

education, Herbel-Eisenman and colleagues (In Press) note that praxis has been used by scholars and activists to connect their work to sociopolitical perspectives. This includes Frankenstein (1983) who brought Freiran thought to mathematics as a way to cultivate critical consciousness through social justice pedagogy. Building on her work, Gutstein (2006; 2012; 2018) describes how he has engaged in praxis with students at various educational levels (middle school, high school and teacher education) as a way to "investigate and critique injustice, and to challenge, in words and actions, oppressive structures and acts" (Gutstein, 2006, p. 4). Many in mathematics education have built on Gutstein's work as a way to engage in social justice pedagogy (see Harper, 2019 for a review).

Methodologically, praxis has taken many forms of research. In teacher education, often praxis research has been framed through teacher action research (Cochran-Smith & Lytle, 1999a; Manfra, 2019). Teacher action research has been theorized with a grounding in critical social theories aimed at driving change; additionally, the knowledge is constructed collaboratively with teachers and students (Cochran-Smith & Lytle, 1999a). Kemmis (2012) argued "practitioner research, or research within practice traditions, stands in stark contrast to much conventional educational research undertaken from the perspective of the spectator" (p. 891) In mathematics education, Stinson and Bullock (2012) propose a praxis of uncertainty. They describe praxis as a "continuous cycle of action and reflection in which sacrificing action equates to empty verbalism while sacrificing reflection equates to mere activism" (p. 49). From this conceptualization, they define praxis of uncertainty as "speaking a true word and transforming the world are both left open to multiplicitous possibilities" (p. 49). In mathematics education research, some teacher action research partnerships speak back to educational research and highlight multiple possibilities unarticulated in published academic articles. For example, drawing on discussions

about the idea of revoicing within a long-term action research group, Herbel-Eisenmann and colleagues (2009) found teacher-researchers named a range of fused forms, functions and meanings for revoicing that attended to issues of power, control, and authority that did not appear in research articles. In practice, Herbel-Eisenmann (2023) reflects on her 10-year partnership with teachers as a form of praxis research in mathematics education. In this partnership, teachers engaged in action research to explore positioning from in their classroom discourse practices as a way to disrupt deficit discourses (Busby et al., 2017). Using this work as evidence of praxis, Herbel-Eisenmann describes how the teachers engaged in reflection around the racialized nature of who participated in the classroom. From these reflections, the teachers took up collaborations to better consider how to support students of Color in classroom discourse (Herbel-Eisenmann and Shah, 2019).

## Praxis as Methodology for a Dissertation

As discussed in a *Journey to the Dissertation*, my experiences as a (mentor) teacher, researcher, and research participant shape the way I approached this dissertation. Returning to the *Letter to Frances*, I see how our relationship and the stories I knew she could tell deeply impacted the way I view research. Paris (2011) states "we can be friends with our participants. We can, in small ways, come to understand. We can inspire them as they inspire us. We can humanize through the act of research" (p. 147). As I reflect on this quote, I think about how both research and teaching is dependent on real and authentic relationships. When I was a K-12 classroom teacher, relationships with students were always key to me, not because the research said it increases academic performance or because it has been shown to improve classroom management issues. Relationships were important to me because I was going to be in a room with the same people (students) for an hour, five days a week. It just made sense to me to

develop relationships with them where I authentically engaged in their lives. This belief about relationships has extended into my conception of research, both empirical and theoretical.

**Praxis-Oriented Research as Methodology**

Praxis-oriented research, as described by Lather (1986), is an approach which integrates theory and practice in a way that challenges existing power structures and promotes social change. She emphasizes that praxis-oriented research is not merely about generating knowledge for its own sake but as a way to carry out research 'that is explicitly committed to critiquing the status quo and building a more just society' (Lather, 1986, p. 258). Building on Lather's work, Fahy (1996) described how praxis research "is conceptualized as an on-going spiral of practice, self-reflection, scholarly inquiry and theorizing which leads to changed practice, further reflection, scholarly inquiry and theorizing about practice" (p. 55). Additionally, Mattsson & Kemmis (2007) described praxis research as serving a purpose "beyond that of new knowledge. Praxis-related research should be understood as a cultural, social and political process that generates action as well as reflection" (p. 189).

Praxis-oriented research involves reflexivity, where researchers critically examine their own assumptions, biases, and positions of privilege (Lather, 1986). It also requires collaboration with participants or stakeholders from the community being studied. This collaborative approach allows for the co-creation of knowledge and ensures that research addresses the needs and concerns of those directly affected. Mattsson & Kemmis (2007) build on this by arguing that projects should "take into account the authenticity of the life experiences involved" (p. 200). This collaboration and consideration of life experiences supports critical reflection by creating spaces where participants will share their experiences and be in conversation to make sense of those experiences.

Finally, Lather (1986) argues this co-generation of knowledge "requires a reciprocal relationship between data and theory" (p. 267). Mattsson and Kemmis (2007) echo these statements by noting that "praxis-related research is rooted in critical theory which is one reason for expecting a researcher to clarify the relation between theory and praxis" (p. 195). This clarification of theory and praxis is part of the relationship where the data is viewed through the lens of a theoretical framework, but "keeps a particular framework from becoming the container into which the data must be poured" (Lather, 1986, p. 267). This approach allows for "the interactive, reciprocal shaping of theory and practice" (Lather, 1986, p. 258).

**Humanizing Research Methodology**

In taking a praxis-oriented approach to this dissertation, it is deeply grounded in the ideas of humanizing research. However, humanizing research is not a methodology in the traditional sense. In Paris and Winn (2014), numerous different methodologies are pulled together to work towards a vision of humanizing research. Paris (2011) argues that through the work of Freire (1970/2018) is calling for a mutual relationship for teachers and students in order to challenge an oppressive world. Expanding on this notion Paris calls for this "stance and methodology [to be extended to] educational research working with students in contexts of oppression and marginalization" (p. 137). Through expanding Freire's work on humanization to research, Paris aligns with Winn and Ubiles (2011) who argue for a methodology where "participants are of equal value" (p. 298) with the researchers. In synthesizing the work of Paris (2011) and Winn and Ubiles (2011), I share some of the key features I have come to understand as part of humanizing research:

1. Building reciprocal relationships of dignity and care with participants

2. Unit of analysis in research is not the genuine relationships, but the unit of analysis is facilitated through the relationships.
3. Researchers must recognize the power structures in their relationships.
4. Researchers need to engage in authentic participation in activities that matter to participants.
5. Not every story told is to be shared. Despite being shared may be considered too private to report in research.
6. Humanizing research doesn't end when the study ends because it is built on true and authentic relationships.
7. A humanizing stance towards research works to end colonizing inquiry of looking for deficits and treating participants like subjects

Additionally, in participating in this collective sharing of stories, there is a recognition that some stories will be told within the analysis, but the stories left untold. In my letter to Frances, something I left unsaid is the stories she could tell but has chosen not to tell. For instance, while she was there one day, we had an incident that has forever shaped the way I view myself as an educator. Although this moment was very impactful for me, due to the nature of the incident, the story can easily be taken up as another deficit story of urban schools. Although Frances has not shared this story, it has led me to reflect quite a bit on how as discussed in Tuck and Yang (2014) part of research is knowing when to share a story and when a story is not yours to share. By choosing to not share specific stories, the researcher is not only honoring their relationships to participants, but they are also "ending the colonizing inquiry of looking for deficits in the cultures of oppressed communities" (Paris, 2011, p. 147)

In considering these features of humanizing research, originally, I was drawn to participatory action research (Fine et al., 2003; Fine & Torre, 2019; Osibodu et al., 2023; Torre, 2009) as a form of research. However, as I have reflected more on this specific study and the work of engaging mentor teachers to learn more about their experiences. I realized the burden of participatory research would be high on the mentor teachers and would require more time than a dissertation would allow to do the work in humanizing, authentic ways. Although this dissertation study is not grounded in participatory research, as I will discuss later (in Chapter 10: future work), I have come to understand that this study is the first of a longer participatory, humanizing research exploration.

**Praxis-Oriented Research as Humanizing Methodology**

Instead, I turned to praxis-related research as a methodology to inform this larger dissertation. Here, I argue that praxis-related research is a humanizing methodology. Praxis-oriented research facilitates the relationship building necessary for humanizing research. According to Lather (2017), praxis-oriented research involves the researcher to "develop an understanding of the worldview of the participants" and engage in "theoretically guided action over a period of time" with the participants (p. 75). In order to develop an understanding of someone's worldview, genuine relationships need to be developed. Part of developing these relationships includes working in community over time by the researcher engaging in activities which matter to participants. An example of this is the praxis work Herbel-Eisenmann (2023) describes undertaking with teachers over a 10-year span. Across those ten years, the teachers were able to drive the direction of the inquiry based on the things that matter to them, like equitable participation.

Engaging in these activities means participating in authentic ways and challenging power structures (Mattsson & Kemmis, 2007). One way to challenge these power structures is for the researchers to authentically share their stories and participate in the experiences with participants. This joining in experiences reciprocates the vulnerability researchers are asking participants to demonstrate (San Pedro, 2017). Dennis (2018) argues that this collaborative sharing of stories is a way praxis research is validated. She noted "We mutually recognize one another through the norms and tacit knowledge claims which are linked to identity claims. Thus, as we take the norms to be valid, we simultaneously establish the validity of our agency in the acceptance of the norms" (p. 7).

As described above, Lather (1986) argues theory is being shaped through a reciprocal relationship with the data in praxis-related research. Additionally, Lather argues reciprocity must also exist with the participants in the study. In 2017, Lather explained reciprocity between researcher and researched to be: (a) interviews conducted in an interactive manner that requires self-disclosure on the side of the researcher, (b) sequential interviews in both individually and in small groups to facilitate collaboration and deeper probing of issues, and (c) negotiation of meaning where descriptions, analyses, and conclusions are shared to refine the theory.

Building on Lather's (2017) definition of reciprocity, I also draw from San Pedro and Kinloch (2017) who describe this process of building reciprocity as projects in humanization. They describe these projects as projects which

> "center the daily experiences (e.g., storytelling, story gathering, relationship building, reciprocal engagements) we have with people in ways that, on the one hand, emphasize our shared desires for racial, linguistic, educational, political, and social justice in schools

and communities and, on the other hand, emphasize those same desires in our professional and personal lives." (p. 374)

Through this process the researcher and researched divide is bridged through reciprocal sharing of stories and experiences which build collective knowledge. Additionally, in considering a praxis orientation to this type of reciprocity, the stories are not just to be shared but also used to inform the shaping and creation of theory.

**Orientation to the Dissertation**

Drawing from this idea of sharing stories (San Pedro & Kinloch, 2017) to engage in praxis-oriented research (Lather, 1986), my dissertation employs a humanizing, praxis-oriented research methodology. In practical terms this means first I conducted a theoretical study drawing on mentoring and critical consciousness literature to answer the theoretical research questions of:

- Theoretical Research Question 1: *How can the practices of educative mentoring be employed to support prospective teachers' critical mathematics consciousness?*
- Theoretical Research Question 2: *How does this form of mentoring disrupt exclusionary practices in mathematics education?*

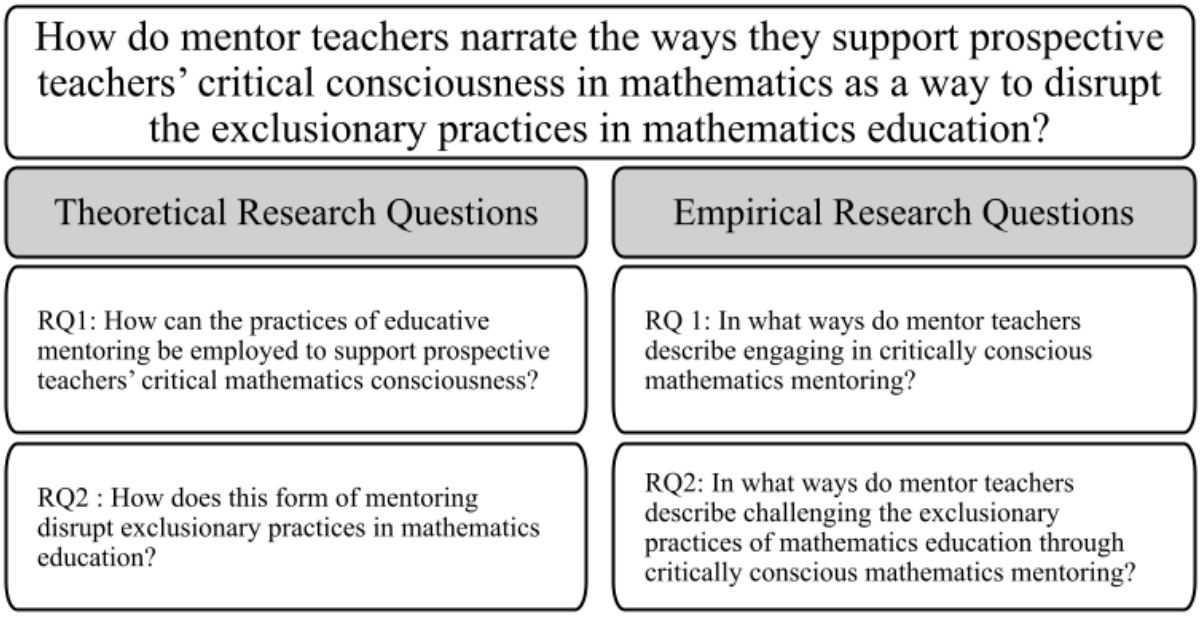
Following the theoretical study, I conducted an empirical study in the traditions of humanizing research (see chapter 5 for descriptions of methodology) to amplify the voices of mentor teachers to answer the empirical research questions:

- Empirical Research Question 1: *In what ways do mentor teachers describe engaging in critically conscious mathematics mentoring?*
- Empirical Research Question 2: *In what ways do mentor teachers describe challenging the exclusionary practices of mathematics education through critically conscious mathematics mentoring?*

In drawing from praxis-oriented research where theory is used to inform the empirical studies and empirical studies are used to inform theory, I then used the findings from the empirical study to refine the proposed construct and address my overarching research question of *how do mentor teachers narrate the ways they support prospective teachers' critical consciousness in mathematics as a way to disrupt exclusionary practices in mathematics education?* Figure 1 shows the various research questions explored throughout the study as a way to help clarify the organization.

**Figure 1**

*Research Questions to Guide the Dissertation*



# CHAPTER 3: LITERATURE REVIEW

In this chapter, I begin the process of theorizing mentoring for critical consciousness in mathematics teacher education by reviewing the literature related to the ways mathematics classrooms operate as exclusionary spaces, how critical consciousness has been discussed in [mathematics] teacher education, the ways in which mathematics teacher educators have sought to integrate social justice into mathematics teacher education, and how mentor teachers have been described as a partner in this work. Then in Chapter 4, I will bring together these bodies of literature.

To conduct this review of the literature, I searched google scholar related to each body of literature (see table 1 for search terms for each body of literature).

**Table 1**

*Search Terms for Literature Review*

| Body of Literature | Search Terms |
|---|---|
| Exclusionary Practices in Mathematics | Exclusionary mathematics, whiteness mathematics, racial justice mathematics, critical mathematics, math person |
| Critical Consciousness | Critical consciousness, critical consciousness teacher education, critical consciousness mathematics |
| Mentor Teacher | mentor teachers, mathematics, cooperating teacher, social justice mentoring |

After collecting the literature, I reviewed the collected literature and removed pieces that were not relevant. For example, Brendefur & Frykholm (2000) was excluded from the mentor teacher literature because although the study took place in a student teaching setting and there was mention of how the mentor teacher impacted the preservice teachers practice, the study itself did not focus on the mentor teachers. After eliminating literature, I looked at the pieces which cited

the constructs I drew from (educative mentoring and critical mathematics consciousness) to ensure that no relevant literature related to those constructs were missed.

## Exclusionary Practices in Mathematics Classrooms

Mathematics classrooms have long been sites of racial injustices that perpetuate antiBlackness through physical, symbolic, and epistemological violence (Martin et al., 2019). These forms of violence have been perpetuated by initiatives for equity and inclusion through liberal White imaginaries (Martin, 2019). For instance, as Martin (2003, 2013) examined, the reform movement of Mathematics for All was not about making mathematics for all children but forcing students to assimilate into mathematics. This forced assimilation into the dominant form of mathematics is one of the reasons mathematics education scholars have argued that mathematics operates as a proxy for whiteness (Battey, 2013; Gutiérrez, 2013; Martin, 2009). Additionally, mathematics upholds whiteness through maintaining the unearned privileges of white people in society and by serving as a proxy for intelligence (Gutiérrez, 2013). One of these unearned privileges is that of gatekeeping; mathematics is used to decide who has access to higher education and high paying jobs (Battey, 2013). Felton (2010) also highlights that through the choices about problems teachers make, they "communicate what is considered 'normal' in our world and what is not" (p. 61). The choices teachers make send powerful messages about who is (and is not) welcome in the mathematical community.

In recognizing these choices as well as the systematic ways mathematics classrooms have excluded students, Battey and Leyva (2016) building on the work of Martin (2009) further provided a framework for understanding the ways mathematics operates as a white institutional space. In this framework, they described three interrelated dimensions which highlight how mathematics operates as whiteness: institutional, labor, and identity. The three dimensions point

to how inequities in mathematics are created and perpetuated for children of Color through structures and systems which limit access (institutional), enforce expectations to regulate their behavior and emotions (labor), and delegitimize their mathematical ability (identity). These dimensions do not operate independently of each other but as three lenses that provide a window into how mathematics acts as white institutional space. Building on this work, Leyva, individually (2021) and with colleagues (2022), extended this conceptualization to consider how mathematics within STEM is a white, cisheteropatriarchal space. Drawing on this work, Harper et al. (2021) examines how whiteness teachers sought to challenge whiteness in their classrooms through teaching mathematics for social justice. In this work, they found that although teachers attempted to challenge whiteness, they still upheld it in many ways. Additionally, Harper and Orr (Under Review) examined the ways in which students resisted and upheld the discourses of whiteness related to mathematics.

In addition to the work specifically on how whiteness perpetuates itself in mathematics classrooms, the field of mathematics education has documented many ways in which mathematics classrooms have engaged in exclusionary practices. In mathematics education, an entire body of literature is devoted to mathematical identity. Much of this work is grounded in exploring how students see themselves in mathematics; with students often describing seeing themselves as not a "math person" (Andersson et al., 2015; Elin-Saintine, 2021; Gholson & Wilkes, 2017; Mendick, 2005). Elin-Saintine (2021) provides a poignant insight into the ways high school students of Color enrolled in an honors pre-calculus course describe being a math person and not seeing themselves in this conceptualization. Students, in this study, described a math person as predetermined, something you are born with, able to just look at a problem and solve it, not having to work too hard, and being able to solve problems quickly and accurately.

To achieve being a math person, one has to embody the characteristics of what it means to be good at math. Through conforming to the characteristics and becoming a "math person", students are placed into higher tracked mathematics classes and positioned for different future creating value in being perceived as a math person.

Scholars (e.g. Anyon, 1980; Ladson-Billings & Tate, 1995) have argued that there are different ways students have experiences with and access to various types of curricula, including mathematics. In mathematics, this looks like some students experiencing a procedural and rote mathematics curriculum that stresses mastery of the basics before moving on to more complex problems. Where other students are able to engage in mathematics through open ended problems with no obvious solution. This also can be seen in the experience in out of school mathematics. Some folks are able to engage in mathematics through experiences like MathCircles where mathematics involves solving open ended problems in fun and engaging ways. On the flip side others engage in out of school mathematics through tutoring and remedial experiences which stress accessing the basic skills (Scarbrough, 2017). Through creating different experiences for students, the ways they are able to use and enjoy mathematics.

These different ways students are able to experience and enjoy mathematics has created a hierarchy of who belongs in mathematics. The general notion of an ability hierarchy is not new in mathematics. Ernest (1991) noted there is an assumption of fixed ability with "every child assigned a position on this hierarchy" (p. 244). Building on this work, scholars have highlighted the racialized, gendered and ableist ways children are placed on the hierarchy in mathematics education (Joseph et al., 2019; Martin, 2009; Mendick, 2005; Shah, 2017, 2019; Yeh, 2023; Zavala, 2014). These practices of determining where children belong on the mathematical hierarchy, position students as not belonging in mathematics. Either they are positioned as not

capable mathematicians (Joseph et al., 2019; Martin, 2009; Yeh, 2023) or they are excluded for excelling beyond the perceived standard (Chen & Buell, 2018; Shah, 2019). In this hierarchical structure, mathematics education is able to uphold reputational and status property with "how only White people are permitted to solve this Goldilocks problem and attain full personhood" (Shah, 2019, p. 679) and racialized, gendered and disabled people being excluded from this community for being "too good" or "not good enough".

Finally, mathematics education has excluded folks from being seen as full members of the communities in many ways. Battey (2013) demonstrates how through the use of test scores to separate students, mathematics has been able to also exclude, disproportionately impacting students of Color from being placed into advanced mathematics courses (p. 335). In addition to excluding children from entering the space through tracking, mathematics education has enacted the right to exclude through what type of curricula appears in classrooms. Bullock (2017) examined the ways selective STEM schools used curricula to perpetuate this exclusion. Additionally, this exclusion happens when mathematics education positions the curriculum as neutral. However, as Felton (2010) highlights, the choices about problems teachers make, they "communicate what is considered 'normal' in our world and what is not" (p. 61). The choices teachers make in their classroom send powerful messages about who is welcome in the mathematical community. These choices reflect not only what is deemed mathematical in the sense of types of problems being solved but also who is mathematical. As Gutiérrez (2017) highlights, there is a long history of people doing mathematics in ways that stand apart from the western notions of mathematics. By choosing to ignore the ways in which mathematics has been done across the globe (Joseph, 1987), mathematics education is not only excluding people from its ranks but also ideas. In this sense mathematics is embodying the right to exclude.

These exclusionary practices of mathematics education highlight what Louie (2017) describes as the dominant norm of mathematics classrooms, a culture of exclusion, which is a "restrictive and hierarchical culture that has historically dominated American mathematics education" (p. 489). This culture of exclusion sorts students into those who know and those who don't know while creating only narrow forms of participation in the classroom. Additionally, this culture sets the stage for a competitive classroom culture. Running counter to this culture of exclusion is an inclusive mathematics classroom. This classroom encourages multiple solution paths and forms of participation, as well as, encouraging students to engage in true collaboration (see table 2 for a full explanation of exclusive and inclusive classrooms).

**Table 2**

*Culture of Exclusion & Inclusion in Mathematics Classrooms*

| | Exclusive | Inclusive |
|---|---|---|
| The Nature of Mathematical Activity | The rote practice frame<br>Mathematics is a fixed body of knowledge to be absorbed and practiced. Correctness is paramount. This includes presenting standard formulas, algorithms, and so forth; assigning routine tasks requiring only the application of previously demonstrated algorithms; asking closed questions in conversation with students; explicitly stating the importance of repetitive practice; and focusing discussion exclusively on answers | The sense-making frame<br>Mathematics is about making sense of ideas and understanding connections. This includes: assigning open-ended, nonroutine tasks; asking open-ended questions and pressing for meaning in conversation with students; and explicitly stating the importance of sense making<br><br>The multidimensional mathematics frame<br>Mathematics includes activities such as collaboration, experimentation, and argumentation, not just rote practice. This includes: assigning open-ended, nonroutine tasks and explicitly naming skills that have not traditionally been seen as mathematical as mathematically important |

Table 2 (cont'd)

| | Exclusive | Inclusive |
|---|---|---|
| The Nature of Mathematical Ability | The hierarchical ability frame<br>Mathematical ability is distributed along a linear continuum. Some people have a lot; others have very little. This includes explicitly valorizing speed and correctness and positioning some students as helpers and others as in need of help | The multidimensional ability frame<br>Everyone has both intellectual strengths and areas for growth that are relevant to mathematics learning. This includes: valorizing skills that have not traditionally been seen as mathematical; naming a variety of students as resources for their peers' learning; and making statements about mutual dependence (everyone contributes, everyone learns together) |

*Note.* Table is adapted from Louie (2017)

Louie (2017) developed this framework on work at an individual level of a single classroom, the work has been extended to consider various layers of systemic discourse (Adiredja & Louie, 2020). Adiredja and Louie (2020) argue that this exclusionary culture is replicated through deficit discourse at the layer of the individual classroom, at the layer of local communities of practice, and at the layer of society at large.

## Critical Consciousness in [Mathematics] Education

Although much of this review focused on the exclusionary practices in mathematics classrooms and how those practices impact students, there are proposals for how to create more liberatory, humanizing mathematics classrooms (Joseph, 2021; Martin et al., 2019). The conception of humanizing classrooms often draws on the work of Freire (2000) argues that humanization is the process of becoming more fully human through participation in the world. Building on this work, Bartolomé (1994) argues for a pedagogical approach which addresses the sociocultural realities of students' lives, the historical and political dimensions of education, and casts students as critically engaged, active participants in the classroom. This pedagogical approach balances the need for teacher's command of content knowledge with teacher's

knowledge of the students they serve. Building on this work del Carmen Salazar (2013) puts forth principles of humanizing classrooms which ask educators to critically reflect on their own beliefs, and create community through critical reflection and dialogues, and building on students' lived experiences in the curriculum. This work of building humanizing classrooms to challenge the culture of exclusion (Louie, 2017) is an act of developing critical consciousness.

Freire (2000) describes critical consciousness as "learning to perceive, social, political, and economic contradictions, and to take action" (p. 35). Freire's conceptualization of critical consciousness was informed by his work with marginalized people in Brazil around literacy and the work of scholars, such as Albert Memmi, Franz Fanon and Carter Woodson (Watts et al., 2011). Weaving together these experiences, Freire (2005) argues that critical consciousness "represents the develop-ment of the awakening of critical awareness. It will not appear as a natural byproduct of even major economic changes but must grow out of a critical educational effort based on favorable historical conditions." (p.15). He continues on to argue that our traditional school curriculum hinders the development of critical consciousness due to its detachment from everyday life. In order to support educators in working towards developing critical consciousness, del Carmen Salazar (2013) builds on Freire's definition of praxis as "reflection and action upon the world in order to transform it" (Freire, 2000, p. 145) to theorize the role of teachers in this work. This conceptualization of critical consciousness as critical reflection and critical reflection is defined by many scholars (Gutstein, 2006; Kokka, 2020; Ladson-Billings, 1995; Watts et al., 2011). Although often these two aspects are discussed separately, Freire, himself, argued "critical reflection is also action." (2000, p. 128)

**Teacher Education**

In teacher education specifically, scholars have worked to support prospective teachers to develop critical consciousness. For instance, Milner (2003) engaged teacher candidates in a race reflective journaling activity to support them developing critical consciousness by realizing they are racialized beings. Additionally, Cammarota and Romero (2006) describe engaging students in "I am" poems about their identities as a way to support identifying social justice issues relevant to their lives. These poems are a form of critical self-reflection that leads to what Freire describes as transformative dialogue which requires teachers and students to become "subjects," rather than "objects," thereby creating reciprocity of teaching and learning. As a result, teachers and students are essentially critical beings working together to co-construct knowledge (Shor & Freire, 1987), and students can "feel they are knowledgeable Subjects that guide the educational process" (Cammarota & Romero, 2006, p. 20).

Carter Andrews and colleagues (2019) shared their own work to cultivate not only their prospective teachers' critical consciousness but their own as well. They describe a process that allows teacher educators and prospective teachers to critically evaluate their own beliefs and engage in dialogue that challenges societal norms which are perpetuated in schools. Carter Andrews and Castillo (2016) describe "a critically conscious K–12 educator might raise questions about how current policies and procedures unintentionally serve as gatekeeping mechanisms for allowing access to advanced placement and college preparatory courses" (p. 114). Building on this, they argue that prospective teachers need to be able to critically examine these policies and practices in order to take action to challenge the role of educational institutions in perpetuating oppressive systems.

**Mathematics Education**

Frankenstein (1983) brought the conceptions of cultivating critical consciousness through social justice pedagogy to mathematics education. Over the years this has been described in literature as social justice mathematics (Gutstein, 2006), critical mathematics (Gutiérrez, 2002), teaching mathematics for social justice (Bartell, 2013; Harper, 2019) and critical mathematics consciousness (Kokka, 2020). Frequently, this has been described with two main goals (a) increasing students' sociopolitical consciousness and (b) increasing students' proficiency in traditional or dominant mathematics.

Gutstein (2006) describes having both social justice and mathematical goals as part of social justice mathematics. Gutstein's social justice pedagogical goals include (a) reading the world with mathematics (b) writing the world with mathematics and (c) developing positive culture and social identities; the mathematical goals include (a) reading the mathematical world, (b) succeeding academically in the traditional sense, and (c) changing one's orientation to mathematics. Building on this work, Kokka (2020) conceptualized Critical mathematics Consciousness as the interrelated development of "sociopolitical understanding, empathy, and taking action" (p.782). This conceptualization builds on the social justice pedagogical goals of teaching mathematics for social justice (Gutstein, 2006) and critical civic empathy (Mirra, 2018). Gutstein's (2006) conceptualization of social justice pedagogical goals include (a) reading the world with mathematics, which Kokka extends to describe as understanding sociopolitical conditions; (b) writing the world with mathematics, which Kokka extends to describe as taking action to change the world; and (c) developing positive culture and social identities. Kokka argued developing positive cultural and social identities was not intended for those who belong to the dominant group, so she modified the goal to focus on empathy.

## Social Justice Mathematics Teacher Education

In mathematics teacher education, there has been a variety of efforts to conceptualize justice-oriented pedagogies, in addition to social justice mathematics (Gutstein, 2006). Conceptualizations have included: culturally relevant mathematics teaching (Tate, 1995), and most recently the call to (re)humanized mathematics classrooms (Gutiérrez, 2018). Similar to the concerns of K-12 mathematics classrooms, mathematics teacher education has found teachers of all experience levels find it challenging to stray away from dominant forms of mathematics instruction which set up classrooms as hierarchical and exclusionary spaces for learning (Louie, 2017).

Part of the dominant script of mathematics is the perceived neutrality of mathematics as a sterile objective field. This perceived neutrality of mathematics is one of the challenges faced by mathematics teacher preparation programs when mathematics teacher educators are attempting to prepare prospective teachers to reimagine mathematics classrooms as loving and nurturing spaces for learning. To support prospective teacher in this reimagining work, mathematics teacher educators have worked to infuse the preparation of prospective teachers to enact justice-oriented pedagogies into a variety of spaces from content courses to methods course work.

Felton et al. (2012) discussed how they design tasks for their mathematics content courses which push prospective teachers to consider how social issues can be integrated into the mathematics classroom. Through this integration of social issues, the authors are building prospective teachers' content knowledge while modeling how to incorporate students' experiences into the classroom. Other ways MTEs have worked to develop prospective teacher content knowledge is through building in opportunities for prospective teachers to reflect on how modifications to activities impact the way students engage with lessons, which can support

prospective teachers in seeing how mathematics lessons can empower students beyond mastering procedural skills (Lawler et al., 2017). Through supporting prospective teachers not just developing their content knowledge but modifying tasks to engage students in different ways, MTEs create opportunities for prospective teachers to consider how students will engage in classrooms.

Additionally, when considering pedagogical content knowledge, MTEs need to push beyond "traditional" pedagogical moves. For instance, a common pedagogical practice taken up in practice-based teacher education is eliciting student thinking. Part of preparing prospective teachers to help them recognize different questioning patterns (Arbaugh & Freeburn, 2017; B. A. Herbel-Eisenmann & Breyfogle, 2005). However, in moving towards a more critical practice-based teacher education, MTEs can begin to push the idea of eliciting student thinking to encourage prospective teachers to consider their biases in questioning patterns (Herbel-Eisenmann & Shah, 2019). One way of doing this is through having prospective teachers record their teaching and then analyze it using a tool like Equip to reflect on the equity in their questioning patterns (Byun et al., 2023)

Another way to prepare teachers to develop pedagogical content knowledge, which helps center students in mathematics classroom is through problem posing. However, it is more than just posing cognitively demanding problems, but supporting prospective teachers in developing collaborative problem posing (Crespo & Harper, 2020). Crespo and Harper (2020) found that through exposing their prospective teachers to Horn's (2012) idea of equitable mathematics teaching and principles for modifying tasks resulted in prospective teachers creating tasks which prioritize student interdependence. Through centering interdependence in their mathematics

tasks, the prospective teachers are beginning to challenge the notion of mathematics as an isolated individualistic field.

Shifting from knowledge of students to knowledge with students is a challenge for many prospective teachers to take up. As Gutiérrez (2012) discusses, knowledge with students allows teachers to challenge deficit narratives and provide students with experiences in the classroom grounded in their own lived experiences. The challenge comes in supporting prospective teachers in developing knowledge with students when they are not in a classroom daily. However, there are a few powerful examples of MTEs building capacity in prospective teachers to do this work.

Kalinec-Craig and colleagues (2021) use LessonSketch to have prospective teachers notice mathematical strengths of students. They found that by providing sentence stems prospective teachers were able to shift their language to asset-based language. However, as with many such interventions, it is hard for the authors to know if it is just a shift in language or a shift in fundamental beliefs about students. In a similar analysis, it found that despite the shift in language about students, prospective teachers did not always enact moves which aligned with the asset-based language, particularly with multi language learners (Crespo et al., 2021). Despite the limitations of these findings, their work does highlight how prospective teachers can begin moving against deficit notions of students, even if there is still work to be done to move prospective teachers into knowledge with students.

Another way MTEs have worked to develop prospective teachers' knowledge with students is in their field placements. A recent example is the use of the Community Mathematics Exploration Module (CME) created as part of the Teachers Empowered to Advance Change in Mathematics (TEACH Math) project (Bartell et al., 2019). The components of this module include a community walk, mathematics lesson development, and a write up and reflection

(McDuffie & Foote, 2019). Through implementation, MTEs have found prospective teachers increased their desire to make mathematics more relevant to students and expressed the importance in finding opportunities to learn about students, their families, and their communities (Stoehr, 2019; Turner et al., 2013; Willey & Pinheiro, 2019; Zavala & Stoehr, 2019). Additionally, many prospective teachers identified the importance of adapting the context of the task but did not always adapt the task to attend to issues facing the students' communities (Harper et al., 2018; Zavala & Stoehr, 2019).

To develop prospective teachers' political knowledge for teaching, it is important to not just make them aware of ways to challenge systems but provide them opportunities to practice doing that work. The examples provided in the previous domains are a way to help prospective teachers consider how to push back on deficit narratives, update curriculum which does not reflect their students, challenge inequitable teaching strategies, and provide students with rigorous opportunities to engage in mathematics. However, another aspect of political knowledge for teaching is talking back to the systems and the people who uphold those systems. One such way to talk back is through creative insubordination (Gutiérrez, 2015). Gutiérrez (2016) highlights several strategies for how teachers enact creative insubordination, such as turning issues into a moral one, counter with evidence, seek allies, use the master's tools, etc. However, as with other types of knowledge, prospective teachers need opportunities to rehearse (Lampert et al., 2013) how these conversations will happen. This type of rehearsal has been explored in numerous ways through activities like "In My Shoes" (Gutiérrez et al., 2017) or critically analyzing the supporting difficult situations (Marshall et al., 2020). Each of these tools allow prospective teachers to talk through situations and work collaboratively to develop strategies to subvert systems of power in schools.

As the reviewed studies have shown, mathematics teacher educators have implemented numerous activities in their teacher education classrooms to prepare prospective teachers for justice-oriented practices and to potentially learn to enact humanizing mathematics teaching. While much of the research shares the tools used in mathematics teacher preparation classrooms, there have been no studies in mathematics education that consider the role of the mentor teacher in this work.

## [Mathematics] Mentor Teacher

A common experience in prospective teachers learning to teach is the student teaching phase. This experience, and working with a mentor teacher, is often identified by prospective teachers as the most important part of their preparation (Gareis & Grant, 2014; Schwille, 2008). In this study, I, similar to Stanulis and colleagues (2019), use the term mentor teacher instead of cooperating teacher because mentoring extends the focus from the what of teaching to the how and why of teaching. Butler and Cuenca (2012) argue that mentoring is a socially constructed practice given the situated nature of mentoring. In a review of the literature, they propose that mentor teachers are represented in literature by fulfilling the roles of instructional coach, emotional support system, and socializing agent. Additionally, Clark and colleagues (2014) conducted an extensive literature review of studies involving MTs and identified 11 different categories to describe the ways MTs participate in the process. These categories range from providers of feedback to abiders of change to teachers of children. In this work, they found that mentor teachers felt varying levels of authority to enact each of these different categories within university teacher preparation programs.

This lack of authority may come from the ways many research studies still position mentor teachers as barriers to prospective teachers' enacting reform-pedagogy (Rozelle &

Wilson, 2012) and as gatekeepers who hold power over the prospective teacher (Lilach, 2020). However, in much of this work, the mentor teachers were not engaged to find out their perspective. Goodwin et al. (2016) began to challenge this notion that MTs are barriers through considering how "the distance between MTs' intentions and their teaching realities could be framed as dilemmas" (p. 1215). In doing so, they were able to reframe some of the struggles mentor teachers faced in considering the experience of the mentor teacher. This aligns with the work of Siebert and colleagues (2006) who share reflections from mentor teachers of how the struggles of prospective teachers in the classroom impact both the mentor teacher and the K-12 students.

Despite these challenges van Ginkel and colleagues (2016) found that mentor teachers often become mentors to both further their learning and to support new teachers in learning to teach. They argue these findings support the argument of mentor teachers as co-learners with prospective teachers. Stanulius and colleagues (2019) propose various ways mentor teachers engage as colearners with their prospective teachers. Through their work with various mentor teachers, they found that mentor teachers engaged with prospective teachers through coplanning, observing and debriefing, and analyzing student work. These three moves sound like typical activities in teacher preparation; however, Stanulius and colleagues found that mentor teachers engaged in these practices in ways that support prospective teachers to center the K-12 students, zoom in on specific instructional moves, and develop plans for how to move forward. Additionally, Bieda and colleagues (2015) found that through collaborative lesson study with mentor teachers, prospective teachers increased their attentiveness to K-12 student thinking.

In addition to specific moves mentor teachers make in through the process, a recent literature review examined the four main approaches mentor teachers take to their work: (a)

personal growth, (b) situated perspective, (c) core practice, and (d) critical transformative (Orland-Barak & Wang, 2021). Given the focus of this dissertation on critical consciousness and social justice teacher education, I will discuss the ways mentor teachers have taken a critical transformative approach. In this approach, Orland-Barak and Wang (2021) argue that mentor teachers support prospective teachers to teach against the grain, problematize various teaching practices, and support prospective teachers to challenge the experiences they had as students. In doing so, mentor teachers help preservice teachers critically reflect on their practices and propose alternative ideas to teach for social justice (Gardiner, 2011).

**Mathematics Mentor Teachers**

In mathematics education, there are many opportunities for mentor teachers to support prospective teachers to take this critical transformative approach. For instance, recent work has highlighted the ways race and gender shape prospective teachers' noticing of students' written mathematical work (Jackson et al., 2023), how prospective teachers evaluate students' mathematical thinking in classroom video (Battey et al., 2021), and how prospective teachers notice justify participation in whole-class discussions (Byun et al., 2023). Mathematics education has not examined how mathematics mentor teachers challenge or uphold these exclusionary practices. In mathematics education, much of the research has been focused on how mentor teachers conceptualize their roles (Leatham & Peterson, 2010; Wilson et al., 1999, 2005).

Wilson and colleagues (1999) examined secondary mathematics mentors' perceptions of their role. They found that most mentor teachers perceived their role in similar ways, such as that of an expert mathematics teacher or of an encouraging, supporting mentor. However, the ways mentor teachers enacted these roles were very different. Building on this work, Leatham and Peterson (2010) explored what mathematics mentor teachers believed was the purpose of student

teaching. They found that mentor teachers identified the following as purposes of student teaching: a chance to learn with and from a practicing teacher, to gain real classroom experience, to learn about classroom management, to interact with students and build relationships with them, to determine one's fit for the teaching profession, to develop affective characteristics of a good teacher, and to be enculturated into the school system. One limitation of this work was it was conducted with mentor teachers who all worked with a specific teacher preparation program.

Although the ways mentor teachers consider the purpose of student teaching is important for the field to understand, it tells us little about their approach to mentoring. Feiman-Nemser (1998) describes educative mentoring as a process where mentors "think seriously about how to help novices learn to teach, have clear ideas about the kind of teaching they want novices to learn, and what that teaching entails" (p. 71). One way this educative mentoring has been taken up in mathematics teacher education is through noticing and wondering conversations between mentor teachers and prospective teachers (Roller, 2019). In educative mentoring, the mentor teachers are often conceptualized as teacher educators working the university-based teacher educators and the prospective teacher. Wood and Turner (2015) have explored what this could look like through creating a third space collaboration. In this collaboration, they found ways mentor teachers can contribute complexity to the situations by providing valuable insight from the classroom that the prospective teacher may have missed.

## Summarizing Literature Review

In this literature review, I have described how mathematics classrooms have historically perpetuated racial injustices and anti-Blackness through various forms of violence, which continue even under equity and inclusion initiatives (Martin et al., 2019). These injustices are perpetuated by forced assimilation into dominant mathematical practices, serving as a proxy for

maintaining white privilege and gatekeeping access to higher education and lucrative careers (Battey, 2013; Battey & Leyva, 2016; Gutiérrez, 2017; Louie, 2017). Systemic change at multiple levels is necessary to combat the deep-rooted culture of exclusion in mathematics education. Despite exclusionary practices, there are proposals for creating more liberatory, humanizing environments in mathematics education. Drawing on Freire's concept of humanization and critical consciousness, educators advocate for social justice pedagogy in mathematics aims focusing on understanding sociopolitical conditions, taking action to change the world, and developing empathy (Frankenstein, 1983; Gutstein, 2006; Kokka, 2020). Building on this work various justice-oriented pedagogies, such as culturally relevant mathematics teaching and rehumanized mathematics classrooms, have been conceptualized to support prospective teachers (Ramsey-Jordan, 2020) and the role of mentor teachers in justice-oriented teaching remains underexplored (Ramsey-Jordan, 2022). Mentor teachers, focusing on the how and why of teaching, engage in co-learning with prospective teachers, supporting them in addressing biases and evaluating students' mathematical thinking through critical transformative approaches and educative mentoring.

# CHAPTER 4: A THEORIZATION OF CRITICALLY CONSCIOUS MATHEMATICS MENTORING

As described in the literature review (chapter 3), teacher educators across content area disciplines have been working to cultivate critical consciousness in prospective teachers. Given the ways mathematics has been positioned in schools as a gatekeeping mechanism (Battey, 2013), a site of trauma (Matthews, 2018), and a tool of white supremacy (Martin, 2009), it is vitally important for mathematics teachers to be critically conscious. Part of being a critically conscious mathematics teacher is challenging these systems of power and oppression that mathematics upholds. Although mathematics teacher education has worked to prepare prospective teachers to engage in justice-oriented pedagogies; an example is the edited volume by White and colleagues (2016) which has over seventy contributions discussing justice-oriented pedagogies in mathematics education, there has been no studies which explore mentor teachers' role in this work, either theoretically or empirically (Ramsey-Jordan, 2022).

To address the gaps in the literature, I conducted the theoretical study of this dissertation and undertook the theorization of a construct of mentor teachers' roles in social justice mathematics teacher education in supporting prospective teachers' development of critical mathematics consciousness. In doing so, I answered the following theoretical research questions:

1. *How can the practices of educative mentoring be employed to support prospective teachers' critical mathematics consciousness?*
2. *How does this form of mentoring disrupt exclusionary practices in mathematics education?*

## Mentoring to Support Prospective Teachers Critical Mathematics Consciousness

In this section I will seek to answer the first theoretical research question. I first provide an overview of educative mentoring (Feiman-Nemser, 1998, 2001) and critical mathematics consciousness (Kokka, 2020); then I bring these two constructs together to provide a theorization of critically conscious mathematics mentoring.

### Educative Mentoring

As the above literature described, there are various ways mentor teachers have been part of teacher preparation. Feiman-Nemser (1998, 2001) describes an approach to mentoring, *educative mentoring*, where the mentor teacher acts as a teacher educator in supporting prospective teachers to "learn to teach and develop the skills and dispositions to continue to learn in and from their practice" (Feiman-Nemser, 1998, p. 66). This work of mentoring prospective teachers is described by Feiman-Nemser (1998, 2001) as educative mentoring. An educative mentor takes a colearning, inquiry orientation towards mentoring through attending to the prospective teachers' current concerns and questions while still focusing on long term growth of the prospective teacher. Part of educative mentoring is balancing the needs of the prospective teacher with the needs of the PK-12 students in the classroom (Stanulis et al., 2019). Specifically, Feiman-Nemser (2001) describes educative mentoring as follows:

> "Educative mentoring rests on an explicit vision of good teaching and an understanding of teacher learning. Mentors who share this orientation attend to beginning teachers' present concerns, questions, and purposes without losing sight of long-term goals for teacher development. They interact with novices in ways that foster an inquiring stance. They cultivate skills and habits that enable novices to learn in and from their practice. They use their knowledge and expertise to assess the direction novices are heading and to

create opportunities and conditions that support meaningful teacher learning in the service of student learning" (p. 18).

In order to engage educative mentoring, Feiman-Nemser (1998) argues mentors engage in *joint work* with the prospective teacher and *thinking aloud.* Joint work is when mentor teachers engage novices in authentic tasks of teaching, taking the lead when needed, and prospective teachers learning from doing and talking about the work with their mentor. Additionally, thinking aloud is when educative mentors make visible and explicit the choices, they are making in managing the tensions of instructional decisions (Lampert, 1985). Feiman-Nemser argues this is done through providing prospective teachers a space to engage in active listening, asking questions, and interpreting their own classroom experiences. In a later study, Feiman-Nemser (2001) builds on the work of educative mentoring to examine the practice of an exceptional mentor. From this work, she proposes eight practices of educative mentoring (see Table 3 for practices and descriptions).

**Table 3**

*Educative Mentoring Practices*

| **Educative Mentoring Practice** | **Descriptor** |
|---|---|
| Finding Openings | Focusing mentoring conversations on topics salient to prospective teachers that lead to consideration of larger issues teachers need to consider |
| Pinpointing Problems | Supporting prospective teachers in identifying problems and talking about the problems of teaching in precise, analytic ways |
| Probing Novices' Thinking | Asking questions of prospective teachers to clarify their understanding and be able to explain their reason for instructional choices in ways clear to themselves and others |

Table 3 (cont'd)

| Educative Mentoring Practice | Descriptor |
|---|---|
| Noticing Signs of Growth | Providing specific positive feedback about specific strengths of a prospective teacher |
| Focusing on Students | Focusing on the PK-12 students' thinking and sense making as a place of conversation for the mentor an prospective teacher takes pressure of the prospective teacher's concerns about their practice |
| Reinforcing an Understanding of Theory | Reinforcing theoretical ideas in context supports novices in developing usable knowledge and principled understandings |
| Giving Living Examples of One Person's Way of Teaching | Providing prospective teachers opportunities to observe and unpack particular teaching ideas and begin to clarify general characteristics of good teaching |
| Modeling Wondering about Teaching | The mentor takes a stance of coteacher & colearner by using their own practice as a site for learning about student thinking |

*Note.* Practices are from Feiman-Nemser (2001)

**Critical Mathematics Consciousness**

Kokka (2020) conceptualized Critical Mathematics Consciousness as the interrelated development of "sociopolitical understanding, empathy, and taking action" (p.782). This conceptualization builds on the social justice pedagogical goals of teaching mathematics for social justice (Gutstein, 2006) and critical civic empathy (Mirra, 2018). Gutstein's (2006) social justice pedagogical goals include (a) reading the world with mathematics, which Kokka extends to describe as understanding sociopolitical conditions; (b) writing the world with mathematics, which Kokka extends to describe as taking action to change the world; and (c) developing positive culture and social identities. Kokka argued developing positive cultural and social identities was not intended for those who belong to the dominant group, so she modified the goal to focus on empathy. Below I describe each goal in more detail as connected to this study.

### *Understanding Sociopolitical Conditions*

In conceptualizing understanding sociopolitical conditions, Kokka (2020) draws on reading the world with mathematics. Gutstein (2003) originally described reading the world with mathematics as follows:

> "to use mathematics to understand relations of power, resource inequities, and disparate opportunities between different social groups and to understand explicit discrimination based on race, class, gender, language, and other differences. Further, it means to dissect and deconstruct media and other forms of representation and to use mathematics to examine these various phenomena both in one's immediate life and in the broader social world and to identify relationships and make connections between them" (p. 45).

In later work, Gutstein (2006) describes how he cultivated a classroom in which students began to understand sociopolitical conditions through reading the world with mathematics. Through this practice, Gutstein created mathematical problems where his students analyzed various systems of oppression. For example, students explored if racism was a factor in mortgage rates across the city of Chicago (Gutstein, 2006, p.57), analyzed racial profiling in traffic stops (Gutstein, 2006, p. 53) and created various models to represent the world wealth gap (Gutstein, 2006, p. 48). In each of these activities, students not only solved mathematical problems, but they also wrote reflective responses where they connected the mathematics to oppressive systems.

Gutstein (2006) described the importance of the reflective activities as an opportunity for students to "consider, question, and critique their previous learning and beliefs" (p. 63). Additionally, he described how a supportive, open and honest, critical environment was needed for students to be able to fully engage in these analyses. To create this environment Gutstein

(2007) described creating a pedagogy of question. Pedagogy of questioning where students pose their own questions, name their own realities, strive to unravel complex social phenomena, engage and analyze multiple perspectives, and questions are tied to actions and social movements (Gutstein, 2007). Gutstein (2007) shared an example from a student of the back-and-forth questioning process in analyzing the data around if racism was a factor in mortgage rates. This back and forth allows for teachers to "provide students with the necessary historical knowledge, the disposition to continue to probe, and specific mathematical tools" (Gutstein, 2007, p.67). These moves of supporting students in posing their own questions related to systems of power and oppression extended beyond just an initial questioning and finding the answer.

***Empathy***

As described above, since Kokka (2020) worked with students of the dominant group, she argues that instead of cultivating positive cultural and social identities the students she worked with needed to cultivate critical civic empathy. She states this conceptualization is "useful because she differentiates individual empathy, or simply seeing another's perspective, from critical civic empathy, which includes seeing another's perspective while also engaging in structural analysis of power and privilege to take civic action for social transformation" (p. 782). Building on this work, I also choose to draw on empathy instead of cultivating positive cultural and social identities. Instead of grounding my work in critical civic empathy, I draw on Warren's (2018) notion of perspective taking empathy, a form of empathy specifically conceptualized around prospective teachers.

Warren (2018) describes perspective taking empathy as an "iterative process including acquisition of knowledge and use of knowledge to drive decision making" (p. 171), or more plainly it connects what a teacher knows to what the teacher does. Warren argues that "teacher

candidates need empathy to better understand students, families, and communities, especially if they are preparing to teach in racially, ethnically, and linguistically diverse school settings" (p. 169). In part of developing this empathy, Warren and Hotchkins (2015) caution the ways false empathy, "a state of mind that ultimately places the needs, desires, and points of view of the empathizer above those needs, desires, and points of view of the intended beneficiary of an empathetic response" (p. 279), can creep into teacher preparation. Because of this Warren argues that to develop prospective teachers' empathy, teacher educators must support prospective teachers in noticing patterns in their beliefs as well as providing opportunities for them to "model, practice, and discuss during their professional preparation to teach" (p.169) the ways empathy can guide their instructional decisions.

To support prospective teachers in developing perspective taking empathy Warren (2018) provides recommendations to teacher education to consider. He encourages teacher educators to provide prospective teachers opportunities to engage in critical self-reflection, not just on the disciplinary content but also their goals, values and sociopolitical/historical contexts. Additionally, he suggests creating community-based field experiences (e.g. Zygmunt et al., 2018) to allow students opportunities to practice working with students and support in debriefing those experiences. Finally, he encourages engaging prospective teachers with counterstories, cross racial dialogues, and race reflections in order to support them in taking another perspective through empathy.

***Taking Action***

In conceptualizing taking action, Kokka (2020) draws on writing the world with mathematics. Gutstein (2006) describes writing the world with mathematics as a "process of beginning to see oneself capable of making change" (p. 27). He describes how in order to

support students in doing this work, he needed to work to develop agency in his students to go beyond mathematics. This was done through having students "(1) learn their histories, (2) learning that ordinary people have changed the world, (3) envisioning and taking action themselves, and (4) finding commonalities and solidarity with other oppressed people" (Gutstein, 2006, p. 96).

Building on the ways in which Gutstein (2006) discussed teachers can engage students in taking action, Kokka (2018, 2023) has explored the ways teachers have taken action in their work as mathematics teachers. She describes teachers attending to social justice in their classrooms through drawing on the practices of teaching mathematics for social justice, creating humanizing relationships with their students which improved the students' relationships with STEM, and rejecting "the notion that mathematics or science should be 'on a pedestal' explicitly calling out the influence of capitalism" (Kokka, 2018, p. 109). Recently, this work was expanded to consider the ways teachers "(1) center relationships and community wellness (of humans and the earth) for collective healing, (2) examine and dismantle systems of oppression, (3) broaden conceptualizations of knowledge, and (4) foster healthy relationships with dominant mathematics." (Kokka, 2023 p. 12).

**Toward Critically Conscious Mathematics Mentoring**

Although educative mentoring looks to extend the role of teacher educator to a mentor teacher by honoring their expertise, it does not address the way mentoring is different when explicitly considering the development of prospective teachers' critical consciousness. To address this, I draw on the above bodies of literature to answer the first theoretical research question, *how can the practices of educative mentoring be employed to support prospective teachers' critical mathematics consciousness?* I propose that mentor teachers use the practices of

educative mentoring to support critical mathematics consciousness through *critically conscious mathematics mentoring*. Critically conscious mathematics mentoring has three components (a) mentoring for understanding sociopolitical conditions, (b) mentoring for perspective taking empathy, and (c) mentoring for taking action. Below I describe what these components look like theoretically.

### *Mentoring for Understanding Sociopolitical Conditions*

To mentor for understanding sociopolitical conditions involves mentor teachers in creating spaces for prospective teachers to engage in critical reflection which allows for them to connect their own lived experiences to the choices they are making in their classroom. For instance, how prospective teachers engage with the ideas of being a mathematics person and learning mathematics impact the ways they engage their students with mathematical ideas. In doing so mentors engage in the practice of designing activities for students to critique previous experiences (Gutstein, 2006; Kokka, 2018). This critiquing of previous learning experiences allows for prospective teachers to consider the ways systems, such as tracking, may have benefited them, but do not benefit all students (White, 2016). Additionally, through having prospective teachers connect these ideas to their classrooms and teaching practices, mentor teachers are engaging in the educative mentoring practice of probing novices thinking (Feiman-Nemser, 2001). This work allows for prospective teachers to draw these connections and think about how their own experiences are informing the choices they make in the classroom while their mentor supports them in this work.

Additionally, mentor teachers engage in a pedagogy of questioning (Gutstein, 2007) by supporting the prospective teachers to ask questions of their experiences and the biases about who does mathematics. This work allows mentor teachers to not only probe the prospective

teachers' thinking, but also connect these questions to the larger theories of justice-oriented mathematics teacher education, another practice of educative mentoring (Feiman-Nemser, 2001). In order to do this, mentor teachers need to create an environment where the prospective teacher feels supported to do this critical reflection, another component of understanding sociopolitical conditions (Gutstein, 2006; Kokka, 2018). This is not to say that the mentor teacher does not challenge the prospective teacher, but the challenges come from a place of support to unpack and critically think about their experiences and beliefs; in order to make sure the choices in the classroom are serving all students. In doing so, the mentor teacher engages in pinpointing problems (Feiman-Nemser, 2001) to support the prospective teacher in discussing their classroom practice and figuring out how their experiences and beliefs are impacting what the prospective teacher is seeing in their classroom.

### *Mentoring for Perspective Taking Empathy*

To mentor for perspective taking empathy, the mentor teachers support the prospective teachers in shifting their critical reflection from themselves to the students in the classroom by putting the focus on students (Feiman-Nemser, 2001). This includes supporting prospective teachers in understanding current events in the community, community histories, the support provided by the community, and how these different community experiences impact the classroom, which Warren (2018) describes as a key component of perspective taking empathy. This work really involves shifting the focus from the prospective teacher to the students and their experiences. One way mentor teachers can engage in this practice is similar to what Feiman-Nemser (2001) describes as focusing on kids. This practice involves looking beyond the teacher to the experiences of the children in the class and how they are learning. Feiman-Nemser

describes this as a way to take the pressure of the prospective teacher by making it about the students and not them.

Another part of perspective taking empathy, as described by Warren (2018) is not just learning about the history but supporting the prospective teacher to notice the patterns in their own reflections based on their assumptions and/or experiences in the community. Mentors can do this through providing spaces for the prospective teachers to debrief their experiences and thoughts in a supportive learning environment. Part of creating this environment is providing supportive critical feedback to the prospective teacher such as making sure to highlight ways the mentor sees the work of critical reflection, incorporating and building students' histories, and engaging with families and communities' changes over the mentoring period. Feiman-Nemser (2001) describes this practice as noticing signs of growth and making it explicitly and specific to the prospective teacher.

### *Mentoring for Taking Action*

The final aspect of mentoring for critical consciousness is taking action. Although Gutstein (2006) originally conceptualized this idea of taking action through writing the world with PK-12 students, Kokka's (2018; 2023) work on mathematics teacher activism aligns more clearly with the work of mentoring for taking action. One way mentor teachers engage in mentoring for taking action is by clearly sharing the ways they have taken action and pushed back on oppressive systems. For instance, mentor teachers can share the ways in which they have engaged in creative insubordination (Gutiérrez, 2016). In doing so mentor teachers provide prospective teachers with an example of a living practice of how one teacher engages in taking action, which Feiman-Nemser (2001) identifies as a key practice of educative mentoring.

Another way mentor teachers can engage in taking action is through broadening how prospective teachers conceptualize what counts as mathematics and teaching mathematics (Kokka, 2023). Mentor teachers can highlight this work through modeling different ways of knowing mathematics and different structures of engaging students in the classroom (Feiman-Nemser, 2001). Sometimes this work can look like setting aside the pacing guide of mathematical content to ensure students are supported in where they are in-the-moment.

Finally, Kokka (2023) discusses taking action by "fostering healthy relationships with dominant mathematics" (p. 12). Many prospective secondary mathematics teachers already have a healthy relationship with the dominant mathematics. To mentor for this domain, mentor teachers engage in what Feiman-Nemser (2001) describes as finding openings that are salient to the prospective teacher. Through finding these openings, mentor teachers support prospective teachers in unpacking their relationship with mathematics, so prospective teachers can foster this relationship and share that love with others. Part of this work, Kokka describes, involves connecting back to the larger conception of broadening conceptions of mathematical knowledge. It is not just enough for prospective teachers to support their students' love of mathematics, but they need a broad sense of what mathematics is and the different ways students can love it. To support this broadening of conceptions of mathematical knowledge, mentor teachers can reinforce the understanding of theory for what it means to know and do mathematics.

## Critically Conscious Mathematics Mentoring Disrupts Exclusionary Practices in Mathematics Education

Above, I provide a review of the literature which describes the way that mathematics education has operated in exclusionary ways. Although critiquing the ways mathematics education perpetuates racism and exclusion in schools is critically important, I seek for this

dissertation to move beyond critique and consider ways to disrupt these exclusionary practices. In order to move beyond critique of mathematics education to action, I theorized critically conscious mathematics mentoring. I am now providing a proposal for the ways in which critically conscious mathematics mentoring can disrupt the exclusionary practices in mathematics classrooms, answering the second theoretical research question, *how does this form of mentoring disrupt exclusionary practices in mathematics education?*

As I share my initial thoughts on the way critically conscious mathematics mentoring disrupts exclusionary practices in mathematics classrooms, I want to take a moment and pause to remember this is one potential way in which disruption can happen. I, as a white woman, former mentor teacher, and current mathematics teacher educator, see things in a specific way due to my socialization. However, the mentor teachers with which I work may see different opportunities for disruption due to their experiences. Additionally, you as a member of my committee may see other opportunities for disruption based on your own lived experiences. I am stating this first to remind myself that every theory is shaped by the lived experiences of those who do the theorization. Second, I am sharing this to highlight that this is just an initial theorization and will be refined throughout this dissertation. In the sections that follow I am organizing the sections based on the aspects of critically conscious mathematics mentoring.

**Disruption with Mentoring for Understanding Sociopolitical Conditions**

When mentor teachers engage in mentoring practices for understanding sociopolitical conditions, they disrupt exclusionary practices in a number of ways. Through probing prospective teachers thinking by engaging in activities to critique their previous mathematics learning experiences and think critically about what it means to be a successful mathematics student (Feiman-Nemser, 2001; Gutstein, 2006; Kokka, 2020), mentor teachers work to disrupt

the notion of "a math person". This can be done through activities similar to those described by Bartell and colleagues (2021), which support mathematics teachers to understand systems of privilege and oppression in mathematics education. Through considering systems of oppression in mathematics, such as tracking, and considering the different ways mathematics learning experiences contribute to these systems, mentor teachers support prospective teachers in considering ways they have benefited from these systems (Amidon et al., 2023). Additionally, when mentor teachers engage in a pedagogy of questioning (Gutstein, 2007) to probe prospective teacher's thinking and connect to theories of mathematics education (Feiman-Nemser, 2001), they are working to disrupt the racial hierarchy in math. This is explicitly done when mentor teachers ask prospective teachers to consider who the structures in the classroom are supporting and which students are getting excluded from the space. Finally, these discussions around who the structures the classroom are supporting and who they are excluding also works to disrupt the right to exclude.

**Disruption with Mentoring for Perspective Taking Empathy**

When mentor teachers mentor for perspective taking empathy, they work to keep the focus on the students (Feiman-Nemser, 2001) by supporting prospective teachers in understanding current events in the community, community histories, the support provided by the community, and how these different community experiences impact the classroom (Warren, 2018). Through this work, mentor teachers can help prospective teachers get to know the communities in which they are working and bring in community based mathematical knowledges (Civil, 2016). Through doing this work, mentor teachers disrupt the exclusionary view of mathematics through honoring mathematics outside of the typical PK-12 curriculum and inviting multiple ways of knowing mathematics into the classroom.

To mentor for perspective taking empathy, the mentor teachers support the prospective teachers in shifting their critical reflection from their own experiences to the students in the classroom (Warren, 2018; Feiman-Nemser, 2001). This shift to critically reflecting students' experiences supports prospective teachers in seeing beyond a mathematics experience that worked for them. In considering the various ways students experience mathematics and the importance of a collaborative community in learning, mentor teachers support disrupting the idea of mathematics as a lone individualistic endeavor and instead focus on how students can support one another and be resources for each other in learning (Louie, 2017). Part of making this shift involves mentor teachers supporting the prospective teacher to notice the patterns in their own reflections based on their assumptions and/or experiences (Warren, 2018). Mentors can do this through providing spaces for the prospective teachers to debrief their experiences and thoughts in a supportive learning environment and noticing signs of growth on behalf of the prospective teacher (Feiman-Nemser, 2001). This noticing patterns in belief and highlighting growth in prospective teachers can disrupt the exclusionary practices in mathematics classrooms when the discussion focuses explicitly on skills and traditions that are not historically seen as mathematical (Louie, 2017).

**Disruption with Mentoring for Taking Action**

The final way critically conscious mathematics mentoring disrupts the exclusionary practices of mathematics classrooms is through mentoring for taking action. One way mentor teachers engage in mentoring for taking action is by providing an example (Feiman-Nemser, 2001) of how they have taken action to subvert oppressive systems through creative insubordination (Gutiérrez, 2016). Examples of creative insubordination can disrupt the exclusionary aspects of mathematics in many ways. When mentor teachers share times, they

have chosen to modify the curriculum to push students beyond the procedural problems in the course text, they disrupt the ways that schools provide different students different opportunities to learn (Anyon, 1980). Mentor teachers are sharing specific ways to take action in your school to make sure all the students are able to access rich mathematical problems. Additionally, when mentor teachers share ways, they have engaged in creative insubordination this can challenge mathematics exclusionary culture; especially, if introducing these mathematically rich problems, happen in a class that is traditionally considered "low tracked". In this work, mentor teachers are modeling a first step in challenging the racist, ableist practice of tracking in our schools through making sure all students have access to rich mathematics.

Another way mentor teachers engage in mentoring for taking action is through finding openings with prospective teachers (Feiman-Nemser, 2001) by supporting them to consider their relationship with mathematics and consider why they enjoy dominant mathematics (Kokka, 2023). Similar to described above, this analysis of prospective teachers' relationship with mathematics is part of the work in disrupting the notion of "a math person". Kokka (2023) describes part of this work as broadening the conception of what counts as mathematics. By expanding what "counts as mathematics", mentor teachers also move mathematics beyond sites of remediation for some students into a place where all the students are able to engage in mathematics in ways that make sense for them (Yeh et al., 2020).

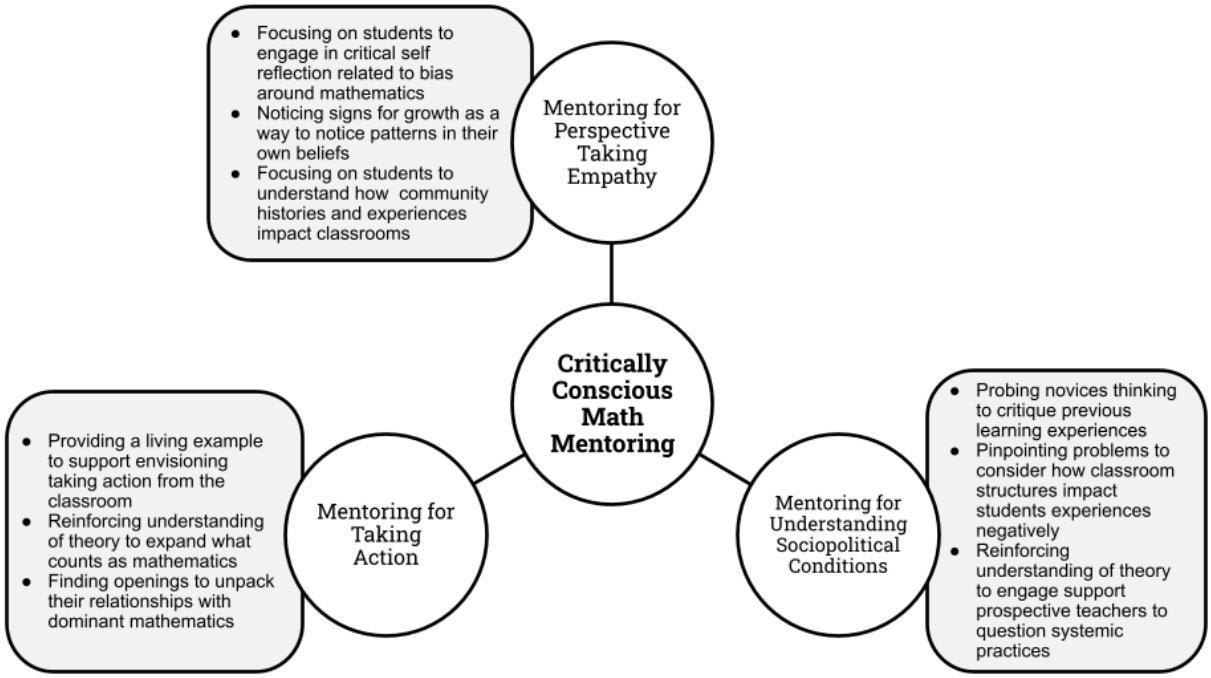
## Summarizing the Theoretical Study

In answering the first theoretical research question, I propose critically conscious mathematics mentoring builds on the constructs of educative mentoring and critical mathematics consciousness to extend the role of teacher educator to a mentor teacher as a way to honor their expertise in the field specifically related to considering the development of prospective teachers'

critical consciousness. Above I have argued that as mathematics and teacher education have turned towards justice, it is important to consider the roles of mentor teachers in preparing prospective teachers to do this work. Specifically, critically conscious mathematics mentoring is a form of mentoring that focuses on mentoring for: (1) understanding sociopolitical conditions; (2) perspective taking empathy; and (3) taking action. It is important to know that these mentoring moves attend to various aspects of teaching including classroom practices, specific commitments a teacher may hold, and a specific orientation to teaching. Figure 2 provides an overview of the ways theorized above that mentor teachers can bring together educative mentoring and critical mathematics consciousness.

**Figure 2**

*Theoretical Model of Critically Conscious Mathematics Mentoring*




*Note.* The practices from educative mentoring appear first in the theorized model and aspects of critically conscious mathematics mentoring appear second.

In answering the second theoretical research question, I have argued that this type of mentoring pushes prospective teachers to challenge exclusionary practices in mathematics education. This happens through disrupting the notion of a "math person", challenging curriculum students have access to via tracking and curriculum which attempts to be "neutral" and supporting how to expand the ways for students to make sense of mathematics. It is important to note here, although the framework in Figure 2 is organized in a list, this construct is not to be used as a checkbox or a rubric. This construct is a potential tool for teacher educators (both university and school based) to think with around mentoring. This is evident in how I built on the theoretical work in this portion of the dissertation. I designed an empirical study to document how mentor teachers narrated their mentoring practice related to critically conscious mathematics mentoring.

# CHAPTER 5: EMPIRICAL STUDY

Since this dissertation is grounded in praxis-oriented research, it involves "the interactive, reciprocal shaping of theory and practice" (Lather, 1986, p. 258). This means that although the construct has been proposed, it needs to be shaped by the practices of mentor teachers. In order to begin this reciprocal shaping of theory and practice, I have designed an empirical study consistent with humanizing methodologies (Paris & Winn, 2013; San Pedro & Kinloch, 2017) which draws on dialogic tools common in narrative inquiry and critical narrative analysis. The goal of this study is to understand the perspectives of mentor teachers through conversations about supporting the development of prospective teachers' critical mathematics consciousness. Specifically, this study seeks to answer the following empirical research questions:

1. *In what ways do mentor teachers describe engaging in critically conscious mathematics mentoring?*
2. *In what ways do mentor teachers describe challenging the exclusionary practices of mathematics education through critically conscious mathematics mentoring?*

## Narrative Inquiry as Humanizing Research

For the empirical study, I drew on narrative inquiry (Connelly & Clandinin, 1990) and critical narrative analysis (Souto-Manning, 2014b, 2014a) for the methodology. Narrative inquiry is grounded in telling and sharing the stories of those with which you work (Connelly & Caldinin, 1990). This work of storytelling involves a dialogical spiral which stresses not just the value of the stories being told but also "the value of listening and understanding, which are activities that are dialogic in nature and that are collaboratively constructed" (Kinloch & San Pedro, 2013, p. 28). Kinloch and San Pedro (2017) describe this process as storying

> "which allows us to be invited into relationships where we dialogically listen and give back to the stories shared…. we listen not to extract; rather, we listen to build, develop, and share our own stories with those who have shared their stories with us. In so doing, we contextualize storying as research and knowledge production, which allows us to forward social justice, educational equity, and positive social change" (p. 376)

As narrative inquiry allows for this sharing and listening to stories, critical narrative analysis "allows for the critical analysis of narratives in the lifeworld – the everyday stories people tell – within the context of institutional discourses." (Souto-Manning, 2014a, p.163). Souto-Manning (2014b) argues that this form of analysis is humanizing because it allows for a "full understanding of participants' situations while … dispelling the myth that institutional discourses (the system) affect individual lives (life-worlds) only in specific unidirectional ways" (p. 6).

In taking a praxis-oriented approach to narrative inquiry and critical narrative analysis, the mentor teachers will be able to share their own stories that reflect their experiences, perspectives, and values of mentoring for critical consciousness. In order to facilitate authentic listening and constructing of stories, I followed the mentor teachers' lead related to the stories being shared. This means that although I will engage in multiple interactive, dialogic interviews (to be discussed later in Chapter 5), not all stories shared through these experiences will be shared in this dissertation. As Tuck and Yang (2014) describe refusal to participate in research is not just for the participants choosing not to share stories, but also for the researchers. They state

> "This refusal might take the form of turning off the tape recorder; not disclosing what was on the tape even if it was recorded; hearing a story and choosing to listen and learn from it rather than report it; resisting the draw to traffic theories that cast communities as in need of salvation." (p. 250)

Throughout this dissertation, mentor teachers will be sharing with me their lived experiences and the experiences of the students and prospective teachers with which they work. As I consider which stories to share in these pages, I am guided by the fact only mentor teachers are agreeing to participate in this study, so stories they share about students and prospective teachers which help me contextualize their mentoring are not mine to tell. Additionally, given the nature of my relationship with the participants (see chapter 5 for description), I also am choosing to not share stories that although may add context are not specifically focused on critically conscious mathematics mentoring.

## Research Design

In alignment with the ideals of humanizing and praxis-oriented research, I designed this study as a mentor teacher inquiry group (similar to Stanulis et al., 2019) which met during the summer of 2023. The purpose of the inquiry group was not only to inform the understanding of critically conscious mathematics mentoring, but also to engage mentor teachers in authentic activities to inquire and reflect on their mentoring practice. In addition to participating in the collaborative inquiry group, I also conducted individual, dialogic interviews with the mentor teachers in order to understand more about their individual work as mentors which may not have come out in the collaborative session.

## Recruitment Process

Since the goal of the empirical study was to refine the theoretical constructs and illuminate the ways mentor teachers describe disrupting the culture of exclusion in mathematics classrooms, mentor teacher recruitment and selection was intentional to ensure the mentor teachers participating in the inquiry group met the following criteria: (a) mentor prospective teachers prior to summer 2023, (b) had engaged in professional learning related to equity and justice in educational settings, and (c) employed justice-oriented pedagogies in their classrooms. In order to find mentor teachers who met these three criteria, I reached out to a national network of teacher leaders which I am a member of and asked to be connected with folks who had been known to serve as mentor teachers (see Appendix A for recruitment email). I selected this network of teacher leaders because the organization has a commitment to providing professional learning, such as: complex instruction, facilitating classroom discussions, designing culturally relevant lessons, and examination of how race impacts STEM classrooms, and support for teachers to engage in justice-oriented pedagogies and take on leadership roles, such as being a mentor teacher. Based on the response from the network, I was provided the names of eleven potential mentor teachers who met the criteria described above. I reached out to each mentor teacher via email (see Appendix B for the email) describing the project. Three mentor teachers agreed to participate in this study.

## The Mentor Teachers

The three mentor teachers who agreed to participate in this study have a wide range of experiences and varying positionalities. The three mentor teachers all knew each other and me prior to this study. Two of the mentor teachers participated in several professional developments together due to their connections. This relationship the mentor teachers had with each other and

myself helped facilitate the authentic relationships across this study that continued to build. These relationships helped fuel the vulnerability needed to share the stories and build the collective knowledge. Below I describe each mentor teacher based on the information they shared with me in the demographic survey and individual interview. Below I introduce each mentor teacher alphabetically based on the pseudonyms they choose.

***Dana***

Dana identifies as a cisgender, white woman. After graduating from college, she spent one year teaching in the project-based learning program at suburban comprehensive public high school in the Midwest. Since then, she has been teaching at a small, urban-emergent (Milner, 2012) project-based learning public charter school in a midsize city near the US-Mexico Border for nine years. Dana is monolingual, but many of her students are bilingual. However, unlike Sam (as to be discussed next), a majority of the bilingual students at Dana's school are considered proficient in English. In addition to her responsibilities in the classroom, Dana is the professional learning coordinator for her school. Over her 10 years of teaching experience, she has mentored three different prospective teachers with varying positionalities: a cisgender, white female, a queer, Latinx male, and queer, white female.

In addition to the professional learning provided by the national network, Dana has sought out professional learning related to project-based learning, creating more equitable mathematics classrooms, and facilitating courageous conversations (Singleton, 2021). Several of these professional developments were with Skylar. Through these professional developments, Dana describes realizing how her positionality as a white woman impacts the classroom and there being "a very distinct shift in [her] teaching practice" following these professional developments. These professional developments not only inform the way she structures the

classroom, but she also draws on them as she mentors prospective teachers and facilitates professional learning for her school.

***Sam***

Sam identifies as a queer, Asian American male of Chinese and Japanese descent. His entire experience (11 years) in education has been at the same school in a large urban-intensive school district on the west coast of the US. Although part of a large public district, the school Sam works at, according to the website, is a small school designed for recent immigrants who have attended school in the US for four years or less. This means that a majority of the students at the school are emerging language learners, often with what Sam describes as “interrupted educational experiences". Additionally, the majority of students’ first language is Spanish, and Sam is bilingual, speaking both English and Spanish. Sam has mentored one prospective teacher, a Latinx male who had previously worked at the school as a paraprofessional. Additionally, Sam has served in the role of instructional coach supporting new teachers at the school. He has recently transitioned to administration at the same school.

In addition to the professional learning provided by the national network, Sam has sought out professional learning related to creating more equitable mathematics classrooms at both local and national levels. Additionally, the teacher preparation program he worked with provided professional learning around mentoring to the mentor teachers.

***Skylar***

Skylar identifies as a cisgender, Black woman. She was raised in the same large city on the east coast of the US where she now teaches. Over her 11 years of teaching experience, she has worked at three different public high schools all in the same large, urban-intensive (Milner, 2012) district. Each school has very different racial demographics (mulit-racial, predominately

Black, and predominately white). Skylar has mentored one prospective teacher across an entire academic year (a white male from the Midwest) and in recent summers mentored six different prospective teachers (positionalities were not shared) in a summer field placement.

In addition to the professional learning provided by the national network, Skylar has sought out professional learning related to identity in the mathematics classroom, creating more equitable mathematics classrooms, and facilitating courageous conversations (Singleton, 2021). Several of these professional learning opportunities were completed with Dana. Skylar shared these opportunities impacted how she structures the classroom. Additionally, the teacher preparation program Skylar worked with provided professional learning to the mentor teachers.

**Mentor Teacher Inquiry Group**

A foundation of the work each mentor teacher engaged as a fellow in the national network of teacher leaders is practitioner inquiry where teachers engage in a "systematic and intentional inquiry about practice" (Cochran-Smith & Lytle, 1999b, p. 279). This process includes teachers completing inquiry cycles which involve asking questions, collecting and generating data, analyzing data, and engaging with critical friends. Additionally, the national network of teacher leaders supports teachers across the country, so the mentor teachers came with preexisting shared norms around how to engage in sustained inquiry in virtual settings. Sustained inquiry in a virtual space includes completing something in your classroom, bringing what is generated to a zoom meeting to share with colleagues, engaging in data analysis protocols to learn new insights, and then using those insights to refine the question. This experience as part of the national network of teacher leaders means that engaging in inquiry about mentoring practices are authentic activities for the mentor teachers to engage in.

Building on the shared experiences of the mentor teachers of previously engaging in as members of the community, the mentor teacher inquiry group was designed to engage in similar practices. Since the inquiry group was meeting over the summer, only one (Skylar) of the three mentor teachers was actively engaged in the mentor process. Because of this, I structured the inquiry group to be as similar to previous experiences as possible while honoring there were two members who were not actively mentoring teachers. The inquiry group met three times over the summer 2023 engaging in a variety of activities as represented in table 4.

**Table 4**

*Description of activities in inquiry group sessions*

| **Inquiry Session** | **Activities** |
|---|---|
| Session 1 | ● Share Mentoring Beliefs<br>● Brainstorm around Critical mathematics Consciousness |
| Session 2 | ● Check In/Access Needs<br>● Develop Norms<br>● Discuss Imagined Mentoring Scenario<br>● Launch Mentor Teacher Replays |
| Session 3 | ● Check In/Access Needs<br>● Revisit Norms<br>● Data Analysis Protocol to Discuss Teaching Replays |

## Data Sources

The following data sources were used as part of this study. They are listed in chronological order as experienced by the mentor teacher. All activities were completed in a written capacity (google document, jamboard, etc) or via zoom. The activities completed via zoom were recorded for analysis. I made the decision to record the zoom meetings instead of taking notes, so that way I could be present and responsive to the needs of the mentor teachers without worrying that I

jotted down every little detail. This choice to be present in the activities allowed me to engage in the activities that I am asking the mentor teachers to engage in (San Pedro, 2017). My participation facilitated the dialogic spiral of listening and telling (Kinloch and San Pedro, 2014) which continued to build the relationships between me and the mentor teachers.

### *Demographic Survey*

The initial demographic survey was administered to the mentor teachers in June. The purpose of the survey was twofold. It served as the written consent form, and the second page (following consent) was demographic questions (see Appendix C).

### *Inquiry Group Session 1 - Asynchronous*

All the initial inquiry sessions were planned to be synchronous. However, due to various travel schedules of the mentor teachers (since it was summer). The first session was done asynchronously. This session mostly focused on mentor teachers reflecting on their beliefs about mentoring and initial thoughts about critical mathematics consciousness. Once I realized this was going to need to be asynchronously completed, this work was intentionally done prior to the initial interview, so I could ask any follow up questions which surfaced from the asynchronous work. I provided each mentor teacher with the agenda in Appendix D and asked them to complete their activities on the Jamboard with their name.

For the reflections on mentoring, I drew on the idea of belief maps for mathematics teachers (Herbel-Eisenmann & Cirillo, 2009; Johnson et al., 2022). I had the participants construct mentoring belief maps, the procedure was similar; however, the prompts were focused on the role of mentoring mathematics prospective teachers (Appendix D, Figure D.1 has a full representation of the slides and prompts). The mentoring belief maps are not analyzed as part of this study. However, there are lots of places throughout the study where the mentor teachers

reflect on their mentoring practices, so I wanted to provide them with a space to write down their initial thoughts about what it meant to be a good mentor.

Part of this individual work included introducing the participants to the work of Kari Kokka. I made the choice to share a bit about critical consciousness and the framework of Critical Mathematics Consciousness because these are ideas (empathy, sociopolitical understanding and taking action) all of them would have been exposed to previously as part of their work with the national network. However, the ways in which Kokka brings the ideas together would have been new to them, so I had them start with just brainstorming what the words meant to them and then how they see these concepts showing up in mentoring (Appendix D, Figure D.2)

***Initial Interviews***

Following the asynchronous inquiry session, I met with each mentor teacher individually to ask follow up questions about what they shared in their demographic survey, mentoring beliefs, and initial reflections on Critical Mathematics Consciousness. The general protocol for each interview is in Appendix E. The interviewers were anywhere from 60 - 90 minutes long depending on the mentor teacher. The asynchronous work to varying degrees prior to the individual interview. If that had been the case, there was some initial introduction to the ideas and then space provided in the interview for individual thought time before answering the questions. Since these interviews were dialogic, they varied in length based on the conversations we had and how our (mine and the mentor teacher) stories connected.

***Inquiry Group Session 2 - Synchronous***

For this inquiry session, the purpose was to begin to analyze a mentoring scenario and begin to think about our mentoring practices (see Appendix F). Since this inquiry session was the

first one where all the members were synchronously on zoom, we began by discussing the norms. Initially, I had planned to co-develop norms with the participants. However, after the individual interviews, I decided to draw on the norms used in many of the meetings of the national network of teacher leaders: (a) step up and step back, (b) engage in ways you are able, and (c) assume positive intentions, but take responsibility for impact. I began the session by having the mentor teachers reflect on the norms. After the reflection period, we all agreed these norms would serve our meetings.

Following analyzing the norms, the mentor teachers engaged in a reflective activity on a mentor scenario (see Appendix F, Figure F.1 for full details). The mentoring scenario was developed based off of my previous work with prospective teachers (Orr, 2024). In this work, prospective teachers created imagined dialogues between them and a student surrounding different classroom scenarios and then met with me to discuss their intentions behind the imagined actions. I selected one of the classroom scenarios from the prospective teacher named Danielle[1]. In this scenario, Danielle is proposing a response to the scenario below:

> Two Black students come up to you after class and complain about having Mada (an emerging multilingual student) in their group. They claim that Mada just doesn't get along with other people in the group, and they think she'd feel more comfortable working with some of her friends (also emerging multilingual students). But, you suspect that maybe they feel like having Mada in their group is a burden and the main issue seems to be that the students are upset with having to work with other students to do math problems.

[1] Danielle is a pseudonym which was used in the previous paper for this prospective teacher.

With the mentor teachers, I shared Danielle's responses and asked them to respond to the following questions:

- If Danielle was your student-teacher, how would you respond at this moment?
- How does her goal shape the ways you respond to her?
- Given Danielle's reflection, goal for the conversation, and the actual conversation, what mentoring moves would you make to support Danielle in developing a sociopolitical understanding, empathy, or to take action?

***Mentor Teacher Replays***

Between inquiry session 2 and inquiry session 3. The mentor teachers constructed a *mentor teacher replay*. Adapted from Horn (2010) work around a teaching replay, a mentor teacher replay is a narrative description of a classroom scene. It includes descriptions of what the mentor is doing, the student-teacher was doing, what the students were doing, what may have been happening in the background. Pieces of the conversation(s) may be incorporated. Interpretations of the scene are allowable; that is, it can include your thoughts and feelings about the event. In other words, it describes what was happening in the classroom, so that the reader of the replay can envision the classroom during those moments. At the end of inquiry session 2, the mentor teachers were provided with the directions on how to construct a mentor teacher replay (Appendix G). In the session, they were given space to read the directions and ask any clarifying questions. They were asked to bring a completed mentor teacher replay to inquiry session 3 to engage in collaborative analysis.

***Inquiry Group Session 3 - Synchronous***

The final group inquiry session revolved around sharing the mentor teaching replays and engaging in a collaborative data analysis protocol (See Appendix H for full agenda). During

session 3, the data analysis protocol was modified from the Atlas and data mining protocols from the School Reform Initiative. These two protocols were selected and merged together for this discussion due to their prevalence of being used as data analysis tools in the national network of teacher leaders. This meant the mentor teachers had previous experiences with similar protocols to look at moments from their classroom.

Skylar had something come up and was unable to attend this session. However, she did send along her mentor teacher replay. Since these protocols had a portion where the presenting mentor teacher would remain silent and listen to the other group members discuss, I participated as a previous mentor teacher in the data analysis. This allowed for the conversations to still happen even though Skylar was unable to attend.

Since this was the last group session, I wanted to honor that although the work for me as a researcher was ending, the work of mentoring prospective teachers was continuing for the mentor teachers. Figueroa (2014) asks us to consider "have we—in both our own opinion and the opinion of the participants—fulfilled the commitments we made at the beginning of our study?" (p. 129). In considering this question and what it means to "finish" with the inquiry group, I found it deeply dehumanizing if I end the group just because I am done benefiting from it. To address this, I opened up a conversation with the mentor teachers about potentially continuing the group into the future, opening the community up to other mentor teachers, and if there are ways they would like to continue to be involved in the sharing of the research. This conversation highlights how the research relationship does not always end at the time of the study because the relationships are ongoing and authentic.

### *Reflexive Memoing - Related to Positionality*

Since my positionality is so connected to and influential in shaping this study, I engaged in reflexive memoing to be mindful of potential bias I may bring to the analysis through what Milner (2007) describes as the dangers seen, unseen, and unforeseen in conducting research. Following each activity described above as a data source and each round of data analysis described below, I either recorded verbal or written reflexive memos about my reactions, wonderings, and early thoughts of patterns I noticed in the data. In the reflexive memos, I focused on Milner's (2007) four components of the Framework of Researcher Racial and Cultural Positionality. This framework calls on the researcher to engage in (1) reflection of self, (2) reflection of self in relation to others, (3) dialogue with participants to collaboratively reflect on findings, and (4) consideration of the influence of systemic factors (e.g. racism, classism, patriarchy) to the findings. Reflexive memo writing helped address the first two components. The third component was addressed through ongoing conversations in the research process. The fourth principle was addressed through the theoretical frameworks chosen for this study, which explicitly attend to marginalization related to structural factors (e.g. racism, colonialism, patriarchy, and oppression based on other intersectional identity characteristics) to foreground systemic factors in analysis.

## Data Analysis

As a way to analyze the stories the mentor teachers narrated across the data generation process, I drew on Josselson and Hammack (2021) guidance on analyzing stories. In their work, they stress the importance of transparency and reflexivity in the analytic process and sensitivity to the co-construction of narratives that occur. This aligns with the ideas of the praxis-oriented research where the data is viewed through the lens of a theoretical framework, but "keeps a

particular framework from becoming the container into which the data must be poured" (Lather, 1986, p. 267). This happens through an iterative process that they recommend for narrative analysis (which I outline below). Additionally, narrative analysis puts an emphasis on transparency and reflexivity to reach "methodological integrity". This was particularly important to me given my positionality and personal experiences that are similar yet different from the mentor teachers in this study. Although relationships are central to humanizing research, I wanted to make sure that my stories were not overpowering the stories of the mentor teachers. The iterative process includes multiple readings of the data with discrete goals for each. These various goals allowed me to build familiarity with the data, identify salient voices, build coherence across themes and voices, identify theoretical connections, and locate cross-case connections.

Table 5 illustrates the iterative process used to engage in data analysis; I will describe each step in greater detail next. For this study, I engaged in the first four phases for each participant individually (e.g. I examined all of Dana's materials before moving on to Skylar's materials). After I had conducted this process for each mentor teacher, I then looked across the mentor teachers data to see commonalities and refine the theory.

**Table 5**

*Iterative Phases in the Narrative Analysis Process (Adapted from Josselson & Hammack, 2021)*

| Phase | Goal | Process |
|---|---|---|
| 1 | Familiarize with Data | This process involved transcribing and cleaning the transcripts. |
| 2 | Track Emerging Themes | Read through all of the participant materials and engage in open coding. Following coding, I collapsed and expanded codes. |

Table 5 (cont'd)

| Phase | Goal | Process |
|---|---|---|
| 3 | Voices | Engaged in an open coding of whose voice was being represented. I worked to group the codes in a broader sense. |
| 4 | Connect to Theoretical Construct | Reviewed all previously identified segments and coded them for based on Educative Mentoring, Critical mathematics Consciousness, and the Culture of Exclusion |
| 5 | Cross-cutting themes & theory refinement | Once phase 1-4 was completed for each participant, I looked across the participants to refine the theorization of critically conscious mathematics mentoring and how it disrupts the culture of exclusion. |

*Note.* Phase 5 is described in Chapter 9 as this was completed as part of the refinement process.

**Phase 1: Transcription**

My first pass through the data was in the transcription process. I used an online, voice recognition transcription service called Temi to produce a first pass transcript of each interview and inquiry session. After the Temi program produced a first pass, I verified the accuracy of each transcription by listening to the audio recordings, correcting minor errors, scrubbing identifiable information, and capturing important features of the conversation such as long pauses, false starts, emphasis, or laughter as these were important to understand as part of the co-constructed story the mentor teachers were engaging in. Part of this process was beginning to decide which stories were not to be told and removing them from the transcripts. At this point the stories removed were the ones that came up at the beginning and end of sessions where we were talking about our lives. Although these conversations are critical in relationship building, were technically consented to by the mentor teachers to have recorded, and often added some

contextual elements, I made the decision that these stories were not shared with the intention that they would be "research". Along with the transcript verification, this first round afforded me an opportunity to begin to make meaning of the data. As I listened to the mentor teachers' voices and read their words, I jotted down notes in my reflexive memos to capture emergent themes and potential codes. This also was a first chance for me to begin to reflect on my own experiences and how they overlapped with the mentor teachers.

**Phase 2: Tracking Emerging Themes**

Following the transcription process, phase two involved tracking the emerging themes. To do this I engaged in iterative rounds of data analysis, where I used a combination of conventional analytical-inductive methods (e.g., Miles & Huberman, 1994) and less conventional methods of iteratively viewing the data and the framework through the lens of the other to build our understanding of both (Augustine, 2014). With these theoretical lenses (critically conscious mathematics mentoring and culture of exclusion) in mind (but not as predefined codes), I inductively generated codes to exhaustively categorize the content of all data excerpts. Following this process, I engaged in *clustering*, a feature of thematic analysis where codes are grouped according to similarity and/or overlap with other codes (Terry & Hayfield, 2021). During the clustering process, themes for the ways in which mentor teachers discussed their roles. Through the clustering process, I arrived at 13 emerging themes that described the content of the data sources. The 13 emerging themes and their descriptors are represented in table 6.

**Table 6**

*Emerging Themes and Descriptors*

| Emerging Theme | Examples of topics discussed by mentor teachers |
|---|---|
| Advocacy | taking action in their classroom, advocating for students or teachers, finding different resources, seeking long term solutions, utilizing existing school structures for change, and finding different ways to show up. |
| Asset Based Approaches | challenging deficit ideologies, problematizing the idea mathematics is about speed, creating a learning community, letting kids play with math, opening up access to math, and focusing on students strengths |
| Centering Students | building relationships with students, checking in with students, taking the students point of view, considering and leveraging knowledge of the students and their communities, and considering the students feelings and experiences |
| Draw on Experiences | similar and different lived experiences between students and the teacher (both mentor and student teacher), building on their own experiences student teaching, understanding and connecting to the school context, considering the students lived experiences in classroom materials, prioritizing students needs and experiences in mathematics classrooms |
| Feelings | their own personal feelings in the process, acknowledging the student teachers feelings, considering how students are feeling, being vulnerable, creating trust, and other emotions involved in the classroom. |
| Justifying Mentoring Choices | why they became a mentor teacher, their goals for the requests made of student teachers, and the ways the school communities (and families) impacted their thinking. |
| Justifying Pedagogical Choices | explaining the choices they made with their students or the curriculum, asking the prospective teacher to make their choices and rationales more clear, discussing assumptions at work, making clear their expectations, and discussing trying to be flexible. |
| Mathematics Content & Pedagogy | complex instruction and features associated with it, various pedagogical structures used to support students, providing students with various ways to access the mathematics (visual, written, oral, etc.), deemphasizing speed and traditional ways to communicate mathematically, supporting mathematical noticing, and extending beyond specific examples. |

Table 6 (cont'd)

| Emerging Theme | Examples of topics discussed by mentor teachers |
|---|---|
| Mentoring Actions | affirming the prospective teacher's choice while pushing them to consider other perspectives, probing prospective teachers to consider next steps and ways to examine their practices, finding private moments to intervene with the prospective teacher, and giving the prospective teacher the freedom to try new things. |
| Mentoring Stance | providing another lens in the classroom, creating space to pause, questioning to understand, drawing from their own experiences, curricular freedom, taking the mentees perspective, and how to know when to intervene. |
| Neoliberal Agenda in Schools | the results of high stakes tests for students, the constraints of teacher preparation programs and their support, and the challenges for prospective teachers to entering the profession |
| Race | how their racial identities impact their classroom, how their prospective teachers racial identities impact the classroom, systemic barriers, micro and macro aggressions, and how they navigate white spaces |
| Relationships | connecting with families, building relationships with students, engaging in community walks, existing relationships within the school, finding new ways to connect with students, authenticity, and potential challenges for student teachers to build relationships |

Following identifying the emerging themes for each mentor teacher, I wrote a reflexive memo. These memos both focused on how I was seeing the emerging themes developing as well as how I was seeing my own story and my relationship with the mentor teachers represented in the emerging themes. This was particularly prevalent for Dana because her story aligned very much with my experiences as a mentor. For her analysis, this process of a reflexive memoing allowed me to pull apart my story from her story and make sure I was staying true to her words.

**Phase 3: Voices**

The goal of this phase was to illuminate the different voices being evoked by the narratives and to identify the people, contexts, or ideologies that participants incorporated, adopted, or rejected to construct their own story. To do this, I reread the coded excerpts from

phase two and identified the voices being evoked by the speaker. For instance, Sam was evoking the voice of his student teacher reflecting on his practice when he stated,

> "In the debrief we had, Javvy reflected on the fact that he wasn't always intentional about checking in with all groups. He had seen a strategy at another school where groups used green, yellow and red cups to signal how much help they needed from the teacher and wanted to try that strategy"

However, not all voices were aligned with a particular person. Sometimes the mentor teachers identified a larger master narrative. Josselson and Hammack (2021) argue these narratives can be significant because "the voices of ideologies or master narratives—systems of belief or discourses which the individual must navigate as they develop their own language" (p. 49). For instance, when Skylar stated "let's just say if I could, I would, I don't think there's space for that….I definitely in my own classroom start off with those conversations, but I don't know if there's actually space", she is referencing the large systemic beliefs about what belongs in a mathematics classroom in the summer program she collaborates with verse the power she feels in her own classroom. By identifying these voices and narratives that informed the mentor teachers' descriptions of practice, I was able to recognize power structures and look for contradictions in their stories. This is an aspect of humanizing, praxis-oriented research because it allows for a more nuanced understanding of the mentor teachers' statements that reflects their world views (Lather, 2017).

As I reread each of the mentor teachers' excerpts, collapsing and expanding various voices until I arrived at the 4 parent codes of voices represented in the data: (1) *experiences*: categories include power dynamics, racialized experiences, professional learning, goals, knowledge of students, and how identities are similar or different from students; (2) *individual*

*voices*: categories include mentor teachers, 7-12 students, prospective teacher; (3) *schools*: the various school the mentor teacher worked in and the teacher preparation program they collaborated with; (4) *systemic - practices*: included practices systemic in mathematics classes, practices systemic in schools, requirements of the teacher preparation program.

**Phase 4: Connect to Theoretical Construct**

In the fourth phase, the excerpts were coded through the lens of the critically conscious mathematics mentoring. In this phase the theoretical construct was operationalized into an analytical framework in order to answer each of the empirical research questions around how the mentor teachers described their work. Since the empirical study had two research questions, phase 4 had two distinct parts.

***RQ1: Critically Conscious Mathematics Mentoring***

To address the first empirical research question–*in what ways do mentor teachers describe engaging in critically conscious mathematics mentoring*–the excerpts were coded through both the lens of educative mentoring and critical mathematics consciousness. Table 7 provides examples from the data and justification for how educative mentoring was used as an analytic framework coding the data.

**Table 7**

*Examples and Justification of Educative Mentoring Codes*

| Educative Mentoring | Examples from the Data | Rationale |
|---|---|---|
| Finding Openings | "I wanted Javvy to call on a wider variety of students to speak, I chose not to say anything in the moment; I wanted him to begin to build a foundation as the lead teacher and didn't want to throw him off. I also knew that we would have time to debrief later. I also didn't think that calling on/not calling on certain students would harm students or their learning, so I didn't want to interfere." | referencing how during the debrief they will share the participation tracking with the intern as a way to open the conversation about participation inequities instead of just intervening in the lesson |
| Focusing on Students | "to these two students are coming to her because they, they see an issue happening and so I don't know if pushing is the right word, but like, I think encouraging her to think about like what, what are the supports or check-ins you're gonna do with these students, right? Because, so we've had the talk, how are we checking to see if change is happening and if change isn't happening, what are some potential things you could do to support that don't involve changing their group necessarily." | responding to the way a prospective teacher responded to the scenario, put the focus back on the students and their experiences in the class instead of on what the prospective teacher did. |
| Giving Living Example of One Person's Way of Teaching | "awareness of where you are in the system and the leverage points that you can press on to advocate for yourself and others are extremely important in this work…..like in our staff meeting, you should bring that up. Like, you, you have a voice" | sharing their philosophy for taking action and how they model that for the prospective teacher |

Table 7 (cont'd)

| Educative Mentoring | Examples from the Data | Rationale |
|---|---|---|
| Modeling Wondering about Teaching | "us having conversations around, um, just what that meant with our students and the placement of like where they're at in Austin and, um, where, uh, like where our students lived in relation to like, where they were thinking about like putting the location. So I feel like….we think about in, in that space, we definitely just think about like who our students are where . and what they interact with, um, in the days. Um, and then whether it relates to them" | discussing the questions they asked prior to the prospective teacher starting a project as away to model how students could connect to an idea for a project |
| Noticing Signs of Growth | "she did a good job and I maybe would start with that of like, I feel like you did a good job addressing and asking questions and not passing judgment and giving the students opportunities to think about, um, like the other student's position versus just, um, trying to placate the situation and make everybody happy." | sharing how they would open the conversation by highlighting the positives and way the prospective teacher has grown |
| Pinpointing Problems | "like she talked a lot about like, like verified their learning deficit or things like that. Um, where I wish that like I, that might be where a spot where I open up the conversation of like, how could we talk about like what, um, what was her Mada could bring to the group?" | is sharing a concern related to the interaction between the prospective teacher and a student (Mada). In the reflection the mentor is sharing how they would bring the focus from deficit language to asset-based language. |

Table 7 (cont'd)

| Educative Mentoring | Examples from the Data | Rationale |
|---|---|---|
| Probing Novices' Thinking | "When I asked her how she felt about engagement, she pointed out herself that she struggles with getting students to give her their attention and often just talks to the students who choose to put their phones down unprompted. I was happy that she had noticed it as well and we worked through some next steps and when she would find it important to have them listen and put away their phones, versus times it might be acceptable. One of the goals her group had in place from the beginning was student driven collaboration. My intern noted that if they're on their phones, they're not only ignoring her but their peers. She ends up having to repeat directions individually and helping students individually instead of being able to engage multiple students in a conversation and have them give each other feedback." | is referencing how the mentor teacher asked the prospective teacher about engagement and then asked follow up questions to figure out why this could be an issue. |
| Reinforcing Understanding of Theory | "Thinking about where she says also to see the other side of things, especially if she's had training in complex instruction. I wonder if there is a way, like she talks about, um, right. I think people name that like the, the two students are sort of, they're not seeing the strengths that Mada brings, but hopefully she is a, as a student teacher, is seeing some of the strengths that Mada is bringing. Somebody said like, there's a reason she's in that group and so what are ways to name that name the, especially if it's not, it's sort of out of the, the way students are traditionally used to communicating and thinking." | discussing how the ideas of complex instruction supports looking at students strengths, which isn't happening in this scenario. The mentor is reflecting on how the prospective teacher should connect with the ideas of student strengths as a way to frame the conversation. |

Table 8 provides examples from the data and justification for how critical mathematics consciousness was used as an analytic framework coding the data. Not all of the codes were present in the data, so it is noted in the row when that happened.

**Table 8**

*Examples and Justification of Critical mathematics Consciousness Codes*

| **Critical mathematics Consciousness** | **Examples from the Data** | **Rationale (Here the mentor teacher is …..)** |
|---|---|---|
| Understanding Sociopolitical Conditions - Classroom Environment | "using that same lens to like de-emphasize it seems like they're annoyed 'cause she's holding them back. And so like de-emphasizing like the speed in which they're completing things and maybe talking about how, right. Like, like that's not the purpose of if that's, I'm assuming that's what she values. If she's like studied that and it's been trying to bring it into the class, like another lens of like, well, does that really matter? And like, can you tell me why? So she gets their perspective and then kind of gives her reasoning for why might, that might not be the case." | discussing the ways they would push the prospective teacher to consider the environment they are setting up and are they bringing lens to create open and supportive environments. |
| Understanding Sociopolitical Conditions - Engaging in a pedagogy of question. | "we're working in groups all the time for projects, um, we talk a lot about like why we think students will, like what are strengths students have and like who might support who. Um, and so I think when you talk about that and that dynamic to set up groups, like you almost are automatically already talking about them as very unique individuals. . . Um, and then if we get to a student and they're like, I don't, I don't know about this student or things like that, it's like, okay, so how do we, um, how do we get more insight into that? And like, what do you wanna do in class to ensure that you start to learn more about them individually? Um, and yeah." | sharing questions they encourage the prospective teachers to begin asking as they create groups in their classrooms to make sure all students are being supported. |

Table 8 (cont'd)

| **Critical mathematics Consciousness** | **Examples from the Data** | **Rationale (Here the mentor teacher is …..)** |
|---|---|---|
| Understanding Sociopolitical Conditions - Questions and critique previous learning | "it might be that the classroom, like the student teacher's coming into a classroom that doesn't do a lot of group work and, and is now trying to implement group work. And that's a very different feeling for students. Which then still, I think a lot of the comments that we said about what's the group structure look like to set up the space for group work." | is naming how the group work runs counter to traditional classrooms and we need to consider the ways to support it |
| Perspective Taking Empathy - Better understand students, families, and communities | "pick a student, even if it's a student who like you do vibe with, like ask them these questions and get to know them and their backgrounds better. Um, just because I think, I think our [prospective] teachers in general do wanna support our students and like want to know more about them, but we don't ever carve out time for them or give them a way to do that " | discussing how they encourage prospective teachers to do empathy interviews in order to learn more about students lives and backgrounds. |
| Perspective Taking Empathy - Counterstories/race reflections | "she was really interested in thinking about thinking about race in the classroom and . thinking about, um, just how that showed up. She was also very aware that she was white, white teaching non-white students… we just had like more open conversations about like . , what that meant, and like how our like lived experiences, um, like showed up in that space" | highlighting the way they had conversations around how their positionality impacts the classroom. |
| Perspective Taking Empathy - Critical self-reflection (both content & socio/historical) | "I have to unlearn a lot of things that I like learned in my own schooling. Right. And then . in my undergrad program. Like all those things of just like, this is how you're gonna run a classroom, like what's gonna be effective?" | discussing the unlearning and reflection they had to do and how they share that with prospective teachers. |

Table 8 (cont'd)

| Critical mathematics Consciousness | Examples from the Data | Rationale (Here the mentor teacher is …..) |
|---|---|---|
| Perspective Taking Empathy - Debrief community experiences | "go, like ideally the teacher or the students will actually go and take teachers out into their community and be like, this is where we live. Yeah. These are the restaurants we go to. Just so they have that context. And in my head, 'cause we did that at one point 'cause I know the students and like have been there for a little bit and I'm like, yeah, it's like it's, it's different and here's how it impacts that." | sharing how they support prospective teachers to be in the community and think about how impacts the classroom. |
| Perspective Taking Empathy - Provide opportunities model, practice, and discuss how empathy informs instructional decisions | "having very clear expectations for what you want out of students, but also then there was no room for like, anything to go wrong. Um, and like having those conversations about, you know, like you're planning but you're not like dictating, um . and you want you as a human need to remember that these are humans who will do what you don't want them to do or don't expect. And, um, like that flexibility." | sharing about the conversations they have with prospective teachers to remember you are working with humans and how to be flexible to their needs. |
| Perspective Taking Empathy - Support in noticing patterns in beliefs | "the two students are sort of, they're not seeing the strengths that Mada brings, but hopefully she is a, as a student teacher, is seeing some of the strengths that Mada is bringing. Somebody said like, there's a reason she's in that group and so what are ways to name that name the, especially if it's not, it's sort of out of the, the way students are traditionally used to communicating and thinking." | pushing the prospective teacher to consider their beliefs about a student and notice how it is being enacted in the conversation. |
| Taking Action - Centering relationships and community wellness | "we did a lot of norms then. Lemme actually look back at the agenda. I don't remember anything from this. Um, I know we had, like, I thought we had norms. We, I know like we have school norms and our agendas usually have a bit of like a setup where it's where we do norm setting." | sharing the way to center relationships in mentoring through having norms for the conversations following observations and the work they did earlier in the year. |

Table 8 (cont'd)

| Critical mathematics Consciousness | Examples from the Data | Rationale (Here the mentor teacher is …..) |
|---|---|---|
| Taking Action - Envision and taking action themselves | "awareness of where you are in the system and the leverage points that you can press on to advocate for yourself and others are extremely important in this work" | discussing how they push the prospective teachers to consider as they find ways to take action. |
| Taking Action - Examining and dismantling systems of oppression | "having conversations around, um, like what it meant to, like what's the pathway… but what were like the pathways to get to calculus, who got access, um, to that …. reflecting like, like what are my leverage points in like, I felt in my school ….what were avenues to go down to s best support students or what were small things that she could do this year that then maybe down the line would put her in a place to be able to press on the current system that she was in." | sharing the ways leverage points can be found base on power to dismantle systems (in this case tracking to Calculus). |
| Taking Action - Broadening conceptualizations of knowledge [mathematical] | "there's also value in, in like letting kids play and learn and like kind of just come up with their own summary and conclusions." | discussing how they support prospective teachers to see the value in letting kids play with mathematics and get their own conclusions. |
| Taking Action - Find commonalities and solidarity with oppressed people | "one of his strengths was being able to go in and check with different groups. I'm like, use some of what you can do to elevate that" | reflecting on how the prospective teacher was really good at connecting with different groups but didn't always transfer that to whole group situations. |
| Taking Action - Fostering healthy relationship with dominant mathematics | "So Javvy didn't end up going on to get his teaching credential. Mm-hmm. 'cause he like panicked about the testing and sort of refused to take the test 'cause he didn't wanna fail. And thinking of, right. Thinking about like what, what can we do? What are we able to do? And like when there are things that we don't know about, like in retrospect I'm like, oh, test anxiety, that's a thing. But like he was, he was doing so well in the classroom and with kids" | reflecting on how he missed the mark in this regard because the prospective teacher didn't ever take the mathematics test to get certified. |

Table 8 (cont'd)

| **Critical mathematics Consciousness** | **Examples from the Data** | **Rationale (Here the mentor teacher is …..)** |
|---|---|---|
| Taking Action - Learning ordinary people can change the world | "think really like focusing on the local, like, like, just because it doesn't feel like a formal thing that you can put on your resume, like what you do in your room. Um, like I, like I, you know, like in really knowing that even if it doesn't feel like the impact is happening in real time, that it, that there is, that there is an impact." | highlighting the small ways you can take action in your classroom without being some type of award or major action. |
| Taking Action - Learning their histories | "And I was like, oh, okay. Like my, like I grew up like my family, uh, like immediate family is pretty quiet and then like, I grew up very much like, sit at your desk, do your work, be quiet, get it done. Um, and I was just like, wow. Like this is like, they're all being productive and they're doing really great work and they're talking across tables, but they're getting back on task. And if I stopped this right now or if I had stopped it, like I would've destroyed the productivity. They would've been mad at me, and it would've been a battle just to get them to do work at a level, a noise level that I needed it happen. and then like, that was just, it was just very eye opening." | sharing their reflection with prospective teachers about how they learned the ways their experiences impact classroom routines to encourage prospective teachers to do the same. |

The codes assigned to the excerpts were exhaustive but not mutually exclusive. To identify how each mentor teacher described engaging in critically conscious mathematics mentoring, I data displays to identify patterns in the co-occurrence of the codes for each mentor teacher individually. Then, for the most common co-occurrences for each individual mentor teacher, I looked at excerpts at these co-occurrences intersections to identify the specific ways they described their own mentoring practices (discussed in Chapter 6, 7, and 8).

### *RQ 2: Disrupting the Culture of Exclusion in Mathematics*

To address the second empirical research question–*in what ways do mentor teachers describe challenging the exclusionary practices of mathematics education through critically conscious mathematics mentoring?* –the excerpts were coded through both the lens of the culture of exclusion paying attention to both the inclusive and exclusive frames used by the mentor teachers (Louie, 2017) across various layers of social organization (Adiredja & Louie, 2020). Table 9 provides examples from the data and justification for how the codes for the culture of exclusion were applied at the various. Not all of the codes were present in the data, so it is noted in the row when that happened.

**Table 9**

*Examples and Justification of Mathematical Practices Codes*

| Mathematical Frame | Layers of Social Organization | Example from Mentor Teachers | Justification (Here the mentor teacher is…) |
|---|---|---|---|
| Reinforce Exclusionary Practices | | | |
| The rote practice frame | Larger Societal Narratives of Mathematics | "standardized testing the external pressures in terms of the state testing and also the content being foundational, the student understanding of Algebra one. So sort of the importance of why, why it matters that this learning is happening." | discussing the pressures of knowing things for the standardized tests, which reinforces this idea that mathematics is a fixed body of knowledge where things must be correct |
| | Local Communities [School & Classroom level] | "teachers ask multiple questions instead of asking a one question and waiting for an answer, um, or asking multiple questions and really want an answer to just the first one. Um, and you know, kids can't track that fast enough." | discussing how many teachers do not wait for an answer and just keep asking questions. They mention how kids cannot track that fast, which implies there are correct answers for all the questions and it is critical for every question to be answered correctly |

Table 9 (cont'd)

| Mathematical Frame | Layers of Social Organization | Example from Mentor Teachers | Justification (Here the mentor teacher is…) |
|---|---|---|---|
| | Individual [Teacher or Student] | "Just sensing like her, like her understanding that she's not doing a great job, um, and that the lesson is not going how she envisioned it and, and, and wanting to support her in that, but then also realizing you've got this group of kids who most of them wanna learn and they aren't and they aren't getting it" | highlighting how a student teacher struggles means the students aren't understanding the mathematical idea which implies there is one way to understand the idea |
| The hierarchical ability frame | Larger Societal Narratives of Mathematics | "Just like different privilege and access that he had. But so he like came in with a different set of expectations for what like math teaching and learning should be like." | discussing the implication that there is a specific vision of how to teach and learn mathematics and how it it correlated with the privilege positionality of a previous student teacher |
| | Local Communities [School & Classroom level] | "Javvy was able to teach and lead class (and navigate the arrival of several late students), but the voices that I observed speaking were students who knew more English, had stronger educational histories and had higher status." | sharing the way a prospetive teacher priviledged students who spoke English as higher status in the mathematics classroom through asking them to share their answers more regularly. |
| | Individual [Teacher or Student] | "Like, you're not gonna build that muscle unless you're the one having the conversation. Like, I will translate for you, but I feel like you need to be the one who has to use their instincts to say like, this is the thing I need to say, or this is the thing I need to do because my instincts are gonna be different than yours." | is stressing the idea that practices is needed to build a muscle which implies a linear continuum for ability and how to develop it. |

Table 9 (cont'd)

| Mathematical Frame | Layers of Social Organization | Example from Mentor Teachers | Justification (Here the mentor teacher is…) |
|---|---|---|---|
| | | Challenge Exclusionary Practices | |
| The sense-making frame | Larger Societal Narratives of Mathematics | "when like, students are off task and off topic, um, like how that's actually helpful for them to do learning even though it feels counterproductive....like they really kind of leaned into that of like, you're doing math, but you're not talking about math. That doesn't feel like it. And then like at the end, having someone summarize and be like, oh, we actually did something today was really nice... there's also value in, in like letting kids play and learn and like kind of just come up with their own summary and conclusions." | discussing how mathematics is more than just finding solutions, but it is building connections and that happens through playing with the mathematics and having conversations that may appear "off task" |
| | Local Communities [School & Classroom level] | "these are the resources they're using. It's how they're thinking about the problem. Even like watching them interact with students and the questions they're asking is like a nice reminder of like, um, just like collaborative learning and prompting to make connections and things like that." | talking about how the way prospective teachers pull on specific resources to ask questions or make connections within the classroom to support sensemaking |

Table 9 (cont'd)

| Mathematical Frame | Layers of Social Organization | Example from Mentor Teachers | Justification (Here the mentor teacher is…) |
|---|---|---|---|
| | Individual [Teacher or Student] | "Javvy felt about this decision to like look at, at the data after. And like I wonder how he felt like pulling that out, that noticing out like on his own versus like, and Sam could have easily still after, um, in the discussion been like, Hey, you weren't calling on these people or you weren't going to groups equitably. Um, but letting him look at it first. I wonder what, how that landed on him." | discussing the way they drew on the sense making frame and had the prospective teacher analyze data to consider their instruction in supporting equitable instruction. |
| The multidimensional mathematics frame | Larger Societal Narratives of Mathematics | "maybe also using that same lens to like de-emphasize it seems like they're annoyed 'cause she's holding them back. And so like de-emphasizing like the speed in which they're completing things and maybe talking about how, right. Like, like that's not the purpose of if that's" | discussing the way that speed is emphasized in mathematics and how to challenge the idea of speed and competition in a group work setting. |
| | Local Communities [School & Classroom level] | "one of my student teachers did this like drone delivery project, um, and drones were like very new at the time. ... I vague remember us having conversations around, um, just what that meant with our students and the placement of like where they're at in Austin and, um, where, uh, like where our students lived in relation to like, where they were thinking about like putting the location. ... And often we think about in, in that space, we definitely just think about like who our students are where . and what they interact with, um, in the days. Um, and then whether it relates to them" | discussing how the prospective teacher drew on students communitites to design projects and making clear that lived experiences belong in mathematics classrooms |

Table 9 (cont'd)

| Mathematical Frame | Layers of Social Organization | Example from Mentor Teachers | Justification (Here the mentor teacher is…) |
|---|---|---|---|
| | Individual [Teacher or Student] | "I also wonder about, um, we kind of assume that students are equipped to support each other, but like if students are like newer to group work, what are some structures they can use or like even, what are some sentence frames they can use to like, ask her if she has questions or like get, just to get mm-hmm." | discussing specific supports to for mathematical communication and making clear that communication is a mathematical activity |
| The multidimensional ability frame | Larger Societal Narratives of Mathematics | "like what it meant to, like what's the pathway. Uh, she was at a different school at that point . . Um, but what were like the pathways to get to calculus, who got access.....what are my leverage points in like, I felt in my school, I could feel comfortable talking to my leadership directly and I have a lot of leverage in saying certain things . and at that point she didn't. So, um, talking about like what were avenues to go down to s best support students or what were small things that she could do this year that then maybe down the line would put her in a place to be able to press on the current system that she was in." | sharing how to challenge the notion that only certain students can access calculus through finding ways to open calculus up to all students. |
| | Local Communities [School & Classroom level] | "are there changes she can make to the curriculum or the way she's teaching the curriculum so that it's a little more, I don't wanna say accessible, but Right. So that, that it seems right now there are some things that, that indicate that if you have speed and speak English, you're a little more inclined to do well. So like what are some things that could broaden that and give more access or like make visual what people are thinking even if they're not saying it out loud." | considering how to modify the curriculum to incorporate various ways to access the mathematics and draw on students strengths in a variety of ways |

Table 9 (cont'd)

| Mathematical Frame | Layers of Social Organization | Example from Mentor Teachers | Justification (Here the mentor teacher is…) |
|---|---|---|---|
| | Individual [Teacher or Student] | "I think people name that like the, the two students are sort of, they're not seeing the strengths that Mada brings, but hopefully she is a, as a student teacher, is seeing some of the strengths that Mada is bringing. Somebody said like, there's a reason she's in that group and so what are ways to name that name the, especially if it's not, it's sort of out of the, the way students are traditionally used to communicating and thinking." | specifically naming how a student has mathematical strengths and making sure to name those strengths to a classmate. |

Similar to the analysis for research question one, the codes assigned to the excerpts were exhaustive but not mutually exclusive. Although the data was coded for both inclusive and exclusive frames across each layer of social organization, mentor teachers described significantly less ways they reinforced the exclusionary practices in mathematics classrooms. As evident in the table, when they did describe reinforcing exclusionary practices, the excerpts were related to the prospective teachers learning to be a mathematics teacher, not K-12 students learning mathematics. Additionally, critically conscious mathematics mentoring is focused on supporting the critical consciousness development of prospective teachers and this dissertation grounded in humanization is not focused in uncovering deficit notions of mentor teachers; therefore, in this study although I coded both the ways mentor teachers both described challenging and reinforcing the exclusionary practices in mathematics education, the focus of research question two centers on how *critically conscious mathematics mentoring* can challenge these exclusionary practices.

To identify how each mentor teacher described challenging the exclusionary practices in mathematics education through their mentoring practice, I created data displays to identify patterns in the co-occurence of the codes for each mentor teachers' most common critically conscious mathematics mentoring moves and the codes related to culture of exclusion at the various levels of social organization. Then, for the most common co-occurrences for each individual mentor teacher, I looked at excerpts at these co-occurrences intersections to identify the specific ways they described their own mentoring practices to challenge these exclusionary practices (discussed in Chapter 6, 7, and 8).

# CHAPTER 6: DANA'S APPROACH TO CRITICALLY CONSCIOUS MATHEMATICS MENTORING

In this chapter, I will share the ways Dana narrated her approach to critically conscious mathematics mentoring. First, I will share an introduction to Dana's experiences and mentoring philosophy. Then I will unpack how Dana describes engaging in critically conscious mathematics mentoring. Finally, I will conclude with how Dana's narrations of using critically conscious mathematics mentoring disrupts the exclusionary practices of mathematics classrooms.

## Orienting to Dana's Experiences and Mentoring Philosophy

Dana's journey to becoming a mentor teacher felt like a natural extension of her work in the classroom. Dana's long-term goal as "supporting teachers" and she saw being a mentor teacher as "a natural initial step" towards that goal because it allowed her to "look at her classroom from a different lens [because] I can sit as a learner or I can kind of view different things in different ways". These different lenses of her classroom allowed her to develop what she describes as a questioning approach to her mentoring. She describes "trying to get [prospective teachers] to think about the reason behind their choices or reflect on why did you do that in the moment?"

Additionally, for Dana the work of mentoring can be a "jumble of emotions". Dana has a deep commitment to her students and their community. She is a founding member of the small public charter school where she works. This means she has taught many of the students for multiple years, as well as, had multiple students from the same family. She describes a "bond that [the students and Dana] already had and like [the students] trusted, um, [her]". This bond and trust is especially evident when she talks about the state mandated Algebra One exams. Dana works in a state where Algebra One is tested and passing the exam is required for graduation,

which makes it high stakes not just for her evaluation but for her students as well. She has a track record of students passing the exam on their first attempt, so students in her class expect to be prepared for and supported through this process. Part of this work of making students feel prepared is building relationships with the students and supporting them in realizing they are doers of mathematics. This relationship makes her feel protective of the students in the classroom, especially, when white prospective teachers were struggling in her classroom to connect with her students.

As a white woman, Dana is exceptionally aware of her positionality and has done significant professional learning related to her justice-oriented work. Below Dana shares a time when she realized her biases and orientation to the white dominant norms of the classroom.

> "I teach in a very small room with a lot of kids. It was so loud, like, so, so loud and I could not handle it. For some reason, instead of shutting down the noise level initially, I paused and listened to the conversations at the tables. Ninety percent of [the conversations] were on task, good math conversations. And I was like, 'why would I stop this'? I had to check my own bias. I asked some students 'are you bothered by this noise at all?' They [the students] were like, 'no, no, no' And then one of my students, she was like, 'miss, this is quieter than my dinner table every night'. I was like, 'oh, I am the problem.' So I went outside, I listened outside the door to make sure it wasn't going into the classroom next to me and I couldn't hear it out there. I grew up very much like, sit at your desk, do your work, be quiet, get it done. I was just like, wow, they're all being productive; they're doing really great work; they're talking across tables, but they're getting back on task. If I had stopped it, I would've destroyed the productivity. They

would've been mad at me, and it would've been a battle just to get them to do work at a level, a noise level that I needed to happen. It was just very eye opening. I think about that when I think about routines that I hold in my class or why am I getting frustrated with a student or why am I going to do a policy this way? I kind of come back to that moment and like check, like, is it like who, who is it serving and why"

In this story, we see how Dana has reflected on the ways she was raised and how it is important for her to not just force her cultural norms on the classroom but pause and really see what the students need. This is something Dana brings to her mentoring practice as well. She describes when she mentors white prospective teachers, she tries to have "open conversations about what that means [to be a white person] and how our lived experiences showed up in that space". This acknowledging how lived experiences impact the ways teachers show up in spaces also extends to when Dana has mentored across racial lines. One of the prospective teachers Dana worked with identified as Mexican American male and spoke Spanish. This meant he had many shared identities with the students in Dana's classroom. Dana discusses how she recognized "he is bringing in a context that comes from a known identity and background" and that she was "really trusting that he has a different lens that he's looking at things through when engaging with our students." Through this approach to mentoring, Dana not only decenters herself as a white woman, but she also centers the importance of shared lived experiences between the prospective teacher and the high school students.

### Descriptions of Enacting Critically Conscious Mathematics Mentoring

Across the data set, Dana shared various stories about her mentoring practice. In the following sections, I highlight the ways in which Dana discussed her mentoring practices and

how they align with the aspects of critically conscious mathematics mentoring. The purpose of these sections is not to give a full accounting of all the ways in which Dana describes engaging in critically conscious mathematics mentoring, but to illuminate the most salient ways she describes her practice through illustrative examples.

**Mentoring for Understanding Sociopolitical Conditions**

When initially asked what it means to understand sociopolitical conditions during the asynchronous inquiry group meeting, Dana stated "it means understanding the sociopolitical climate in the world but also understanding the systems that affect your classroom and students." In follow up conversations when I asked Dana about what she believes that looks like in her classroom and her mentoring practice, she talked about the ways in which using project-based learning in her classroom allows her to bring in issues relevant to the students into the classroom to analyze mathematically in authentic ways. For instance, Dana shared how she has designed a project around gun violence data as a way to talk about systemic issues facing schools. In this conceptualization of understanding sociopolitical conditions in the mathematics classroom, Dana is discussing how mathematics is used in her classroom to "examine these various phenomena both in one's immediate life and in the broader social world and to identify relationships and make connections between them" (Gutstein, 2003, p. 45).

When discussing her mentoring practice, Dana also took up the ideas of understanding sociopolitical conditions. In her narratives, Dana described various ways she engaged in mentoring practices to foster understanding sociopolitical conditions; the most prevalent ways was through (a) focusing on students by engaging in a pedagogy of question, (b) modeling wondering about teaching by engaging in a pedagogy of questioning and (c) focusing on students and their experiences in the classroom.

***Focusing on students by engaging in a pedagogy of questioning***

In one story Dana shared the way she focuses on students by engaging in a pedagogy of questioning. She tells a story of when she responded to the question about supporting prospective teachers to learn that every student has their own backstory and experiences. Dana states:

> "then it's just kind of through conversation. For instance if a student is struggling, I always observe first to see what the student teacher's going to do with certain things. Then typically when something becomes an issue, like a student isn't turning in their work, we'll have a conversation about it. I prompt them to ask questions like, 'what do you wanna do?' and 'what are the reasons you think this is happening?' Then we talk about all the possibilities. I try to support the student teacher by saying 'let's believe the student wants to turn in their work' and get them to ask 'what could possibly be stopping the student from this based on what you know about the student"

Here Dana is describing keeping the focus on the student and what we know about the student and all the possible reasons a student may be struggling in the class. However, Dana is not just telling the prospective teacher what to do or even being the one asking all the questions. Instead, she is supporting the prospective teacher to ask these questions and consider things from the students' perspective.

In her narrative, Dana continued on to state:

> "because we're working in groups all the time for projects, we talk a lot about what strengths students have and like who might support who in forming groups….If we get to a student and [the prospective teacher] say 'I don't know about this student', it's like, okay, so how do we get more insight into that? What do you wanna do in class to ensure that you start to learn more about them individually?"

Again, we see Dana describing keeping the focus on the students in the classroom and their strengths. Additionally, Dana is engaging in a pedagogy of questioning through both asking questions, but also prompting the prospective teacher to ask questions about why they don't know the student and how they can learn more about the student.

***Modeling wondering about teaching by engaging in a pedagogy of questioning***

Another way Dana engages in a pedagogy of questioning shows up in Dana's narrative is through modeling wondering about teaching by posing questions and inviting the prospective teachers to ask questions as well. Compared to the previous approach where Dana is focusing on students, here Dana is modeling what this would look like for a prospective teacher. An example from Dana's narrative is when she describes the conversations around supporting prospective teachers in designing projects, as described below.

> "One of my student teachers did this drone delivery project, …I remember us having conversations around just what that meant with our students and the placement of like where they're at in [the city] and where our students lived in relation to where they were thinking about like putting the location…..Often we think about who our students are where and what they interact with during the days and then whether it relates to them"

In this narrative example, Dana is describing the way she asks questions during the process of designing projects to make sure that they are relevant to the lives of the students in her classroom. Additionally, in this story, Dana is discussing the way this was done to support the prospective teacher to consider how project topics connect to students' lived experiences. These connections are beyond just considering topics which are in the news, but are the topics actually students experiences. Through this work, Dana was supporting the prospective teacher to develop their own pedagogy of questioning as they move forward in the teaching profession.

Dana also describes modeling wondering about teaching as a way to engage in a pedagogy of question when she discusses the norms in her classroom with prospective teachers. The norms Dana uses are from a complex instruction training she attended: (a) work persistently, (b) communicate productively, (c) take risks. She reflects,

> "I do a lot of just questioning in general, just asking 'why do you wanna try this?' Or 'Why do you want this to be a rule?' I'll often share 'here are the norms that I hold in my classroom, here's why I do them' … So I talk about that and like why I hold those, um, and what they mean to me. Then still try to leave the door open for [the prospective teacher] to try the same thing or try different things. I'm just trying to get them to think about the reason behind their choices".

In this narrative example, Dana is highlighting how first she models reflecting on her norms and sharing the intentionality around why she selected those norms for her classroom. Dana then describes allowing the prospective teacher to have the freedom to modify the norms; however, Dana then pushes the prospective teachers to engage in a similar reflection and questioning process to determine the reasons behind their choices.

***Focusing on students and their experiences in the mathematics classroom***

Dana described focusing on students and their experiences in the mathematics classroom. One illustrative place this appears in Dana's narratives is as she talks about part of her mentoring practice during the inquiry group meetings. During these meetings, the mentor teachers were unpacking various scenarios and how they would respond. In discussing the way a prospective teacher responded to a student, Dana stated,

> "so she kind of invalidates their whole cause of reaching out to her. I might have a conversation with her about…how she's setting up their activity or classroom for group work. Are there group roles or protocols to support or talk about scaffolds for Mada?"

Although Dana is considering the prospective teacher's response to the situation, Dana's focus is entirely on the students and their experience in the classroom. She is asking the prospective teacher to consider the students and make sure their experiences are being validated. She does this through asking about the use of roles and scaffolds to make sure everyone is experiencing mathematics.

Additionally, in the narratives Dana focuses on students and their experiences in the mathematics classroom when she described asking the prospective teacher the following,

> "How is she gonna frame the day to make sure that if [Mada] is lost, that she can ask questions or the other group members have a way to voice frustrations if the group does start to go awry, that's not gonna cut Mada down in that situation?

Here we see Dana again focusing on the way students are experiencing the class. This experience extends beyond just making sure the students who raised the concerns are able to continue to express their thoughts but also stresses how the prospective teacher is going to support the other students in the group too. This work to get prospective teachers to focus on the student experiences in the mathematics classroom pushes the prospective teacher to consider not just the mathematics in the classroom, but the way students are experiencing the mathematics which is often gendered and racialized.

**Mentoring for Perspective Taking Empathy**

When initially asked what empathy means to you and your work during the asynchronous inquiry group meeting, Dana stated

> "Empathy takes a large role….you have to be able to understand each student individually when they come into your room. They all have different back stories and experiences that show up in different ways in the classroom. As a mentor teacher, you are supporting the new teacher through a very stressful experience so having empathy and understanding the new teacher helps in figuring out how to best support them through the experience. As a mentor, you are still paying attention to your students' needs but you are also coaching the new teacher in how to have empathy and understand the students as well."

This conceptualization of empathy highlights one of the biggest tensions Dana raised in her mentoring practice. This idea of supporting the prospective teacher to learn while also supporting the students in what they need to be mathematically successful. In follow up conversations about the way empathy was a part of her role as a mentor teacher, Dana dug deep into this tension, describing it as "a jumble of emotions", especially if the prospective teacher is struggling and students are becoming frustrated with the mathematics.

When discussing her mentoring practice, Dana's narrative shows various ways she engaged in mentoring practices to foster perspective taking empathy. The most prevalent ways Dana described this work was through (a) giving a living example of critical self-reflection, (b) focusing on students as a way to better understand students and their families, and (c) modeling wondering about teaching to provide opportunities to dissect how empathy informs instructional decisions.

***Giving a living example of critical self-reflection***

In Dana's narrative, she described engaging in giving a living example of critical self-reflection, when she is vulnerable with the prospective teachers. This vulnerability happens when

she shares the ways she has had to engage in critical self-reflection over the course of her teaching career. Dana reflects

> "[one prospective teacher] was really interested in thinking about thinking about race in the classroom and thinking about how that showed up. She was also very aware that she was white and teaching non-white students. We just had open conversations about what that meant, and like how our lived experiences showed up in that space".

This reflection highlights the way Dana describes modeling for her white prospective teacher what it means to consider how whiteness impacts the classroom. Part of these conversations included the story shared earlier where Dana realized it was her white cultural norms that were dictating what seemed like an appropriate sound level in the classroom. Through sharing stories such as this, Dana is proving examples of how a white woman teacher checks her bias and privilege to ensure students are having the best mathematical experience.

Another way Dana has described modeling this is by being very open with prospective teachers in areas she feels she struggles. For instance, Dana discusses

> "I think it helps when [prospective teachers] are vulnerable and sharing about themselves too. I think that's one thing that I particularly struggle with sometimes, and I've been growing in to bring more of the outside of the classroom me, into the classroom. I feel like typically [prospective] teachers are willing to do that more. It has ground me back into going back to basics of that and making sure that I'm showing more facets of myself than just my teacher self."

In this reflection, Dana is not only identifying a weakness she has in remembering to be her full self in the classroom, but also is able to reflect that prospective teachers help her do this.

Through sharing this learning, Dana is modeling for prospective teachers what it looks like to critically examine yourself and how it impacts the classroom.

***Focusing on students as a way to better understand students and their communities***

As mentioned above, for Dana empathy in the classroom means understanding "each student individually…they all have different back stories and experiences that show up indifferent ways in the classroom. For Dana this becomes especially salient because of the ways in which she thinks about project-based learning in her classroom. She discusses how when working with prospective teachers around designing projects she tries to

> "have different contexts and sometimes that will push on [community history] or even in developing projects, thinking about which topic to choose and whether or not that supports our students or that our students would be engaged with it."

Through supporting prospective teachers to understand the community, the students, and their interests in relation to project designs, Dana's narrative represents keeping the focus on the students for why it is important to understand students and their communities.

Elsewhere in her narrative, Dana shares how one prospective teacher found "organic openings" in conversations to learn more about students.

> "a kid like brought up that he used to really like skateboarding, but he didn't have a skateboard anymore. They had a big long conversation about skateboarding, which it ultimately ended in like, she gave him a skateboard. Allowing that conversation to free flow was good. It ended up being at a good time and didn't completely derail class. It's good to have those and open up those conversations and sustain them versus, you know, feeling the need to stick on track the entire time."

Through allowing the prospective teacher to engage in these conversations, Dana was allowing for the focus to stay on the student and their interests. Additionally, the prospective teacher was able to learn more about the student and the skateboarding community in the city.

***Modeling wondering about teaching to provide opportunities to dissect how empathy informs instructional decisions***

In Dana's narratives there is also evidence of the way she engages in modeling about wondering about teaching to provide opportunities to dissect how empathy informs instructional decisions in various ways. The most salient example again came when unpacking a mentoring moment during one of the inquiry sessions. Following reading a reflection where the prospective teacher had stated they "wanted to set up an empathy scenario", Dana stated she would have responded by

> "having conversation about what empathy looks like for the student you were talking to. How could you validate their needs a little bit more without changing the outcome. Like revoicing what they're saying or even talking about like the strengths that they might have as group members. For instance I put you in this group because you're really great at communicating the math"

Here Dana is modeling wondering in two ways that provide opportunities to dissect how empathy informs instructional decisions. First, Dana is modeling just wondering what empathy is in general. This includes not just thinking about what it looks like for an instructor but also what it looks like for the students involved in the situation. She is highlighting how empathy may look different for different people and that needs to be considered as instructors make decisions.

The second way she describes modeling how empathy informs instructional decisions is through making sure the students feel heard and also understand why the original decisions were

made. In this scenario, students were concerned about group work. Earlier in the conversation Dana had discussed how she would want the prospective teacher to really think about what strengths students were bringing to the group prior to constructing groups. Here Dana is discussing how she would encourage the prospective teacher to make some of those decisions visible to the students by highlighting their strengths. In doing so, students will then know that there were intentional choices made and it was in the best interest of all the students involved.

**Mentoring for Taking Action**

When initially asked what does taking action mean to you and your work during the asynchronous inquiry group meeting, Dana stated

> "taking action is standing up for others when situations are brought up or occur in your classroom related to sociopolitical conditions. I think this includes supporting students' critical thinking skills related to sociopolitical situations, intervening in conflicts or systemic issues, and advocating for others when needed."

Additionally, Dana really sees her role in mentoring for taking action to be supporting prospective teachers not only to advocate for students, but also advocate for themselves. She notes that because the project-based learning environment is so different from a traditional classroom, field supervisors do not always understand what they are seeing. She talks about how she supports prospective teachers through these conversations in order to make sure they are being assessed fairly.

When discussing her mentoring practice, various ways Dana has engaged in mentoring practices to support taking action shows up across the narratives. The most prevalent ways Dana described this work was through (a) finding leverage points [openings] to work to dismantle

systems of oppression and (b) probing novices thinking to support envisioning and taking action themselves.

***Finding leverage points [openings] to work to dismantle systems of oppression***

For Dana, it is especially salient to the various power dynamics at play in a school setting. She is very aware that as a founding member of the charter school with over a decade of experience she has power and leverage that prospective teachers may not have in their first job. In her narrative, she shares the ways she supports prospective teachers to work towards dismantling systems of oppression, she talks about finding "leverage points". She shares how she approaches it with prospective teachers by

> "you probably can't do this because you're a student teacher and like power dynamics, but like, what can you do? I feel like it's a lot more noticing and understanding here's this thing and it'll probably show up again. In a perfect world, what would you like to do? And then how could you move yourself into a spot where you can then do it."

In this excerpt, Dana is highlighting the reality of being a teacher new to a school, but also making sure prospective teachers know these are systemic issues in education. Through supporting prospective teachers to consider various ways to take action in the classroom, even if that action is delayed due to power dynamics, Dana is supporting finding leverage points to dismantle these systems.

A very specific and poignant example is when Dana is discussing her work to detrack Calculus at her school and how she supported a prospective teacher to consider what that could look like in their future settings.

> "I remember us having conversations around what it meant to be [pause] like what were like the pathways to get to calculus, who got access to it .... just kind of comparing and

> contrasting and realizing that like we're a part of that system. Thinking about what my leverage points are in my school. I could feel comfortable talking to my leadership directly and I have a lot of leverage in saying certain things and at that point she didn't. So talking about what were avenues to go down to best support students or what were small things that she could do and maybe down the line would put her in a place to be able to press on the current system that she was in."

Dana is really making visible the various power dynamics and how teachers move within systems. Additionally, she is actively working with prospective teachers to consider how to dismantle the oppressive system of tracking through finding various ways to leverage the power you do have within a system. Additionally, Dana really is highlighting for prospective teachers how this work is a journey. You will not just dismantle systems of oppression overnight, so it is important to do what you can and put yourself in positions to continue the work.

***Probing novices thinking to support envision and taking action themselves***

Another way Dana mentors for taking action is through probing novices thinking to support them to envision themselves taking action. In addition to her role as a classroom teacher, Dana also is the professional learning coordinator for her school. This means she does much of the planning for staff meetings. For her prospective teachers she will push them to consider what it would be like to speak up. After Dana and prospective teachers have had some of the conversations described above, she will encourage them to consider what it would be like to bring these ideas up in a whole staff meeting. Here Dana is normalizing, sharing your thoughts and speaking up for things you believe in.

Additionally, Dana reflects these conversations are not always easy for prospective teachers. She shares she encourages them

> "I can say 'you have a voice' …it's gonna feel like maybe you have a very different opinion…so having those conversations beforehand of here's how this might play out, here's what you can say and here's what you should say. To get them the confidence then in the actual situation to be able to stand up for the student or stand up for themselves, um, I think is something that is pretty important"

Dana is not only encouraging prospective teachers to envision taking action, but to feel empowered to raise their voice in different situations. However, she also does not leave them unprepared for the situation. Through asking questions and probing their thinking around what they would like to share, Dana is ensuring prospective teachers are set up to be the advocate their students deserve.

### Descriptions of Challenging Exclusionary Practices in Mathematics Education through Critically Conscious Mathematics Mentoring

As Dana describes engaging in critically conscious mathematics mentoring, she disrupts the exclusionary practices of mathematics education in various ways. This was most frequently done through focusing on multidimensional mathematics ability, the idea that "everyone has both intellectual strengths and areas for growth that are relevant to mathematics learning" (Louie, 2017, p. 496) and the idea that mathematics is multidimensional, the idea that mathematics "includes activities such as collaboration, experimentation, and argumentation, not just rote practice" (Louie, 2017, p. 496). Similar to the previous section, the focus is not to share all the ways Dana described challenging the exclusionary practices in mathematics education, but to provide illustrative examples to learn from Dana's practice. In the following section, I share how through each aspect of critically conscious mathematics mentoring disrupts the exclusionary practices at various layers (the individual, community and societal).

**Through Mentoring for Understanding Sociopolitical Conditions**

Dana describes disrupting the exclusionary practices in mathematics education in various ways throughout her descriptions of mentoring for understanding sociopolitical conditions. In Dana's descriptions, mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Dana disrupted the exclusionary practices at various layers of social activity.

***Individual Teacher or Students' Experience***

At the individual layer, Dana disrupted the exclusionary practices when she describes supporting the prospective teacher by focusing on students and their experiences in the mathematics classroom. For instance, Dana notes in analyzing a mentoring scenario, if she was the mentor teacher she would encourage the prospective teacher to "revoice what they're saying about the strengths that [students] might have as group members. I put you in this group because you're really great at communicating math". Here, Dana is really focusing on the different strengths students bring to a mathematics classroom. She is encouraging the prospective teacher to remind students that everyone has different mathematical strengths. This disrupts the notion that mathematics ability is hierarchical.

Additionally at the individual layer, Dana describes focusing on challenging for the prospective teacher what counts as mathematics through focusing on students and their experiences in the classroom. In the same situation as above, Dana describes she would ask the prospective teacher "how is she gonna frame the day to make sure [students] can ask questions or the other group members have a way to voice frustrations if the group does start to go awry". Dana is reminding the prospective teacher that mathematics is not just about answering questions, but also asking questions. Through focusing on students' experiences, Dana is

supporting the prospective teacher to consider the ways they support question asking in the classroom. Additionally, Dana is encouraging the prospective teacher to make space for frustrations and emotions. This sends the powerful message that emotions is part of mathematics classrooms and it is ok to be frustrated as part of doing mathematics.

***Local Community [Classroom or School]***

At the layer of local community, Dana describes disrupting the exclusionary practices in mathematics education classrooms through focusing on students' experiences and their experiences in the mathematics classroom. As shared above, when Dana shares that in her class

> "because we're working in groups all the time for projects, we talk a lot about what strengths students have and like who might support…if we get to a student and [the prospective teacher] is like 'I don't know about this student'. It becomes about how do we get more insight into that? And what do you wanna do in class to ensure that you start to learn more about them individually?"

Dana is really sharing how she supports the prospective teacher to construct a classroom environment intentionally to build on students' strengths. This moves the prospective teacher beyond the hierarchical ability lens of mathematics where some students "help" other students. Instead, Dana is focusing on each student and their experience in the classroom. Additionally, if the prospective teacher cannot name a strength of the student, instead of just sitting in deficit notions, Dana challenges the prospective teacher to get to know the student better as a way to focus on the student and their experiences.

Building on these beliefs surrounding knowing students, another way Dana's narratives disrupt mathematics at the local community level is through the structure of her classroom. Since group work and complex instruction are pivotal to Dana's classroom, she additionally supports

the prospective teachers to expand what mathematics can look like in a classroom. She does this through reinforcing understanding of theory through a pedagogy of questioning. Dana notes

> "I might have a conversation about what she might look for in that group's group work or when she might check in with those students again. Also talk about how she's setting up their activity or classroom for group work. Are there group roles or protocols to support [group] talk?"

Here Dana is describing pushing on the idea that mathematics is a series of problems that only require procedures. As she shares the ways she would support a prospective teacher in considering supporting group work, Dana is reinforcing ideas from teacher education classrooms (such as using protocols or group roles). This reinforcement of ideas is done not just through Dana telling the prospective teacher what to do, but instead through asking questions and encouraging the prospective teacher to ask questions of their practice. This not only challenges the idea of mathematics as an individualistic space, but it also challenges the idea that teaching mathematics is more than just providing formulas, it also includes teaching students how to collaborate and talk mathematically with each other.

***Larger Societal Narratives about Mathematics***

Through fostering an understanding of sociopolitical conditions, Dana additionally challenges large societal narratives about mathematics. Dana describes the role of a mathematics teacher as "understanding the systems that affect your classroom and students" and "supporting students' critical thinking skills related to sociopolitical situations, intervening in conflicts or systemic issues, and advocating for others when needed". These ideas directly contradict the idea that mathematics is a content neutral subject that is void of context and relevance. Through encouraging prospective teachers to consider how mathematics connects to societal issues and

bring them into the classroom (via project-based learning), Dana is reinforcing the theory that mathematics is multidimensional and culturally relevant. Through reinforcing this theory with prospective teachers, they must reconsider their mathematical experiences, especially if they did not include multidimensional and culturally relevant experiences.

**Through Mentoring for Perspective Taking Empathy**

Dana describes disrupting the exclusionary practices in mathematics education in various ways throughout her descriptions of mentoring for perspective taking empathy. In Dana's descriptions, mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Dana described disrupting the exclusionary practices at various layers of social activity.

***Individual Teacher or Students' Experience***

In Dana's narratives, she challenges the exclusionary practices of mathematics on an individual level through reinforcing theory to support novices to notice patterns in beliefs. For instance, when Dana was describing her response to a mentoring scenario from inquiry group one where two Black students are asking the prospective teacher to move Mada, an emerging multilingual student from their group, Dana states

> "I'd probably attempt to validate her on attempting an empathy scenario while still having the conversation of let's not have such a deficit mindset of Mada as you're speaking to students. But I feel like she did still miss, it didn't look like she had a lot of empathy for the kids who were coming to her."

Here Dana is sharing the way she would press the prospective teacher to reflect on what she means by having an empathy scenario. First by highlighting the ways the prospective teacher is positioning Mada in a hierarchical ability in mathematics, but also by unpacking if this was true

empathy. Warren and Hotchkins (2015) describe false empathy as "an individual's tendency to think, believe, and act as if he or she possesses more empathy than what can be personally confirmed or validated by: (a) the beneficiaries of the empathetic response, or (b) positive outcomes resulting from the individual's application of empathy in social relationships" (p. 267). Dana is pulling on this idea and reinforcing for the prospective teacher what having empathy for students would look like.

Additionally, Dana describes supporting prospective teachers in engaging in critical self-reflection by providing a living example of what that looks like. Earlier, I shared the following statement from Dana.

> "[one prospective teacher] was really interested in thinking about thinking about race in the classroom and thinking about how that showed up. She was also very aware that she was white and teaching non-white students. We just had open conversations about what that meant, and like how our lived experiences showed up in that space".

Through creating this space to discuss and consider how lived experiences show up in the mathematics classroom, Dana is not only mentoring for perspective taking empathy, but she is doing it in a way that disrupts the exclusionary culture of mathematics classrooms. Dana's narratives highlight how she sends powerful messages about what belongs in a mathematics classroom to prospective teachers. Instead of supporting the narrative mathematics is neutral and just numbers, Dana is expanding the idea of mathematics for prospective teachers. Additionally, by modeling for the prospective teacher the self-reflection needed as a white woman working with Students of Color, she is making clear that students have different racialized experiences in mathematics classrooms and teachers need to consider that in the mathematics classroom.

***Local Community [Classroom or School]***

At a local community level, Dana's narratives highlight how she disrupts the exclusionary practices in mathematics education by probing novices thinking to engage in critical self-reflection. This is especially evident when Dana describes mentoring white teachers to work in her school, which is predominantly students of Color. Dana describes

> "With teachers who identify as white…we identify mostly differently from our students. There'll be sometimes where I'll bring things up and have conversations about that. There are longer conversations about differences."

Through supporting white prospective teachers to consider the cultural differences between themselves and the students, Dana is probing their thinking to better understand students, families and communities. When taken together with the way Dana previously described drawing on students' experiences to design projects, it becomes clear that Dana is supporting prospective teachers to see the differences as strengths that students are bringing to the mathematics classroom instead of viewing the students' cultural experiences as deficits.

This challenging the exclusionary practices at a community level was echoed in a portion of the narratives from above when Dana describes finding openings to debrief community experiences. Dana reflects

> "One of my student teachers did this drone delivery project, …I remember us having conversations around just what that meant with our students and the placement of like where they're at in [the city] and where our students lived in relation to where they were thinking about like putting the location…..Often we think about who our students are where and what they interact with during the days and then whether it relates to them"

Here Dana is providing context for the community and how to think about the project. Instead of just assuming about students and what they are interested in, Dana is providing important context about the community and if this project even connected to where students live. This really expands the idea of what is mathematical by sending the message students communities belong in the mathematics classroom. Additionally, this disrupts the notion that mathematics is void of context and irrelevant to daily life but not at the expense of authentic connection to students' experiences.

***Larger Societal Narratives about Mathematics***

Finally, in Dana's narrative she has examples of disrupting the larger exclusionary practices about what mathematics is through perspective taking empathy. Through reinforcing theory related to designing mathematics tasks that draw on student communities, Dana continues to expand what counts as mathematics and disrupts the sterile notion of mathematics. She states

> "So doing project-based learning, a lot of projects have different contexts and sometimes that will push on or even in developing projects, thinking about which topic to choose and whether or not that supports our students or that our students would be engaged with it."

Unlike the previous example, where Dana was focused on a specific project for her specific community, here she is sharing a philosophy of project-based learning as a larger pedagogical strategy. By reinforcing these ideas for prospective teachers, Dana is expanding what mathematics classrooms can look like to include the variety of skills, ideas, and ways to engage that project-based learning opens up for students.

### Through Mentoring for Taking Action

Across Dana's narratives, she describes disrupting the exclusionary practices in mathematics education in various ways throughout her descriptions of mentoring for taking action. In Dana's descriptions, mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Dana disrupted the exclusionary practices at various layers of social activity.

#### *Individual Teacher or Students' Experience*

When mentoring for taking action, Dana describes disrupting the exclusionary practices in mathematics education classrooms through supporting prospective teachers at the individual teacher layer to advocate for themselves related to field observations. Since Dana works in a project-based learning environment, the classroom functions differently than a traditional classroom. For Dana this support looks like probing the novices thinking to envision what it would look like to take action and advocate for your classroom. Dana reflects she

> "steps in and support them and to find the words to say. … I had to support her in the conversation ... How might you say it? So a coaching conversation might happen. It's a boosting confidence. I think that's a big thing too"

Through supporting prospective teachers to advocate for their vision for a classroom and challenge systems of the traditional classroom, Dana is supporting the prospective teacher to develop the language for this type of justification in the future. This not only supports prospective teachers in disrupting the notion that mathematics is linear in the moment (by not just teaching content for the field instructor), but also supporting the prospective teacher to envision how to have these types of conversations in their future classrooms.

### *Local Community [Classroom or School]*

When mentoring for taking action, Dana's narrative shows disrupting the exclusionary practices in mathematics education classrooms at the local community layer by focusing on students to center relationships and community wellness. This happens through Dana reflecting on the space she gave a recent prospective teacher to find his own way.

> "My most recent student teacher is Hispanic and most of our students are Hispanic…he's also bilingual. Typically when teachers present themselves or students find out they're bilingual, like there's an instant like, deeper connection. He really used that thread to build relationships and shared a lot of his own personal background… He did this with more structured community openers and like pulling it out of students and then would be vulnerable and share about himself."

Through recognizing the ways in which this prospective teacher could connect with students beyond what Dana (who is monolingual) can connect with students, Dana worked to disrupt who is seen as a mathematics person. As discussed earlier, mathematics classrooms have a perceived racial hierarchy; however, by stepping aside and letting a queer person of Color take the lead about what happens in the mathematics classroom, Dana was signaling that more than just white students belong in mathematics classrooms. Additionally, by supporting community openers that built community connections, Dana was allowing for the message that community is part of a mathematics classroom.

Additionally, Dana describes disrupting the exclusionary practices of mathematics at the community level by probing novice thinking related to envisioning taking action. Dana shares a story of encouraging prospective teachers to consider what it would look like to speak up in meetings.

> "I can say 'you have a voice' …it's gonna feel like maybe you have a very different opinion…so having those conversations beforehand of here's how this might play out, here's what you can say and here's what you should say. To get them the confidence then in the actual situation to be able to stand up for the student or stand up for themselves, um, I think is something that is pretty important"

By encouraging prospective teachers to advocate for students, especially in their mathematics classrooms, Dana is challenging the hierarchical notion that not all students belong in mathematics classrooms. Dana is asking for prospective teachers to consider student strengths and then voice them in meetings as a way to advocate for students and challenge systems.

***Larger Societal Narratives about Mathematics***

Finally, as discussed earlier, Dana's narrative shows her supporting prospective teachers to find leverage points [openings] to dismantle systems of oppression. Dana reflects

> "I remember us having conversations around what it meant to be [pause] like what were like the pathways to get to calculus, who got access to it .... just kind of comparing and contrasting and realizing that like we're a part of that system. Thinking about what my leverage points are in my school. I could feel comfortable talking to my leadership directly and I have a lot of leverage in saying certain things and at that point she didn't. So talking about what were avenues to go down to best support students or what were small things that she could do and maybe down the line would put her in a place to be able to press on the current system that she was in."

Through supporting prospective teachers to find leverage points to provide access to calculus for every student, Dana is really challenging the discourses around who gets to do mathematics. Calculus is a gatekeeper to many professions and access to calculus is very racialized (Battey,

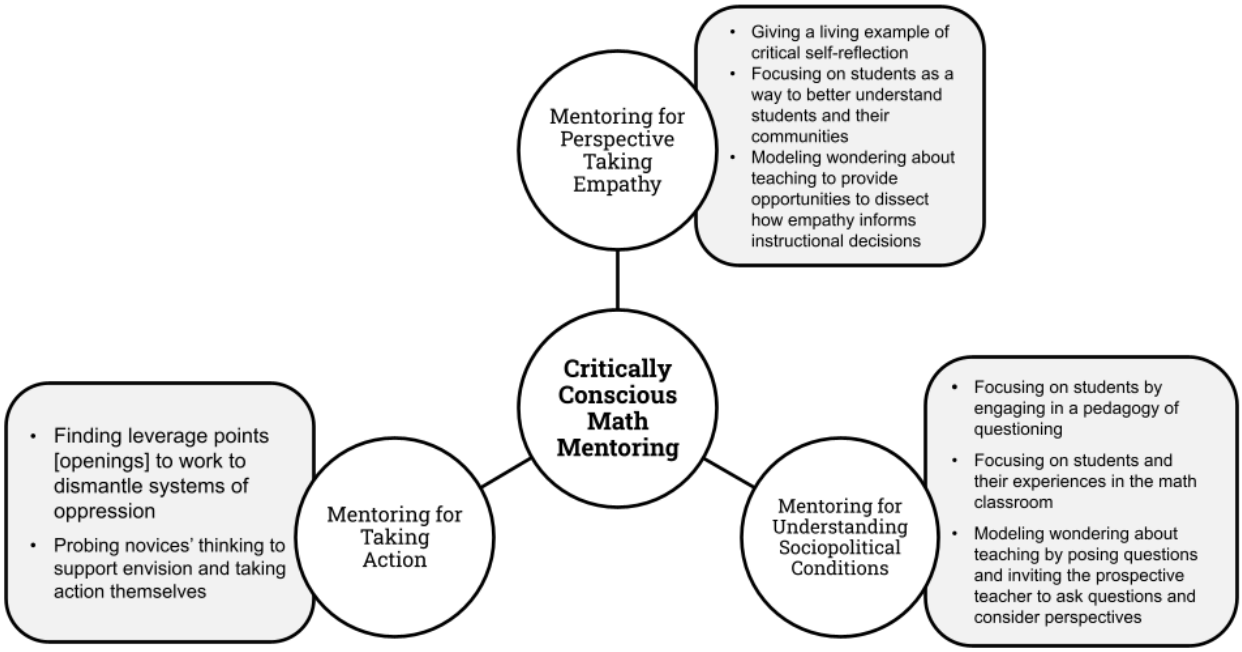
2013). Dana here is not just encouraging her prospective teacher to consider who is in the calculus class and the strengths they bring, but Dana is really advocating that every student has access to the course no matter what. This takes the focus on individual strengths students bring to mathematics (the multidimensional mathematics ability frame) and shifts the lens to a systemic level saying every student has the ability to participate in upper-level mathematics.

### Summarizing Dana's Approach to Critically Conscious Mathematics Mentoring

Across the data set, Dana's narratives have many examples of how she engages in critically conscious mathematics mentoring in various ways. Some of these ways were similar to the ones discussed in the original theorization and others were different than originally theorized. In addition to describing some of the originally theorized ways of engaging in critically conscious mathematics mentoring in ways different from the original theorization, Dana also described moves that were not accounted for in the original theorization. In answering the first empirical research question, Figure 3 highlights the model for Dana's approach to critically conscious mathematics mentoring.

**Figure 3**

*Dana's Model of Critically Conscious Mathematics Mentoring*




In addition to taking up critically conscious mathematics mentoring in various ways, Dana provides insight into the second empirical research question by describing how using this type of mentoring to disrupt the exclusionary practices in mathematics education. Through focusing on the multidimensional ability and multidimensional nature of mathematics, Dana was able to support prospective teachers to consider the exclusionary nature of mathematics and imagine a mathematics beyond these cultural norms.

# CHAPTER 7: SAM'S APPROACH TO CRITICALLY CONSCIOUS MATHEMATICS MENTORING

In this chapter, I will share the ways Sam narrated his approach to critically conscious mathematics mentoring. First, I will share an introduction to Sam's experiences and mentoring philosophy. Then I will unpack Sam's narrations and how they are different ways of engaging in critically conscious mathematics mentoring. Finally, I will conclude with an analysis of Sam's narrations and how he uses critically conscious mathematics mentoring to disrupt the exclusionary practices of mathematics classrooms.

## Orienting to Sam's Experiences and Mentoring Philosophy

As discussed earlier, Sam's school serves entirely recent immigrants who are emerging multilingual students. One of the unique supports they provide to students in an integrated Algebra 1 Geometry class which loops following an A-year, B-year schedule. This allows students to join the class whenever they arrive and know they will get the curriculum over the next two years. Additionally, to support students the mathematics department uses complex instruction as a way to "put an emphasis on group work and language/content integration (all teachers are working to support students to learn English)."

Because of these unique experiences, Sam's journey to becoming a mentor teacher was because of his commitment to the school in which he works. He describes "helping to build a pipeline whenever we need to hire teachers knowing that there would be people that we knew and already knew about our environment". Additionally, he talks about how the school has "train new teachers anyway, so rather than spending the first year focusing on all the systems that we have, we could do that during the student teaching". Despite this desire to build a pipeline into

his school specifically, he does think the skills prospective teachers learn at his school would translate to other schools.

For Sam a big part of his work as both a teacher and mentor is "talking specifically about who is our student population, what is different about them demographically, where do they come from? And then what is different about how our school is set up to support [the students]?" For Sam, his identity becomes a big part of this work. He states,

> "We're 75% Spanish speaking and maybe 10% Chinese speaking, 10% Arabic speaking…so I know enough Spanish that I can talk to kids and families. I do not look Latino. I'm not Latino. My family is from Asia, although all four of my grandparents were born in the United States. So there's this weird thing of: I look a certain way, I speak a certain way, I have a number of shared identities with my students that is not what anyone actually thinks it is. So I sometimes have to unpack that."

The unpacking Sam has done is related to how the combination of various shared identities and experiences intersect with the students in his classroom has led to the choices Sam makes as a mentor teacher. During our conversations, Sam talked a lot about how prospective teachers can draw on students' experiences in the classroom as well as taking asset-based approaches to students.

Additionally, Sam reflects that because he was "given both the support and the freedom to find my own way (facilitative rather than directive) so I tend to do the same, for better or for worse." This means that in Sam's mentoring style he tends to let things happen in the classroom and allow for the prospective teacher to engage in critical reflection afterwards. To do this Sam uses a variety of tools, such as video recording, scripting the conversation, and constructing participation trackers, to record what is happening in the classroom. Then following the teaching,

Sam shares the data with the prospective teacher to support them in unpacking the experiences in the classroom.

## Descriptions of Enacting Critically Conscious Mathematics Mentoring

Across Sam's narratives, he describes various ways in which he engaged in critically conscious mathematics mentoring. In the following sections, I share Sam's narratives about his mentoring practice and how it aligns with the aspects of critically conscious mathematics mentoring. The purpose of these sections are not to give a full accounting of all the ways in which Sam describes engaging in critically conscious mathematics mentoring, but to illuminate the most salient ways he describes his practice through illustrative examples.

### Mentoring for Understanding Sociopolitical Conditions

When initially asked what it means to understand sociopolitical conditions, Sam stated this meant "understanding the worlds our students come from, how those worlds are similar and different to our current environment". In follow-up conversations, he stated he sees this as part of his mentoring work by

> "how I help [prospective teachers] make sense of and leverage what they know. Especially since our school is all recent immigrants, some of whom have interrupted formal education and many who are coming from working class backgrounds and all of whom are trying to understand systems and structures in the United States, this feels especially critical."

In this conceptualization of understanding sociopolitical conditions, Sam is really highlighting the need to question and critique previous experiences and what assumptions prospective teachers are bringing related to the idea of immigration and education.

When discussing his mentoring practice, Sam also took up the ideas of understanding sociopolitical conditions. In Sam's narratives, there are various ways he engaged in mentoring practices to foster understanding sociopolitical conditions. The most prevalent ways Sam described this work was through (a) probing novices thinking around instructional choices and what is informing those choices, (b) finding openings to discuss the classroom environments, and (c) focusing on students as a way to critique previous learning experiences.

***Probing novices thinking around instructional choices and what is informing those choices***

To support prospective teachers in thinking deeply about their instructional choices and what is informing these choices, Sam's narrative highlights how he works to probe their thinking. This doesn't always happen just from him asking questions of the prospective teacher, but Sam discusses how he uses data to have these conversations. He describes having prospective teachers

> "Look at the transcript of your classroom or watch the video and share: what did you notice? What are things that you noticed that happened like both positive but that you'd like to do differently? Then it's let's unpack the thing that you wanna do differently and do you and I wanna role play what that conversation might look"

In this narrative example, Sam is really highlighting how he lets the prospective teacher do the thinking and examining of their choices in the classroom. However, this reflection space is not unstructured, Sam has designed it in a way to really push the prospective teachers thinking around their own practice.

Additionally, Sam seeks to probe novices' thinking related to their lesson plans, specifically considering emerging multilingual students. He states he tries to

> "helping [prospective teachers] reflect on how their lesson plans and their actions have helped their students learn….what are some things that they might do for, do differently to like better support students who maybe don't get the directions when you see them really quickly in English…or giving them think time or different structures that we've used like roles or explanation quizzes in ways that might be a little more specific to our students"

Here Sam is sharing the ways he probes novices thinking to consider what supports students may need to access the mathematics in the classroom. Instead of just dictating how to construct the classroom, Sam engages the prospective teacher to consider what they are doing and who it is supporting. This process of probing the novices thinking allows for the prospective teacher to begin to think about strategies and how they may be used differently for different students.

***Finding openings to discuss the classroom environments***

Another way in Sam's narratives, mentoring for understanding sociopolitical conditions appears is through finding openings to discuss the classroom environment. One place was when he was discussing the observation of a prospective teacher's lesson. He states

> "I wanted Javvy [prospective teacher] to call on a wider variety of students to speak, I chose not to say anything at the moment … I knew that we would have time to debrief later. I also didn't think that calling on/not calling on certain students would harm students or their learning, so I didn't want to interfere…But there was a part of it in the script where…like one or two kids would sort of raise their hand and in my head I'm like pull their names at random and even if they don't say anything, they can pass…don't call on the kids who you already know are going to answer"

As highlighted through this narrative example, we see how Sam made the choice to not interfere because he did not believe students were being harmed in the moment and he knew that having the debrief would allow for the conversation to be grounded in data. Sam shared how in the follow up conversations, Javvy (the prospective teacher) immediately realized the kids speaking in the script were the students who felt more comfortable speaking in English. Through the choice to collect and share data, Sam was able to find the opening to discuss how different students experience the classroom and have that conversation guided by the prospective teacher.

The strategy of finding openings to discuss students' experiences in the classroom also surfaced in the narratives when Sam was considering how he would respond to a mentoring scenario. He described that he would want to

> "make sure that the student teacher is able to name either make sure that she's able to name modest strengths; it could be either look through student work or based on what you've seen, like what are some strengths that you see in Mada so that you can highlight those for other students. Make sure to reinforce that for Mada too."

Again, in the conversation, Sam is describing using data to support the prospective teacher in thinking about classroom experiences. He not only is using student work as an opening to talk about what Mada brings to the classroom in terms of strengths, but he is also supporting the prospective teacher to consider how to surface these strengths both for the other students and for Mada. Through focusing on Mada's strengths, Sam is making sure students are having experiences in the classroom where they are celebrated for what they are bringing to the classroom instead of focusing on what they are missing in the classroom.

***Focusing on students as a way to critique previous learning experiences***

Another way in Sam's narrative mentoring for understanding sociopolitical conditions appeared is through keeping the focus on students as a way to critique previous learning experiences. For instance, when Sam was sharing how he would respond in a mentoring scenario he stated

> "Thinking about where she says also to see the other side of things, especially if she's had training in complex instruction. I wonder if there is a way to name the two students are not seeing the strengths that Mada brings, but hopefully she, as a student teacher, is seeing some of the strengths that Mada is bringing. There's a reason [Mada]'s in that group and so what are ways to name that. Especially if it's not, the way students are traditionally used to communicating and thinking."

In this example, Sam is describing the way he would push on the prospective teacher's knowledge of complex instruction to help make visible the strengths students bring to a group. Additionally, Sam is reminding the prospective teacher that this is not the traditional experience for many students and that means it may be hard for the students to have strategies to support each other in group work. This reminder that students do not necessarily know how to work in groups is important for prospective teachers to consider as they think about supporting group work.

Additionally, in Sam's narratives he describes encouraging prospective teachers to consider ways to balance content and the support students, especially emerging multilingual students, need to access the class. Sam notes

> "what are the things that you need to put in your classroom so that all of the students have access and that there is time for [the prospective teacher] to still check in and think about it, but also understanding that like the content just feels like it moves faster"

In this example, we see Sam discussing the realities of teaching Algebra 2, which in his school is the first year that has a more traditional curriculum set up. However, although the content moves a bit faster, he still focuses his prospective teachers on considering how to to support students. Through asking the prospective teachers to consider ways to check in with students, make sure everyone has access, and think about the students' needs, he is asking the prospective teacher to consider what a mathematics classroom can look like that may be very different from how the prospective teacher experienced Algebra 2.

**Mentoring for Perspective Taking Empathy**

When initially asked what empathy means to him in his work, Sam stated it is "understanding what other people are feeling emotionally, even if I don't share those same feelings and even if I am not in that same situation". When asked in the individual interview to expand on this idea, Sam talked about how his experiences learning Spanish and living in Ecuador gave him some shared connections with the students; however, he went on to say that also includes approaching students with trauma informed lenses. He describes it as "unpacking some of the [experiences], like [the student is] in a new school, they're trying to figure things out. Lots of things are happening to them and that's probably really hard". This approach of really trying to understand the students' experiences is central to Sam's work around perspective taking empathy.

In his narratives, Sam also took up the ideas of perspective taking empathy. Sam described various ways he engaged in mentoring practices to foster perspective taking empathy.

The most prevalent ways it showed up across the narratives was through (a) modeling wondering about teaching as a form of critical self-reflection, (b) focusing on students to support critical self-reflection and (c) focusing on students to better understand students, families, and their communities.

***Modeling wondering about teaching as a form of critical self-reflection***

In Sam's narratives, he describes various ways he engages in modeling wondering about teaching as a form of critical self-reflection. This mentoring strategy becomes especially useful when Sam wants to support prospective teachers to unpack student behavior in the mathematics classroom. Sam describes a scenario between a prospective teacher and a student. He notes that prospective teachers

> "don't always have the tools to pause because this kid yelled at you and yes, at some point send them [out] but maybe we take a break…because a lot of kids if you give 'em that chance and they'll be able to say ….[2] now I'm worried about it. And then you asked me this question I didn't understand, so I yelled at you."

Sam is describing the ways to support prospective teachers to consider other strategies besides sending students out when behavior becomes an issue. In the scenario, Sam is describing the ways to help prospective teachers develop the tools to pause and self-reflect that the student behavior is not about them. This pausing and reflecting on the part of the teacher is critical to challenging the systemic issues in schools around classroom discipline. Through modeling wondering about what would happen if you just give students a break, he is making visible to prospective teachers the ways students will share their lives with them.

[2] Sam gave a specific example of what a student could say. However, the statement is not relevant to the example in this dissertation, so I am choosing not to share it because it is not my story to tell and I was not given permission from the student to share.

***Focusing on students to support critical self-reflection***

Across Sam's narratives, he describes how he seeks to use data to support prospective teachers to consider the classroom environment. He also used the data to focus on students and support engaging in critical self-reflection. He reflects that

> "I feel frequently while watching newer teachers around how to help them structure their teaching and planning to surface all voices. Javvy was able to teach and lead class (and navigate the arrival of several late students), but the voices that I observed speaking were students who knew more English, had stronger educational histories and had higher status."

In addition to the work discussed previously, Sam describes using data to encourage the prospective teacher to consider the voices they are surfacing. This consideration creates a form of self-reflection on the part of the prospective teacher. Not only does the prospective teacher have to consider who they are calling on but they then reflect on why they are calling on certain students.

Another instance of Sam describing focusing on students as a form of critical self-reflection was in his response to a mentoring scenario. He described wondering

> "I'd be curious to ask her again, what is your purpose or what's your goal in doing group work? It's clear-ish to you as a teacher, but then how are you making that clear on a daily basis to students. This is why I have you in groups. It's not just for whatever reason, but I have reasons for you being here."

Here Sam is discussing how he is thinking about the response to students related to raising concerns around group work. He is noting that students often need to understand the reasons for the choices made and that there was intention behind them. In doing so, he is also asking the

prospective teacher to really self-reflect and narrow down why they think group work is important beyond just that my teacher preparation program says it is important. He is pushing the prospective teacher to have a way to communicate that to students.

***Focusing on students to better understand students, families, and their communities***

Finally, in Sam's narratives mentoring for perspective taking empathy is evident through focusing on students to better understand students, families, and their communities. One way he does this is through asking the prospective teacher to do an empathy interview. He describes the goals as

> "understanding the worlds our students come from, how those worlds are similar and different to our current environment and how I help them make sense of and leverage what they know…..So pick a student, even if it's a student who like you do vibe with, and ask them these questions and get to know them and their backgrounds better"

Here Sam is really pressing for prospective teachers to learn more about students by intentionally focusing on the students. These empathy interviews allow for the prospective teacher to understand the student and their experiences more. Additionally, as Sam notes his goal for these interviews is also to help the prospective teacher to begin to find out how to draw on the students' experiences to leverage what they know in the classroom.

Another way Sam describes this mentoring is through encouraging community walks. Even though all of the students at Sam's school come from other countries originally, he also wants prospective teachers to understand where the kids live now. He states

> "actually go, like ideally the students will actually go and take teachers out into their community and be like, this is where we live. These are the restaurants we go to. Just so they have that context…but maybe it's like even just having students do a presentation

about their neighborhood or like maybe we just all go into the [community] and see some of the things there. So like, using this as a tool."

Sam's school is located in a historical and activist oriented area of the city. Due to this long history, he seeks to have prospective teachers experience this area and think about what it means for the students who live there. Additionally, beyond that, he really wants prospective teachers to know about where the students live. Through encouraging community walks, learning about the neighborhood, or going out into the community, he is really pushing the prospective teachers to understand where the school is situated and how it impacts the experiences within the school.

**Mentoring for Taking Action**

When initially asked what taking action means to him in his work, Sam stated it includes "noticing something and doing something about that, whether it be changing a lesson plan, making a statement or thinking about longer term or team-based actions." When Sam was asked to expand on the idea during an individual interview he stated, "I feel… it's hard for me to separate how much of this is who I am as a person versus is this an actual good mentoring practice". Through Sam's experiences first before coming to education, then as part of the National Network of Teacher Leaders, and now in his new roles, he really sees the work of taking action and speaking up as a key part of who he is as an educator.

When discussing his mentoring practice, Sam also took up the ideas of taking action across his narrative. Sam shared various stories which are examples of mentoring practices to foster taking action. The most prevalent ways Sam described this work was through (a) focusing on students to center relationships and community wellness and (b) focusing on students as a way to foster a healthy relationship with dominant mathematics.

***Focusing on students to center relationships and community wellness***

Across Sam's narratives, he mentors for taking action through focusing on students to center relationships and community wellness. An instance of this is when he is describing his response to a mentoring moment. He notes

> "these two students are coming to her because they see an issue happening and so I don't know if pushing is the right word, but I think encouraging her to think about like what, what are the supports or check-ins you're gonna do with these students, right? How are we checking to see if change is happening and if change isn't happening, what are some potential things you could do to support that don't involve changing their group necessarily."

Here Sam is centering the two students who approached the prospective teacher in this scenario. In his centering of these two students, Sam is really focused on the community aspect of the classroom. He is asking the prospective teacher to consider how these students are feeling and what are ways to ensure the students are supported and feel like they are getting what they need out of the community space.

***Focusing on students as a way to foster a healthy relationship with dominant mathematics***

The other way Sam describes mentoring for taking action is through focusing on students as a way to foster a healthy relationship with dominant mathematics. As shared earlier, Sam puts a focus on students as a way to critique previous learning experiences. This quote was shared as a way to unpack how Sam does that,

> "Thinking about where she says also to see the other side of things, especially if she's had training in complex instruction. I wonder if there is a way to name the two students are not seeing the strengths that Mada brings, but hopefully she, as a student teacher, is

> seeing some of the strengths that Mada is bringing. There's a reason [Mada]'s in that group and so what are ways to name that. Especially if it's not, the way students are traditionally used to communicating and thinking."

In addition to pushing a critique of previous learning experiences, Sam also is fostering a healthy relationship with dominant mathematics. As the students approach the prospective teacher, they have a vision of what mathematics class should be, Sam is encouraging the prospective teacher to challenge this vision and expand mathematics to be a place of community which includes communicating mathematically. Through expanding this idea for students, Sam is supporting the prospective teacher in finding ways to foster healthy relationships with the dominant mathematics.

### Descriptions of Challenging Exclusionary Practices in Mathematics Education through Critically Conscious Mathematics Mentoring

As Sam engages in critically conscious mathematics mentoring in his narrative, he also narrates ways that he disrupts the exclusionary practices in mathematics education. This was most frequently done through focusing on the idea that students have multidimensional mathematics ability and the idea that mathematics itself is multidimensional. Similar to the previous section, the focus is not to share all the ways Sam describes challenging the exclusionary practices in mathematics education, but to provide illustrative examples to learn from Sam's practice. In the following section, I share how through each aspect of critically conscious mathematics mentoring Sam's narratives work to disrupt the exclusionary practices at various layers (the individual, community and societal).

**Through Mentoring for Understanding Sociopolitical Conditions**

In Sam's narrative, he disrupts the exclusionary practices in mathematics education in various ways throughout his descriptions of mentoring for understanding sociopolitical conditions. In Sams's stories, mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Sam describes disrupting the exclusionary practices at various layers of social activity.

***Individual Teacher or Students' Experience***

At the individual layer, Sam disrupts the exclusionary practices of mathematics classrooms through finding openings to discuss classroom experiences of students. In response to a mentoring scenario, Sam says

> "make sure that the student teacher is able to name either make sure that she's able to name modest strengths; it could be either look through student work or based on what you've seen, like what are some strengths that you see in Mada so that you can highlight those for other students. Make sure to reinforce that for Mada too"

Through this response to the prospective teacher, first Sam is disrupting the hierarchical ability often used to view mathematics. He is pushing the prospective teacher to find the strengths a student has and make them visible in the mathematics classroom. This focus on student's strengths really honors the idea that everyone has different mathematical strengths, and they are all important in the classroom.

In the same statement, Sam expanded on the idea that everyone has different mathematical strengths. He went on to say

> "I also wonder about how we kind of assume that students are equipped to support each other, but like if students are like newer to group work, what are some structures they can

use or like even, what are some sentence frames they can use to ask her if she has questions”

Here Sam is pushing the idea that mathematics is a body of knowledge where you just perform procedures and produce answers. Through focusing on students' communication skills and collaboration he is expanding the notion of mathematics to include interpersonal skills. In doing so, Sam is challenging the prospective teacher to consider the ways mathematics is multidimensional.

***Local Community [Classroom or School]***

At the local community layer, Sam probes novices' thinking related to students' experiences in the classroom. Specifically, he notes in his response to a mentoring scenario

> “I think it's great that [the prospective teacher] says diversity helps everyone learn differently and build new connections. What does that look like concretely? Like what, what are the actual skills that Mada brings? I'm also curious about her next steps as a teacher…. for somebody who is struggling to engage, especially if it's a language issue, is there somebody else who could be moved into the group so that it's not just the one student who's learning English… or are you doing a group question where it's okay if you explain and we're still not sure, call me over, but make sure you try to explain once first and then I can help fill in the gaps”

Sam is specifically probing the novices thinking about the classroom structures related to supporting students. In this he is recognizing the ways in which prospective teachers often make statements that challenge hierarchical ability, “diversity helps us all learn”, but often there are no concrete plans behind those statements to dismantle this notion. Sam is really challenging this

notion of hierarchical ability through pushing the prospective teacher to consider what it looks like concretely in their classroom to celebrate “diversity helps everyone learn”

Additionally, as Sam pushes for next steps he is opening mathematics up to be more multidimensional. By encouraging the prospective teacher to maybe add another emerging multilingual student to the group, Sam is saying that mathematics is done in various languages and those languages belong in the classroom. Similarly, by suggesting group questions and group explanations, he is really sending the message that collaboration is part of mathematics and should happen before the teacher intervenes.

***Larger Societal Narratives about Mathematics***

In terms of addressing larger societal narratives about mathematics, Sam seeks to support prospective teachers in pinpointing problems related to the students' experiences in the mathematics classroom, especially related to the curriculum. He states

> “are there changes she can make to the curriculum or the way she's teaching the curriculum so that it's a little more accessible ... it seems right now there are some things that indicate that if you have speed and speak English, you're a little more inclined to do well. So what are some things that could broaden that and give more access or make visual what people are thinking even if they're not saying it out loud.”

Sam is describing some of the issues associated with the rote practice frame of the nature of mathematics. Often mathematics is focused on speed and correct answers, he is noting how that privileges some students over others, especially ones who speak English. Instead of reinforcing these ideas he is encouraging the prospective teacher to find ways to modify the curriculum to support more students. For instance, he is suggesting adding visuals and other ways to represent

solutions which do not involve spoken language. Through this Sam is encouraging the idea that mathematics is multidimensional and can be represented in a variety of ways.

**Through Mentoring for Perspective Taking Empathy**

Sam disrupts the exclusionary practices in mathematics education in various ways throughout his narrative by mentoring for perspective taking empathy. In Sam's narrative, mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Sam disrupts the exclusionary practices at various layers of social activity.

***Individual Teacher or Students' Experience***

At the individual layer, Sam describes employing focusing on students to support critical self-reflection as a way to support a multidimensional view of mathematics. He states

> "I'd be curious to ask her again, what is your purpose or what's your goal in doing group work? It's clear-ish to you as a teacher, but then how are you making that clear on a daily basis to students.This is why I have you in groups. It's not just for whatever reason, but I have reasons for you being here."

He is really asking for the prospective teacher to be able to articulate why they believe group work and collaboration is important in the classroom. Through this focus on students and how they experience mathematics, Sam is really supporting the idea that mathematics is collaborative and not an individual endeavor.

***Local Community [Classroom or School]***

At the community level, Sam describes supporting prospective teachers to pinpoint problems as a way to consider how empathy informs instructional decisions. He describes

encouraging prospective teachers to unpack experiences in the mathematics classroom. He states trying to help prospective teachers

> "understand so the student did this…. why do we think that was happening? Let's unpack some using more trauma-informed lenses…like [the student is] in a new school, they're trying to figure things out. Lots of things are happening to them and that's probably really hard"

Not only is Sam encouraging the prospective teacher to understand the students' experiences, but also consider how that could be impacting what is happening in the classroom. Through focusing on the emotional aspect of a student's experience, Sam is disrupting the idea that mathematics is a neutral content void of emotion. He is not only validating that students will be bringing in their experiences to the classroom, but he is telling the prospective teacher to consider these experiences in making instructional decisions.

***Larger Societal Narratives about Mathematics***

Although Sam focused quite a bit on supporting perspective taking empathy, he did not engage much with the ways it can be used to disrupt larger societal narratives about mathematics. This could be for various reasons; however, based on the interviews and conversations across data collection, it appears that this is due to his focus and commitment to his specific school and how to support the recent immigrants and emerging multilingual students at his school. Some of his statements could be connected to larger ideas of mathematics, like it is about speed; however, he almost always described these ideas within the context of a specific student's experience or how he wanted a prospective teacher to challenge this idea at the classroom level.

**Through Mentoring for Taking Action**

Sam disrupts the exclusionary practices in mathematics education in various ways throughout his narratives where he discusses mentoring for taking action. In Sams's descriptions, mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Sam disrupted the exclusionary practices at various layers of social activity.

***Individual Teacher or Students' Experience***

At the individual layer, Sam describes providing a living example of fostering a healthy relationship with the dominant mathematics as a way to expand what counts as mathematics. Javvy was in Sam's classroom the first year Sam taught Algebra 2. He describes having Javvy as "someone else to work with on Algebra 2 and then a mathematics support class related to Algebra 2 was helpful". Through drawing on Javvy as a mathematical expert to consider how to design the courses, modeled for Javvy the ways in which teachers think about curriculum and do mathematics in ways different from their undergraduate mathematics programs. Sam continued on to say the conversations included "trying to make it more specific. What are the things that I was doing in my own practice? How do I do my explanation quizzes? How do I set up my openings?" In considering how he structures his class, Sam was giving a living example of thinking about mathematics. Additionally, by focusing on explanation quizzes[3] Sam is sending the message that mathematics is multidimensional and includes both collaboration and explaining your thinking.

[3] Explanation Quizzes is a strategy from Complex Instruction. In this process, students are given several problems to work on. When they believe they have finished, the students call the teacher over. The teacher then asks a student in the group at random to explain what the group did. This encourages students to discuss and make sure everyone knows how the problem was solved prior to calling the teacher over.

### *Local Community [Classroom or School]*

At the local community layer, Sam describes focusing on students as a way to center relationships and community wellness to highlight the multidimensionality of mathematics ability. He states

> "these two students are coming to her because they see an issue happening and so I don't know if pushing is the right word, but I think encouraging her to think about like what, what are the supports or check-ins you're gonna do with these students, right? How are we checking to see if change is happening and if change isn't happening, what are some potential things you could do to support that don't involve changing their group necessarily."

Through focusing on check-ins and support for the students to make sure they feel supported in the group work, Sam is highlighting how everyone brings different strengths to a group. He is encouraging the prospective teacher to consider those students strengths as well and how they are important to the group. This runs counter to the hierarchical ability idea of mathematics which suggests you either have the ability to do mathematics or you do not.

Through checking in with the students, the prospective teacher will be able to see how they students are engaging in the group, what they bring to the group, and how to make sure the group is structured in a way that all students feel they are able to do mathematics.

### *Larger Societal Narratives about Mathematics*

Sam describes engaging in modeling wondering about teaching as a way to support envisioning taking action themselves. He describes talking to Javvy about

> "What are the things that you as a teacher...what are the structures and systems you should be using? …. And so what are the things that you need to put into your classroom

so that all of the students have access…but also understanding that the content moves faster.

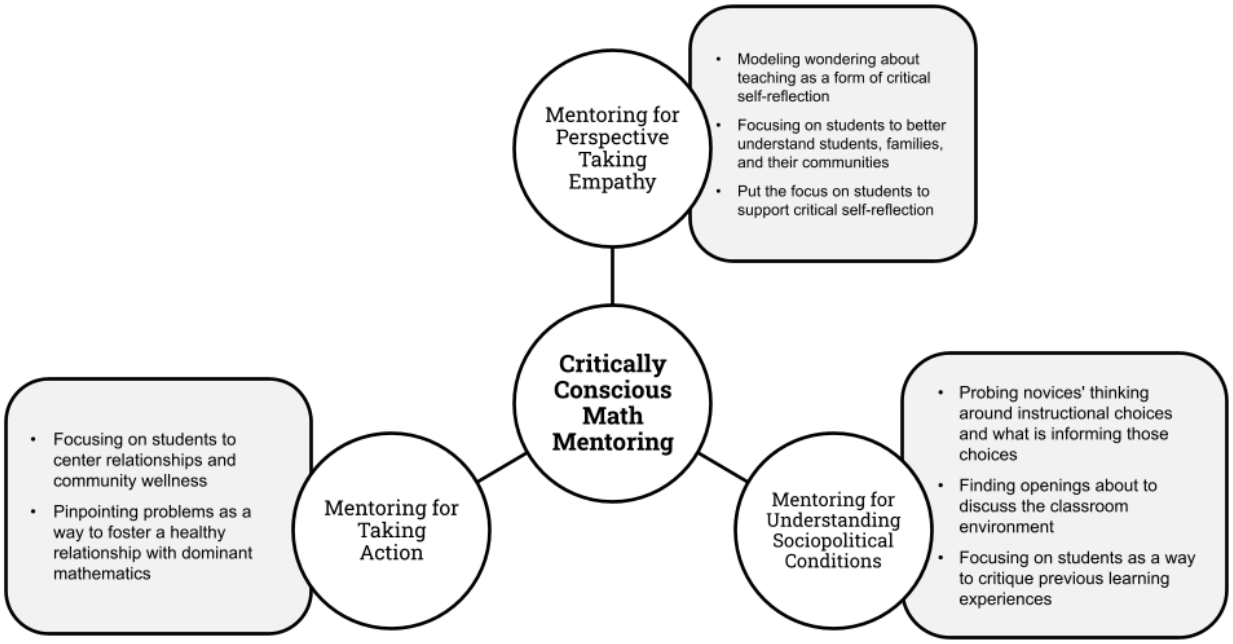
Although in some ways Sam is reifying the idea that there is a specific amount of content to cover throughout the course of Algebra 2, he is also at the same time challenging the idea that the content needs to be taught in a traditional way. This challenges the idea that mathematics needs to be engaged with procedural, standard algorithm ways. He is encouraging Javvy to think about mathematics in a sense-making way by pushing him to consider the different systems and structures to ensure all students have access to the content.

### Summarizing Sam's Approach to Critically Conscious Mathematics Mentoring

Across his narrative, Sam described engaging in critically conscious mathematics mentoring in various ways. Some of these ways were similar to the ones discussed in the original theorization and others were different than originally theorized. In answering the first empirical research question, Figure 4 highlights the model for Sam's approach to critically conscious mathematics mentoring.

**Figure 4**

*Sam's Model of Critically Conscious Mathematics Mentoring*




In addition to describing taking up critically conscious mathematics mentoring in various ways, Sam provides insight into the second empirical research question by describing how using this type of mentoring to disrupt the exclusionary practices in mathematics education. Through focusing on the multidimensional ability and multidimensional nature of mathematics, Sam was able to support prospective teachers to consider the exclusionary nature of mathematics and imagine a mathematics beyond these cultural norms. This is especially salient in Sam's work for supporting prospective teachers to understand the experiences of emerging multilingual students and recent immigrants.

# CHAPTER 8: SKYLAR'S APPROACH TO CRITICALLY CONSCIOUS MATHEMATICS MENTORING

In this chapter, I will share Skylar's narrative and examine how it is an approach to critically conscious mathematics mentoring. First, I will share an introduction to Skylar's experiences and mentoring philosophy. Then I will unpack how Skylar's narratives represent engaging in critically conscious mathematics mentoring. Finally, I will conclude with how the ways Skylar uses critically conscious mathematics mentoring disrupts the exclusionary practices of mathematics classrooms.

## Orienting to Skylar's Experiences and Mentoring Philosophy

Skylar first became a mentor teacher early in her career. As a third-year teacher, her school participated with a program that not only supported the prospective teacher all year, but also provided monthly professional development for the mentor teachers. Although she reflects that it may have been too early in her career, Skylar notes she had support to "troubleshoot the mentoring process as it was happening". Additionally, in recent years, Skylar has begun working with a summer program where she mentors prospective teachers in a summer school classroom. She notes that this is "a great alternative to teaching summer school. I really enjoy working with future teachers and they have a very different perspective and I'm learning stuff from them every day."

Part of Skylar's experiences as mentor teacher is connected to her experiences as a Black woman mathematics teacher. Over her career she has worked at a variety of schools within her district and each school has very different demographics. She describes how racial microaggressions have impacted her in the various spaces and caused her to face "imposter syndrome". She describes feeling that her expertise is only valued from the prestigious

predominantly white institutions she has attended. She notes that often instead of "teaching math, instead of being like the mathematics teacher, I'm like, now also like the person who's like trying to prove that she knows what she's doing." Many of these reasons are why she chooses to participate in a summer school mentoring program instead of having prospective teachers in her school classroom. The experience she describes as "nice to have fresh energy…I observe them while they teach summer school and then we debrief and lesson plan for the next day. It's nice to be reminded that you can do things differently."

## Descriptions of Enacting Critically Conscious Mathematics Mentoring

Across her narrative, there are many ways Skylar engages in critically conscious mathematics mentoring. In the following sections, I share several examples of the ways in which Skylar discusses her mentoring practices and how they align with the aspects of critically conscious mathematics mentoring. The purpose of these sections is not to give a full accounting of all the ways in which Skylar describes engaging in critically conscious mathematics mentoring, but to illuminate the most salient ways she describes her practice through illustrative examples.

### Mentoring for Understanding Sociopolitical Conditions

When initially asked what it means to understand sociopolitical conditions, Skylar struggled to define the idea, but through conversations she articulated it as "things you have access to versus things you believe in and how they can impact schools". She continued on to talk about how as teachers there are often

> "assumptions about [kids] because whatever you see or how they present or how they act or their academic ability versus like their actual situation and background….this has been like something that I've constantly been trying to grow in because…I have to unlearn a lot of things that I like learned in my own schooling."

In this description of understanding sociopolitical conditions, Skylar is highlighting the ways in which assumptions about students and their experiences impact classrooms. Additionally, Skylar is referencing how teachers are products of these oppressive systems and need to actively unlearn these ideologies.

In her narrative, Skylar also took up the ideas of understanding sociopolitical conditions. Skylar shares various stories in which she engaged in mentoring practices to foster understanding sociopolitical conditions. The most prevalent ways Skylar describes this work was through (a) focusing on students and their experiences in the mathematics classrooms, (b) probing novices thinking around instructional choices and what is informing those choices, and (c) finding openings to discuss the classroom environment.

***Focusing on students and their experiences in the mathematics classrooms***

In her narrative, Skylar describes mentoring for understanding sociopolitical conditions by focusing on students and their experiences in a mathematics classroom. When responding to a mentoring scenario during one of the inquiry group meetings which involved the prospective teacher responding to two Black students who raised a concern involving group work (see Appendix F) , Skylar wonders

> "maybe there's also an opportunity for [the prospective teacher] to say what she's know is working in the group. And give them some positive, 'I know this feels frustrating, but I'm seeing that you guys are… this is going really well or I'm really excited that you guys are doing', you know, just to kind of boost them also so they're not just in this deficit mindset."

Here Skylar is encouraging the prospective teacher to consider the students bringing the issues experience and how to support them. Through encouraging the prospective teacher to highlight

the strengths she has seen in the group; Skylar is pushing to focus on students and what they have been doing. Additionally, Skylar is naming the importance of highlighting the positives for students, not only so they know what their group member is bringing to the group, but also, they can be reminded of what they are bringing in the group.

***Probing novices thinking around instructional choices and what is informing those choices***

Another way in Skylar's narrative she mentors for understanding sociopolitical conditions is through probing novices thinking around instructional choices and what is informing those choices. In the same scenario as above, Skylar encourages the prospective teacher to

> "using that same lens to de-emphasize the speed in which they're completing things and maybe talking about how that's not the purpose of it, I'm assuming that's what she values. If she's studied [complex instruction] and it's been trying to bring it into the class, can you tell me why?"

In this description, Skylar is explaining the ways she would ask the prospective teacher questions about why she is using complex instruction. Supporting the prospective teacher to articulate their thinking around complex instruction can allow for this de-emphasis of speed Skylar is encouraging the prospective teacher to share with the students. Through probing the prospective teachers thinking around why they value group work and Skylar is pushing them to really consider their beliefs and choices made in the classroom.

***Finding openings to discuss the classroom environment***

To mentor for understanding sociopolitical conditions, Skylar describes engaging in finding openings to discuss the classroom environment. With the prospective teacher she worked

with in her classroom, Skylar notes that he was a white male, from another part of the country. She discusses

> "There were different privileges and access that he had, so he came in with a different set of expectations for what teaching should be. He came in with a very strong idea of classroom management and with expectations, which there's nothing wrong with having very clear expectations for what you want out of students, but also then there was no room for like, anything to go wrong…we had those conversations about you're not dictating. You are a human and need to remember that these are humans who will do what you don't want them to do or don't expect ... I think he definitely developed a different lens for it.

Skylar is focused on finding spaces to have conversations with the prospective teacher about classroom experiences. In Particular, Skylar looked for openings to discuss with the prospective teacher the importance of flexibility and thinking about the classroom as a collective of humans. Skylar continued on to discuss how she attempted to find these openings to discuss the classroom environment during their structured reflection time. These conversations during the openings she found often worked to challenge some of the systemic issues in the classroom (e.g. the teacher being seen as a dictator).

**Mentoring for Perspective Taking Empathy**

When initially asked what empathy means to her in her work, Skylar stated it is about considering kids "situation and background and what they might need empathy for because of what they're dealing with outside of the classroom". Skylar shares this is something she has been working on because although she grew up in the same city where she now teaches, she had made

assumptions about the experiences of students. This process of realizing her assumptions related to kids is something she seeks to support prospective teachers in also unpacking.

When discussing her mentoring practice, Skylar's narrative also took up the ideas of perspective taking empathy. In her narration, Skylar tells various stories of how she engaged in mentoring practices to foster perspective taking empathy. The most prevalent ways Skylar describes this work was through (a) pinpointing problems as a way to support critical self-reflection and (b) giving a living example of critical self-reflection.

***Giving a living example of critical self-reflection***

In her narrative, Skylar shares examples of mentoring for perspective taking empathy through describing giving a living example of how she has engaged in critical self-reflection. Skylar discusses that part of teaching is "being humble enough to apologize and be honest about things…and that also took a lot of learning and growing." She shares this with prospective teachers about

> "having to be called out on and wrestle with that a little bit, sit with it. Having different students with different experiences cross my path, even with my experiences….just knowing sometimes you can be patient and back up and reflect because this behavior is a trigger for me or something that I've had a bad experience with doesn't mean that that's what's actually happening"

Through being vulnerable with the prospective teachers and sharing her own experiences in having to learn and unlearn certain aspects of the classroom, Skylar models what that looks like for prospective teachers.

### *Pinpointing problems as a way to support critical self-reflection*

When discussing a mentoring scenario, Skylar describes one of the mentoring practices she uses to support critical self-reflection, pinpointing problems. After reading the prospective teacher's goal for the conversation, Skylar shares

> "I don't think she met her goal [laughs]....she's saying she wants to hear how things are going, but [the prospective teacher] is doing a lot of the talking and makes assumptions on behalf of everyone…she definitely has room to listen more and I don't really think she gives them the opportunity to talk."

Skylar continues on to note how she would encourage the prospective teacher to really think about how the students are feeling and how to support them. In this, Skylar is first pinpointing the issue of the prospective teacher making assumptions and not listening to the students related to their concern. In addition to just pinpointing the issue, Skylar is then encouraging the prospective teacher to reflect and think about the students' experiences. This self-reflection includes thinking what assumptions about the mathematics classroom exist that are leading to the students' concerns.

## Mentoring for Taking Action

When initially asked what taking action means to her in her work, Skylar stated "I really like focusing on the local" She goes on to discuss how sometimes taking action can be formal actions, but it also can be small informal activities in your classroom. When discussing her mentoring practice, Skylar also took up the ideas of taking action. Skylar describes various ways she engaged in mentoring practices to foster taking action. The most prevalent ways in Skylar's narrative she described this work was through (a) giving a living example of how ordinary

people can change the world and (b) focusing on students to expand conceptualizations of what counts as mathematics.

***Giving a living example of envision and taking action from the mathematics classroom***

Through this focus on the local, Skylar is providing a living example of what it would look like to take action from within the classroom. Skylar shares that she talks to prospective teachers about

> "really focusing on the local… just because it doesn't feel like a formal thing that you can put on your resume, what you do in your room even if it doesn't feel like the impact is happening in real time, that it, that there is, that there is an impact…I've learned like what I do in my room is a form of [taking action] and … hearing [students] takeaways… I am making a difference in this way. …It's a great way for us to improve… bringing [colleagues] in so other people have that knowledge base.

Skylar is first acknowledging that it may only be in your classroom where action is taken, but that is ok. She is stressing that feedback from students is critical and part of the work of taking action is to make sure students are experiencing the mathematics classroom in positive ways. Then beyond the classroom, Skylar is providing more local examples of how to take action (e.g. department meetings). As prospective teachers move into the classroom, thinking about taking action at the department level as local leverage point, they may have leverage over.

***Focusing on students to expand conceptualizations of what counts as mathematics***

The other way in Skylar's narratives she describes mentoring for taking action is through focusing on students as a way to broaden conceptualizations of what counts as mathematics. She reflects

> "it's nice to see the resources [prospective teachers] are using and how they're thinking about the problem. Even watching them interact with students and the questions they're asking is a nice reminder of collaborative learning. Today I noticed… students are off task and off topic, and how that's actually helpful for them to do learning even though it feels counterproductive… you're doing math, but you're not talking about math; it doesn't feel like it. And then at the end someone summarized…there's also value in letting kids play and learn and come up with their own summary and conclusions."

Skylar is really focusing on what counts as mathematics in her classroom. Through highlighting the way prospective teachers were able to let students have potentially off topic conversations and play with the mathematics, Skylar is broadening what counts as mathematics. Not only is Skylar focusing on how the students are experiencing mathematics, but by creating space for prospective teachers to facilitate a mathematics classroom in this manner, she is also broadening their own conceptualization of what counts as mathematics.

### Descriptions of Challenging Exclusionary Practices in Mathematics Education through Critically Conscious Mathematics Mentoring

As Skylar's narrative provides examples of critically conscious mathematics mentoring, she disrupts the exclusionary practices in mathematics education in various ways. This was most frequently done through challenging the nature of mathematics by focusing on the multidimensional aspects of mathematics and promoting sense-making. Similar to the previous section, the focus is not to share all the ways Skylar describes challenging the exclusionary practices in mathematics education, but to provide illustrative examples to learn from Skylar's practice. In the following section, I share how through each aspect of critically conscious

mathematics mentoring Skylar disrupts the exclusionary practices at various layers (the individual, community and societal).

**Through Mentoring for Understanding Sociopolitical Conditions**

In Skylar's narrative she describes disrupting the exclusionary practices in mathematics education in various ways throughout her descriptions of mentoring for understanding sociopolitical conditions. Mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Skylar's narrative exemplifies disrupting the exclusionary practices at various layers of social activity.

***Individual Teacher or Students' Experience***

At the individual layer, Skylar describes using understanding sociopolitical conditions to challenge the exclusionary practices of mathematics through focusing on students and their experiences in the mathematics classroom. This is especially salient when Skylar stated

> "maybe there's also an opportunity for [the prospective teacher] to say what she's know is working in the group. And give them some positive, 'I know this feels frustrating, but I'm seeing that you guys are… this is going really well or I'm really excited that you guys are doing', you know, just to kind of boost them also so they're not just in this deficit mindset."

In this scenario that Skylar is describing, the two students who are raising the concern to the prospective teacher are Black. By focusing on the experiences of the Black students and encouraging the prospective teacher to elevate the strengths and what has been going well, Skylar is disrupting the racial hierarchy of mathematics. She is sending the message that Black students can do mathematics and need to be acknowledge for the work they are doing.

***Local Community [Classroom or School]***

At the local community layer, Skylar describes noticing signs of growth in prospective teachers related to the classroom environment. She notes

> "it's nice to see the resources they're using and how they're thinking about the problem. Even watching them interact with students and the questions they're asking is a nice reminder of collaborative learning and prompting and things like that."

By noticing the way prospective teachers have grown related to the mathematics classroom they have created, Skylar is challenging for the prospective teachers that mathematics is a fixed body of knowledge that can be absorbed. Instead, Skylar is focusing on how the prospective teachers are building connections to make sense of ideas. Through this work, Skylar is evoking the sense-making frame of mathematics.

***Larger Societal Narratives about Mathematics***

Skylar describes probing novices thinking around instructional choices and what is informing those choices. As discussed above, Skylar states the following in response to a mentoring scenario

> "using that same lens to de-emphasize the speed in which they're completing things and maybe talking about how that's not the purpose of it, I'm assuming that's what she values. If she's studied [complex instruction] and it's been trying to bring it into the class, can you tell me why?"

Through this probing of novices thinking about why they want to use complex instruction in the classroom, Skylar is disrupting larger societal narratives about mathematics. Specifically, by focusing on the multidimensional nature of mathematics. This is done through advocating for the de-emphasis of speed in mathematics and focusing on the purpose of mathematics. This

challenges to notion that mathematics is something you do quickly to find the right answer; instead, Skylar is highlighting the importance of collaboration as part of doing mathematics.

**Through Mentoring for Perspective Taking Empathy**

In her narrative, Skylar describes disrupting the exclusionary practices in mathematics education in various ways throughout her descriptions of mentoring for perspective taking empathy. In Skylar's descriptions, mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Skylar describes disrupting the exclusionary practices at various layers of social activity.

***Individual Teacher or Students' Experience***

At the individual layer, Skylar describes mentoring for perspective taking empathy to disrupt exclusionary practices in mathematics by pinpointing problems to support critical self-reflection. Specifically, Skylar shared her reflection to a mentoring scenario as

> "I don't think she met her goal [laughs]....she's saying she wants to hear how things are going, but [the prospective teacher] is doing a lot of the talking and makes assumptions on behalf of everyone…she definitely has room to listen more and I don't really think she gives them the opportunity to talk."

Through prompting prospective teachers to pause and listen to students, Skylar is challenging the hierarchical ability framing of students in mathematics classrooms. Teachers often position students' complaints based on assumptions about the students which are grounded in who can do mathematics. Skylar is asking the prospective teacher to reflect on their choices. This reflection can lead to prospective teachers really focusing on what the students are saying and bringing to the mathematics classroom.

### *Local Community [Classroom or School]*

At the local community layer, Skylar describes giving an living example of critical self-reflection to disrupt the exclusionary practices of mathematics. When she shared

> "having to be called out on and wrestle with that a little bit, sit with it. Having different students with different experiences cross my path, even with my experiences….just knowing sometimes you can be patient and back up and reflect because this behavior is a trigger for me or something that I've had a bad experience with doesn't mean that that's what's actually happening",

Skylar was challenging the discourse that mathematics is individualistic and sterile. Instead, Skylar is really highlighting that everyone experiences mathematics differently. Through modeling that this is something even she, a native to the city where she works, has to grapple with, Skyler is building connections between mathematics and challenging personal experiences. Through this statement, she is pushing prospective teachers to consider mathematics in different ways and how students experience mathematics differently.

### *Larger Societal Narratives about Mathematics*

To disrupt larger societal narratives around mathematics, Skylar describes pinpointing problems to support noticing patterns in beliefs. She had noted

> "in practice … I have to unlearn a lot of things that I learned in my own schooling ... all those things like this is how you're gonna run a classroom, what's gonna be effective?...then also with my own identity and how I show up in spaces of like not wanting, I, of wanting to be taken seriously, but also not wanting to come across as like the angry Black teacher.....So it's like hard

In this reflection, Skylar is thinking about the struggles she has to unlearn her own learning experiences. She continues on to share how prospective teachers also struggle with this. Additionally, as a Black woman, Skylar is very aware of how she shows up in a space and how it impacts both her prospective teachers and the students in her classroom. By naming the way race impacts these spaces, Skylar is not only disrupting societal narratives around discussing race but she is also making clear as a Black woman she belongs in the mathematics space, which disrupts the racial hierarchy of mathematics.

**Through Mentoring for Taking Action**

Across her narratives, Skylar disrupts the exclusionary practices in mathematics education in various ways throughout her descriptions of mentoring for taking action. In Skylar's descriptions, mentoring happens not just at the individual level but across layers of social activity. In the below sections, I highlight the ways Skylar describes disrupting the exclusionary practices at various layers of social activity.

***Individual Teacher or Students' Experience***

When asked about how her identity impacts her teaching and mentoring, Skylar stated "I think about a lot. And I definitely in my own classroom start off with those conversations, but I don't always know if there's actually space in mentoring [at the summer program]. By starting the conversations in the classrooms related to identity and how it impacts the classroom, Skylar is modeling for prospective teachers how to center relationships and community wellness. Students bring a multitude of identities to the mathematics classroom and honoring those ideas helps promote the community being a space for every student. This disrupts the idea that only some students belong in mathematics classes based on a fixed ability.

Adjacently, in the summer program Skylar is not sure if there is space to discuss these ideas with the prospective teachers directly. Some of this she says has to do with where they are in the teacher preparation curriculum, and they have not in some cases done identity work themselves. However, Skylar does grapple with if she does not have these conversations with the prospective teachers will they be getting the message these conversations are not important.

***Local Community [Classroom or School]***

At the local layer, Skylar describes challenging the exclusionary practices in mathematics education through giving a living example of what it could look like to take action from the mathematics classroom. As shared above, she states

> "really focusing on the local… just because it doesn't feel like a formal thing that you can put on your resume, what you do in your room even if it doesn't feel like the impact is happening in real time, that it, that there is, that there is an impact…I've learned like what I do in my room is a form of [taking action] and … hearing [students] takeaways… I am making a difference in this way. …It's a great way for us to improve… bringing [colleagues] in so other people have that knowledge base.

By giving a living example of what it looks like to take action from the classroom, Skylar is disrupting the idea that mathematics is a neutral curriculum that does not engage with current issues. This shows how mathematics can be multidimensional and include things beyond rote problems. Additionally, the way Skylar talks about bringing colleagues into the work reminds prospective teachers that mathematics teaching is a form of mathematics and can be collaborative.

### *Larger Societal Narratives about Mathematics*

Finally, Skylar describes disrupting the exclusionary practices of mathematics at the larger societal level by challenging what it means to do mathematics. She stated

> "it's nice to see the resources [prospective teachers] are using and how they're thinking about the problem. Even watching them interact with students and the questions they're asking is a nice reminder of collaborative learning. Today I noticed… students are off task and off topic, and how that's actually helpful for them to do learning even though it feels counterproductive… you're doing math, but you're not talking about math; it doesn't feel like it. And then at the end someone summarized…there's also value in letting kids play and learn and come up with their own summary and conclusions."

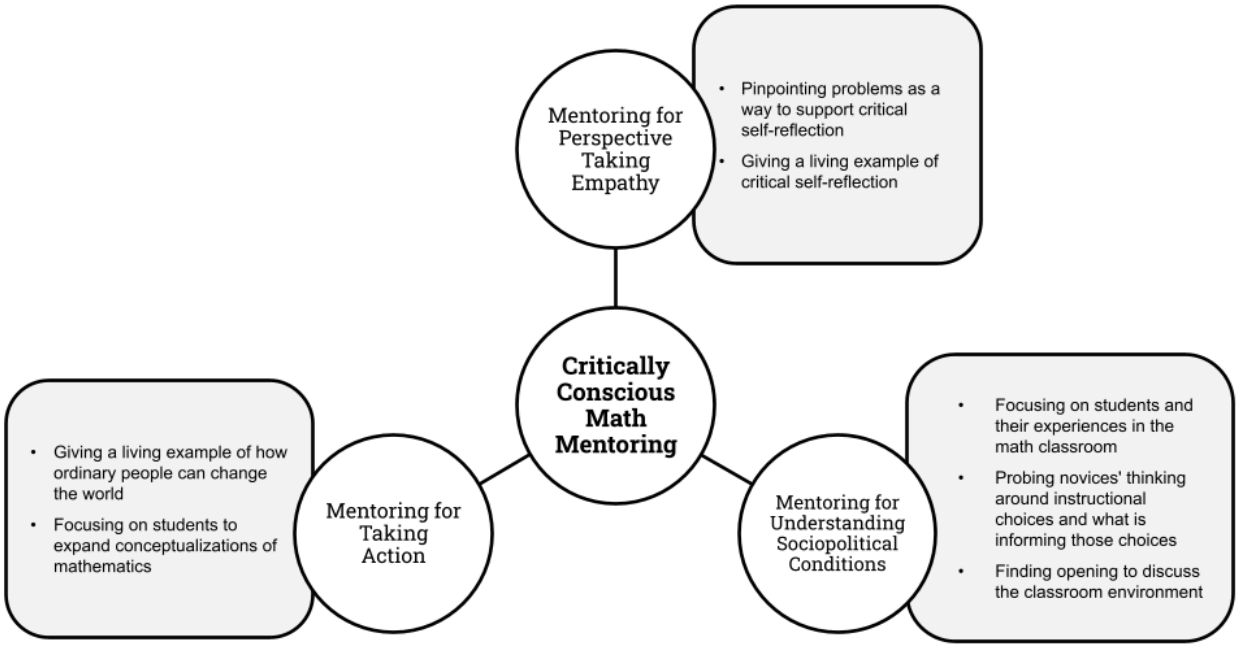
Through focusing on how students can play with mathematics, Skylar is challenging the notion of mathematics as a rote practice. She is really stressing for prospective students the ways mathematics involves sense-making through students trying different things and building connections for themselves.

## Summarizing Skylar's Approach to Critically Conscious Mathematics Mentoring

Across her narrative, Skylar describes engaging in critically conscious mathematics mentoring in various ways. Some of these ways were similar to the ones discussed in the original theorization and others were different than originally theorized. In addition to describing some of the originally theorized ways of engaging in critically conscious mathematics mentoring in ways different from the original theorization, Skylar also describes moves that were not accounted for in the original theorization. In answering the first empirical research question, Figure 5 highlights the model for Skylar's approach to critically conscious mathematics mentoring.

**Figure 5**

*Skylar's Model of Critically Conscious Mathematics Mentoring*




In addition to taking up critically conscious mathematics mentoring in various ways, Skylar provides insight into the second empirical research question by describing how using this type of mentoring to disrupt the exclusionary practices in mathematics education. Through focusing on the multidimensional nature of mathematics and how mathematics focuses on sense-making, Skylar was able to support prospective teachers to consider the exclusionary nature of mathematics and imagine a mathematics beyond these cultural norms.

# CHAPTER 9: A PRAXIS-ORIENTED REFINEMENT OF CRITICALLY CONSCIOUS MATHEMATICS MENTORING

As discussed in Chapter 2, this dissertation is a praxis-oriented research project. Lather (1986) reminds us that praxis-oriented research is a relationship where the data is viewed through the lens of a theoretical framework, but "keeps a particular framework from becoming the container into which the data must be poured" (p. 267). This approach allows for "the interactive, reciprocal shaping of theory and practice" (Lather, 1986, p. 258), which means the data is viewed through the lens of theory, but also the theory is viewed through the lens of data to construct a refined model. In this chapter, I share the method for refining the construct and results of refining.

## Refinement Method

In order to refine the construct of critically conscious mathematics mentoring, I engaged in a three-part process which involved (1) creating a composite model of critically conscious mathematics mentoring based on the analysis of the mentor teachers' narratives, (2) comparing the theorized model and the composite model, (3) based on the composite model and the differences from the theorized model constructing a newly refined model. In this section, I share the way I construct each part of the process.

### Creation of a Composite Model

The composite model is the final phase of data analysis described by Josselson and Hammack (2021). The goal of creating the composite model is to look across the mentor teachers to refine the theory presented in this dissertation. Using the codes generated in phase 4 of the empirical studies methods (described in Chapter 5), I used a similar process of looking at the co-occurrences for individual mentor teachers for the entire data set (across all three mentor

teachers). I began by looking at the co-occurrences of critical mathematics consciousness and educative mentoring to identify the most common pairings. Based on the excerpts at the intersections of these co-occurrences, I wrote descriptions to represent the mentoring practices. I then reread the theoretical framework and engaged in reflexive memoming about how the descriptions which emerged from the data aligned with or deviated from the theoretical framework. This process allowed for the theory to become refined based on the mentor teachers' experiences.

Following determining the most common co-occurrences for critically conscious mathematics mentoring, I examined for those pairing how they intersected with the codes for challenging the exclusionary practices of mathematics education. Examining this intersection allowed me to consider how certain moves disrupt the exclusionary practices at various layers of social organization.

**Comparing the Composite Model and the Theorized Model**

The process of creating the composite model allows the data to be viewed through the lens of a theoretical framework, but "keeps a particular framework from becoming the container into which the data must be poured" (Lather, 1986, p. 267). However, praxis-oriented research requires an "interactive, reciprocal shaping of theory and practice" (Lather, 1986, p. 258). In comparing the composite model and the theorized model, the theoretical model of critically conscious mathematics mentoring is viewed through the empirical data, which in this case is the analyzed narratives of the mentor teachers. To do this, I examined the similarities and differences in the theoretical model and the narratives from the mentor teachers.

## Constructing a New Refined Model

Following comparing the similarities and differences, I constructed a new refined model for critically conscious mathematics mentoring. This is not to say the refined model just becomes what mentor teachers described compared to what was originally theorized. Instead, the conversation between the two models along with the theoretical framework were iteratively examined together to refine my understanding and create a praxis-oriented process of refinement (Augustine, 2014; Lather, 1986). Initially, the original theoretical model and the model constructed off the mentor teachers' descriptions were combined into a single model. In practice this involved including ideas that showed up in both the theorized and the composite model. Then I included ideas that only appeared in the composite model. Following this combination of the two models, the original theoretical constructs (educative mentoring and critical mathematics consciousness) were used to examine the new model to see what was left out of a combined model. In practice this meant examining the ideas that only appeared in the theorized model. For those ideas, I looked across what was already included and decided if they fit with a previous idea or if they needed to be added as their own idea.

### A Composite Model of Critically Conscious Mathematics Mentoring

Although the analysis of each of the mentor teachers' narratives demonstrate the ways they took up critically conscious mathematics mentoring in different ways based on their context and positionality, when looking across the data set there were some distinct commonalities for how the mentor teachers describe engaging in critically conscious mathematics mentoring. Since this chapter is focused on refining the construct, not sharing new empirical findings, many of the examples and analysis are repeated from the individual mentor teachers' chapters. However, here

they are put in conversation with other mentor teachers and the theoretical ideas of critically conscious mathematics mentoring.

**Mentoring For Understanding Sociopolitical Conditions**

When discussing their mentoring practices, each teacher describes various ways they mentor to foster understanding sociopolitical conditions. The most prevalent ways described across the three mentor teachers was through (a) focusing on students and their experiences in the mathematics classrooms, (b) focusing on students to critique their own learning experiences, and (c) probing novices thinking around instructional choices and what is informing those choices

***Focusing on students and their experiences in the mathematics classroom***

The mentor teachers describe mentoring for understanding sociopolitical conditions by focusing on students and their experiences in a mathematics classroom. When responding to a mentoring scenario during one of the inquiry group meetings which involved the prospective teacher responding to two Black students who raised a concern involving group work (see Appendix F) , Skylar wonders

> "maybe there's also an opportunity for [the prospective teacher] to say what she's know is working in the group. And give them some positive, 'I know this feels frustrating, but I'm seeing that you guys are… this is going really well or I'm really excited that you guys are doing', you know, just to kind of boost them also so they're not just in this deficit mindset."

Here Skylar is encouraging the prospective teacher to consider the students bringing the issues experience and how to support them. Through encouraging the prospective teacher to highlight the strengths she has seen in the group; Skylar is pushing to focus on students and what they

have been doing. Additionally, Skylar is naming the importance of highlighting the positives for students, not only so they know what their group member is bringing to the group, but also they can be reminded of what they are bringing in the group.

Additionally, Dana describes focusing on students and their experiences in the mathematics classroom when she described asking the prospective teacher the following,

> "How is she gonna frame the day to make sure that if [Mada] is lost, that she can ask questions or the other group members have a way to voice frustrations if the group does start to go awry, that's not gonna cut Mada down in that situation?

Here we see Dana again focusing on the way students are experiencing the class. This experience extends beyond just making sure the students who raised the concerns are able to continue to express their thoughts but also stresses how the prospective teacher is going to support the other students in the group too. This work to get prospective teachers to focus on the student experiences in the mathematics classroom pushes the prospective teacher to consider not just the mathematics in the classroom, but the way students are experiencing the mathematics.

***Focusing on students to critique their own learning experiences***

Another way the teachers describe mentoring for understanding sociopolitical conditions is through keeping the focus on students as a way to critique previous learning experiences. For instance, when Sam was sharing how he would respond in a mentoring scenario he stated

> "Thinking about where she says also to see the other side of things, especially if she's had training in complex instruction. I wonder if there is a way to name the two students are not seeing the strengths that Mada brings, but hopefully she, as a student teacher, is seeing some of the strengths that Mada is bringing. There's a reason [Mada]'s in that

> group and so what are ways to name that. Especially if it's not, the way students are traditionally used to communicating and thinking."

In this example, Sam is describing the way he would push on the prospective teacher's knowledge of complex instruction to help make visible the strengths students bring to a group. Additionally, Sam is reminding the prospective teacher that this is not the traditional experience for many students and that means it may be hard for the students to have strategies to support each other in group work. This reminder that students do not necessarily know how to work in groups is important for prospective teachers to consider as they think about supporting group work.

Additionally, Sam describes encouraging prospective teachers to consider ways to balance content and the support students, especially emerging multilingual students, need to access the class. Sam notes

> "what are the things that you need to put in your classroom so that all of the students have access and that there is time for [the prospective teacher] to still check in and think about it, but also understanding that like the content just feels like it moves faster"

In this example, we see Sam discussing the realities of teaching Algebra 2, which in his school is the first year that has a more traditional curriculum set up. However, although the content moves a bit faster, he still focuses his prospective teachers on considering how to to support students. Through asking the prospective teachers to consider ways to check in with students, make sure everyone has access, and think about the students' needs, he is asking the prospective teacher to consider what a mathematics classroom can look like that may be very different from how the prospective teacher experienced Algebra 2.

***Probing novices' thinking around instructional choices and what is informing those choices***

Each mentor teacher describes a different approach to when they probed novice teachers' thinking around instructional choices and what is informing them. Dana, for instance, probes their thoughts about teaching by posing questions and inviting the prospective teachers to ask questions as well. An example of how Dana describes engaging in this practice is evident in her descriptions of supporting prospective teachers in designing projects, as described below.

> "One of my student teachers did this drone delivery project, …I remember us having conversations around just what that meant with our students and the placement of like where they're at in [the city] and where our students lived in relation to where they were thinking about like putting the location…..Often we think about who our students are where and what they interact with during the days and then whether it relates to them"

In this narrative example, Dana is describing the way she asks questions during the process of designing projects to make sure that they are relevant to the lives of the students in her classroom. Additionally, in this description, Dana is discussing the way this was done to support the prospective teacher to consider how project topics connect to students' lived experiences. Through this work, Dana was supporting the prospective teacher to develop their own pedagogy of questioning as they move forward in the teaching profession.

When Skylar describes probing novices thinking around instructional choices and what is informing the decision, she describes pressing on the prospective teachers' pedagogical ideas. This is not to suggest the prospective teacher to change their ideas, but to support them in articulating the why for a specific pedagogy. Skylar describes encouraging the prospective teacher to

> “use that same lens to de-emphasize the speed in which they're completing things and maybe talking about how that's not the purpose of it, I'm assuming that's what she values. If she's studied [complex instruction] and it's been trying to bring it into the class, can you tell me why?”

In this description, Skylar is explaining the ways she would ask the prospective teacher questions about why she is using complex instruction. Supporting the prospective teacher to articulate their thinking around complex instruction can allow for this de-emphasis of speed Skylar is encouraging the prospective teacher to share with the students. Through probing the prospective teachers thinking around why they value group work and Skylar is pushing them to really consider their beliefs and choices made in the classroom.

For Sam, he discusses probing novices’ thinking related to their lesson plans, specifically considering emerging multilingual students. He states he tries to

> “helping [prospective teachers] reflect on how their lesson plans and their actions have helped their students learn….what are some things that they might do for, do differently to like better support students who maybe don't get the directions when you see them really quickly in English…or giving them think time or different structures that we've used like roles or explanation quizzes in ways that might be a little more specific to our students”

Here Sam is sharing the ways he probes novices thinking to consider what supports students may need to access the mathematics in the classroom. Instead of just dictating how to construct the classroom, Sam engages the prospective teacher to consider what they are doing and who it is supporting. This process of probing the novices thinking allows for the prospective teacher to begin to think about strategies and how they may be used differently for different students.

**Mentoring For Perspective Taking Empathy**

Similar to mentoring for understanding sociopolitical conditions, each teacher describes various ways they engage in mentoring practices to foster perspective taking empathy. The most prevalent ways the three mentor teachers describe engaging in this practice is through (a) providing a living example of one teacher's way of engaging in critical self-reflection related to bias (b) focusing on students to better understand students, families, and communities, (c) probing novices thinking to notice patterns in beliefs about what it means to be successful at math, and (d) modeling wondering about teaching to provide opportunities to dissect how empathy informs instructional practices.

***Providing a living example of one teacher's way of engaging in critical self-reflection related to bias [in general and who is a doer of mathematics] and how that impacts classrooms***

Based on their positionalities, mentor teachers describe different approaches to providing a living example of one teacher's way of engaging in critical self-reflection related to bias. Skylar, for instance, draws on her personal experience as someone who grew up in the community to mentor for perspective taking empathy. Skylar discusses that part of teaching is "being humble enough to apologize and be honest about things…and that also took a lot of learning and growing." She shares this with prospective teachers about

> "having to be called out on and wrestle with that a little bit, sit with it. Having different students with different experiences cross my path, even with my experiences….just knowing sometimes you can be patient and back up and reflect because this behavior is a trigger for me or something that I've had a bad experience with doesn't mean that that's what's actually happening"

Through being vulnerable with the prospective teachers and sharing her own experiences in having to learn and unlearn certain aspects of the classroom, Skylar models what that looks like for prospective teachers.

Dana also describes engaging in giving a living example of critical self-reflection related to bias, when she is vulnerable with the prospective teachers. This vulnerability happens when she shares the ways she has had to engage in critical self-reflection over the course of her teaching career. This is evident in a narrative shared earlier in the paper, Dana reflects

> "[one prospective teacher] was really interested in thinking about thinking about race in the classroom and thinking about how that showed up. She was also very aware that she was white and teaching non-white students. We just had open conversations about what that meant, and like how our lived experiences showed up in that space".

This reflection highlights the way Dana modeled for her white prospective teacher what it means to consider how whiteness impacts the classroom. Part of these conversations included the story shared earlier where Dana realized it was her white cultural norms that were dictating what seemed like an appropriate sound level in the classroom. Through sharing stories such as this, Dana is proving examples of how a white woman teacher checks her bias and privilege to ensure students are having the best mathematical experience.

***Focusing on students to better understand the students and community's histories and experiences***

The mentor teachers describe engaging in focusing on students to better understand the students and community's histories and experiences. One way Sam does this is through asking the prospective teacher to do an empathy interview. He describes the goals as

> "understanding the worlds our students come from, how those worlds are similar and different to our current environment and how I help them make sense of and leverage what they know…..So pick a student, even if it's a student who like you do vibe with, and ask them these questions and get to know them and their backgrounds better"

Here Sam is really pressing for prospective teachers to learn more about students by intentionally focusing on the students. These empathy interviews allow for the prospective teacher to understand the student and their experiences more. Additionally, as Sam notes his goal for these interviews is also to help the prospective teacher to begin to find out how to draw on the students' experiences to leverage what they know in the classroom. Sam then encourages prospective teachers to engage in community walks. Even though all of the students at Sam's school come from other countries originally, he also wants prospective teachers to understand where the kids live now. He states

> "actually go, like ideally the students will actually go and take teachers out into their community and be like, this is where we live. These are the restaurants we go to. Just so they have that context…but maybe it's like even just having students do a presentation about their neighborhood or like maybe we just all go into the [community] and see some of the things there. So like, using this as a tool."

Sam's school is located in a historical and activist oriented area of the city. Due to this long history, he seeks to have prospective teachers experience this area and think about what it means for the students who live there. Additionally, beyond that, he really wants prospective teachers to know about where the students live. Through encouraging community walks, learning about the neighborhood, or going out into the community, he is really pushing the prospective teachers to understand where the school is situated and how it impacts the experiences within the school.

For Dana, empathy in the classroom means understanding "each student individually…they all have different back stories and experiences that show up indifferent ways in the classroom. For Dana this becomes especially salient because of the ways in which she thinks about project-based learning in her classroom. She discusses how when working with prospective teachers around designing projects she tries to

> "have different contexts and sometimes that will push on [community history] or even in developing projects, thinking about which topic to choose and whether or not that supports our students or that our students would be engaged with it."

Through supporting prospective teachers to understand the community, the students, and their interests in relation to project designs, Dana is keeping the focus on the students for why it is important to understand students and their communities.

***Probing novices' thinking to notice patterns in beliefs about what it means to be successful in math***

One way mentor teachers describe supporting prospective teachers to notice patterns in beliefs about what it means to be successful in mathematics is through probing their thinking. Sam describes his response to a mentoring scenario in this way

> "I think it's great that [the prospective teacher] says diversity helps everyone learn differently and build new connections. What does that look like concretely? Like what, what are the actual skills that Mada brings? I'm also curious about her next steps as a teacher…. for somebody who is struggling to engage, especially if it's a language issue, is there somebody else who could be moved into the group so that it's not just the one student who's learning English… or are you doing a group question where it's okay if you

> explain and we're still not sure, call me over, but make sure you try to explain once first and then I can help fill in the gaps"

Through these questions to really probe the novices thinking around what it means to say "diversity helps everyone learn differently", Sam is pushing on what it means to do mathematics. Through his follow up questions, he is supporting the prospective teacher to unpack what students bring to a mathematics class and what structures are in the classroom to support the different ways of doing mathematics.

Skylar describes engaging in probing novices thinking to notice patterns in beliefs about what it means to be successful in mathematics classrooms. With the prospective teacher she worked with in her classroom, Skylar notes that he was a white male, from another part of the country. She discusses

> "There were different privileges and access that he had, so he came in with a different set of expectations for what teaching should be. He came in with a very strong idea of classroom management and with expectations, which there's nothing wrong with having very clear expectations for what you want out of students, but also then there was no room for like, anything to go wrong…we had those conversations about you're not dictating. You are a human and need to remember that these are humans who will do what you don't want them to do or don't expect ... I think he definitely developed a different lens for it.

Skylar is focused on probing his thinking around students and why he expected certain things from students. Particularly, Skylar sought to probe the thinking of the prospective teacher related to the importance of flexibility and thinking about the classroom as a collective of humans.

Skylar continued on to discuss how she attempted to find these openings to discuss the classroom environment during their structured reflection time.

***Modeling wondering about teaching to provide opportunities to dissect how empathy informs instructional decisions***

Dana describes engaging in modeling about wondering about teaching to provide opportunities to dissect how empathy informs instructional decisions in various ways. The most salient example again came when unpacking a mentoring moment during one of the inquiry sessions. Following reading a reflection where the prospective teacher had stated they "wanted to set up an empathy scenario", Dana stated she would have responded by

> "having conversation about what empathy looks like for the student you were talking to. How could you validate their needs a little bit more without changing the outcome. Like revoicing what they're saying or even talking about like the strengths that they might have as group members. For instance I put you in this group because you're really great at communicating the math"

Here Dana is modeling wondering in two ways that provide opportunities to dissect how empathy informs instructional decisions. First, Dana is modeling just wondering what empathy is in general. This includes not just thinking about what it looks like for an instructor but also what it looks like for the students involved in the situation. She is highlighting how empathy may look different for different people and that needs to be considered as instructors make decisions.

**Mentoring For Taking Action**

Each teacher described various ways they engage in mentoring practices to foster the prospective teachers to see themselves as taking action. The most prevalent ways across the three mentor teachers this work was described was through (a) giving a living example of envisioning

taking action from the mathematics classroom, (b) finding leverage points [openings] to dismantle systems of oppression, (c) focusing on students to center relationships and community wellness, and (d) focusing on students to expand what counts as mathematics.

***Giving a living example of envisioning and taking action from the mathematics classroom***

Skylar describes providing a living example of what it would look like to take action from within the classroom by focusing on the local. Skylar shares that she talks to prospective teachers about

> "really focusing on the local… just because it doesn't feel like a formal thing that you can put on your resume, what you do in your room  even if it doesn't feel like the impact is happening in real time, that it, that there is, that there is an impact…I've learned like what I do in my room is a form of [taking action] and … hearing [students] takeaways… I am making a difference in this way. …It's a great way for us to improve… bringing [colleagues] in so other people have that knowledge base.

Skylar is first acknowledging that it may only be in your classroom where action is taken, but that is ok. She is stressing that feedback from students is critical and part of the work of taking action is to make sure students are experiencing the mathematics classroom in positive ways. Then beyond the classroom, Skylar is providing more local examples of how to take action (e.g. department meetings). As prospective teachers move into the classroom, thinking about taking action at the department level is local point that they may have leverage over.

***Finding leverage points [openings] to work to dismantle systems of oppression***

Dana describes being especially salient to the various power dynamics at play in a school setting. She is very aware that as a founding member of the charter school with over a decade of experience she has power and leverage that prospective teachers may not have in their first job.

As she discusses the ways to support prospective teachers to work towards dismantling systems of oppression, she talks about finding “leverage points”. She shares how she approaches it with prospective teachers by

> “you probably can't do this because you're a student teacher and like power dynamics, but like, what can you do? I feel like it's a lot more noticing and understanding here's this thing and it'll probably show up again. In a perfect world, what would you like to do? And then how could you move yourself into a spot where you can then do it.”

In this excerpt, Dana is highlighting the reality of being a teacher new to a school, but also making sure prospective teachers know these are systemic issues in education. Through supporting prospective teachers to consider various ways to take action in the classroom, even if that action is delayed due to power dynamics, Dana is supporting finding leverage points to dismantle these systems.

A very specific and poignant example is when Dana is discussing her work to detrack Calculus at her school and how she supported a prospective teacher to consider what that could look like in their future settings.

> “I remember us having conversations around what it meant to be [pause] like what were like the pathways to get to calculus, who got access to it .... just kind of comparing and contrasting and realizing that like we're a part of that system. Thinking about what my leverage points are in my school. I could feel comfortable talking to my leadership directly and I have a lot of leverage in saying certain things and at that point she didn't. So talking about what were avenues to go down to best support students or what were small things that she could do and maybe down the line would put her in a place to be able to press on the current system that she was in.”

Dana is really making visible the various power dynamics and how teachers move within systems. Additionally, she is actively working with prospective teachers to consider how to dismantle the oppressive system of tracking through finding various ways to leverage the power you do have within a system. Additionally, Dana really is highlighting for prospective teachers how this work is a journey. You will not just dismantle systems of oppression overnight, so it is important to do what you can and put yourself in positions to continue the work.

***Focusing on students to center relationships and community wellness***

Sam describes focusing on students to center relationships and community wellness. An instance of this is when he is describing his response to a mentoring moment. He notes

> "these two students are coming to her because they see an issue happening and so I don't know if pushing is the right word, but I think encouraging her to think about like what, what are the supports or check-ins you're gonna do with these students, right? How are we checking to see if change is happening and if change isn't happening, what are some potential things you could do to support that don't involve changing their group necessarily."

Here Sam is centering the two students who approached the prospective teacher in this scenario. In his centering of these two students, Sam is really focused on the community aspect of the classroom. He is asking the prospective teacher to consider how these students are feeling and what are ways to ensure the students are supported and feel like they are getting what they need out of the community space.

***Focusing on students to expand what counts as mathematics***

Skylar describes focusing on students as a way to broaden conceptualizations of what counts as mathematics. She describes

> "it's nice to see the resources [prospective teachers] are using and how they're thinking about the problem. Even watching them interact with students and the questions they're asking is a nice reminder of collaborative learning. Today I noticed… students are off task and off topic, and how that's actually helpful for them to do learning even though it feels counterproductive… you're doing math, but you're not talking about math; it doesn't feel like it. And then at the end someone summarized…there's also value in letting kids play and learn and come up with their own summary and conclusions."

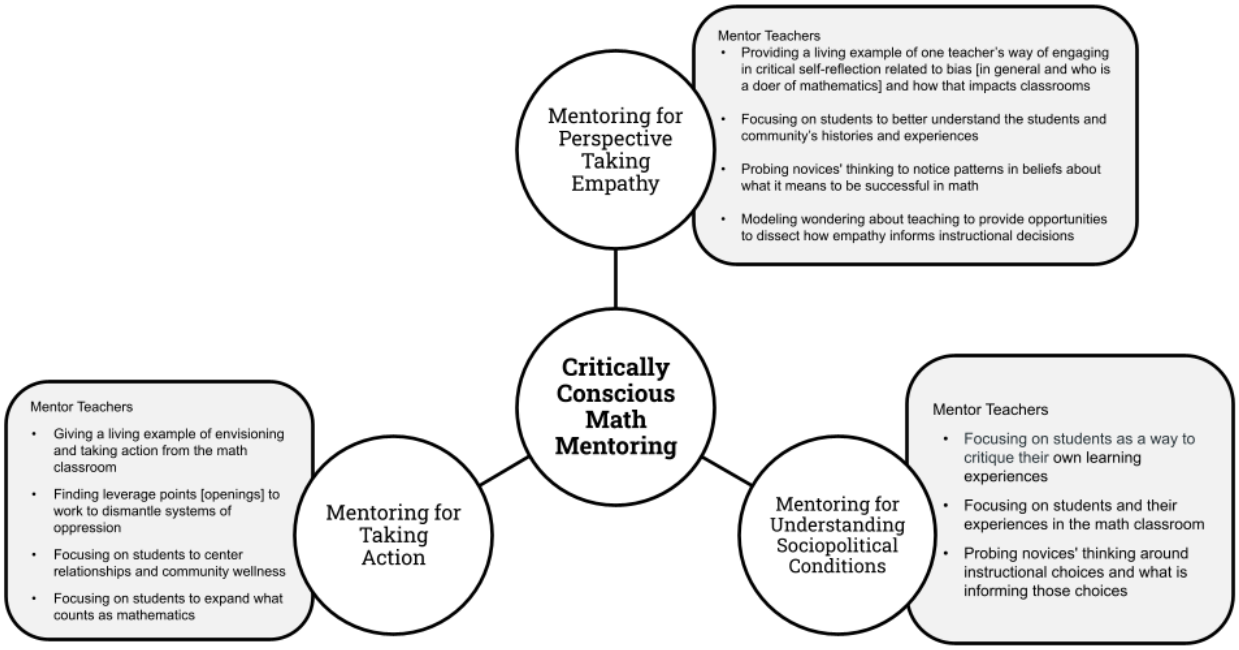
Skylar is really focusing on what counts as mathematics in her classroom. Through highlighting the way prospective teachers were able to let students have potentially off topic conversations and play with the mathematics, Skylar is broadening what counts as mathematics. Not only is Skylar focusing on how the students are experiencing mathematics, but by creating space for prospective teachers to facilitate a mathematics classroom in this manner, she is also broadening their own conceptualization of what counts as mathematics.

**Summary**

Across the data set, the mentor teachers describe engaging in critically conscious mathematics mentoring in various ways. In the next section, I will discuss the ways, as a collective, the mentor teachers' descriptions aligned with and deviated from the original theorization. Figure 6 is the model of how the mentor teachers engaged in critically conscious mathematics mentoring.

**Figure 6**

*Empirical Model of Critically Conscious Mathematics Mentoring*




*Note.* The practices from educative mentoring appear first in the theorized model and aspects of critically conscious mathematics mentoring appear second

## Connecting the Composite Model to Theorized Model

In this section, I share the similarities and differences from the composite model based off the mentor teachers' analyzed narratives to the originally theorized model.

### Mentoring For Understanding Sociopolitical Conditions

The original theorization for mentoring for understanding sociopolitical conditions included (a) probing novices thinking to critique previous learning experiences, (b) pinpointing problems to consider students experiences in the classroom, and (c) reinforcing understanding of theory to engage in a pedagogy of questioning. Through the analysis of the mentor teachers' descriptions, they describe engaging in these three activities as ways to mentor for understanding sociopolitical conditions. Specifically, they describe critiquing previous learning experiences,

considering student experiences in the classroom, and engaging in a pedagogy of question. However, the ways the mentoring moves described by the mentor teachers were different than originally theorized.

Originally, I theorized that mentor teachers would design activities for students to critique previous experiences (Gutstein, 2006; Kokka, 2018) by probing novices' thinking (Feiman-Nemser, 2001) in order to draw connections about how their own experiences are informing the choices they make in the classroom while their mentor supports them in this work. Although mentor teachers did describe engaging in probing novices' thinking related to their own learning experiences, it was much more common for the mentor teachers to describe supporting novices to critique their own [previous] learning experiences by focusing on the students. This centering of the students is used to really support prospective teachers to understand why it is important to critique previous learning experiences. For instance, Sam shares "I feel frequently while watching newer teachers…the voices that I observed speaking were students who knew more English, had stronger educational histories and had higher status." Through really thinking about which students are being asked to share their thinking, Sam is also pushing prospective teachers to consider why this happens which brings up their own mathematical histories.

Additionally, I originally theorized tpinpointing problems to consider students experiences in the classroom. To do this, I argued that mentor teachers support prospective teachers to unpack and critically think about their experiences and beliefs; in order to make sure the choices in the classroom are serving all students. This did happen in the data set, but instead of pinpointing problems, the mentor teachers describe focusing on students as a way to consider the experiences in the classroom. Through focusing on students, mentor teachers were able to support prospective teachers to think in concrete and tangible ways when they are discussing

their classroom environment. Additionally, the mentor teachers were able to take the pressure of prospective teachers' reflection on their practice (Feiman-Nemser, 2001).

The final way I had theorized mentoring for understanding sociopolitical conditions was through reinforcing understanding of theory to engage in a pedagogy of questioning. Although mentor teachers did across the data set describe engaging in the practice of reinforcing understanding of theory, it was by far the least represented practice in the mentor teachers' descriptions. This is not to say that mentor teachers did not reinforce the theoretical ideas, it just was not the practice they used to do this work. Additionally, although mentor teachers all describe engaging in a pedagogy of questioning, the questions mentor teachers prompted prospective teachers to ask and consider related to instructional decisions and what is informing them. The mentoring practice they most commonly describe using to engage in this work was probing novices' thinking. An example of this practice is described by Dana when she states, "I prompt them to ask questions like, 'what do you wanna do?' and 'what are the reasons you think this is happening?' Then we talk about all the possibilities." This practice allows for prospective teachers to really dig deep into their rationale for what is happening in the classroom and why they made the choices they did.

**Mentoring For Perspective Taking Empathy**

The original theorization for mentoring for perspective taking empathy included (a) focusing on students to shift from critical reflection to focusing on students, (b) noticing signs for growth as a way to notice patterns in their own beliefs, and (c) focusing on students to understand how community histories and experiences impact classrooms. Through the analysis of the mentor teachers' descriptions, they did describe engaging in these three activities as ways to mentor for perspective taking empathy. Specifically, they describe supporting critical self-

reflection, noticing patterns in beliefs, and better understanding students and communities. In the case of better understanding students and communities, the mentor teachers describe using the move of focusing on students, similar to theorized. However, in the other cases the mentoring moves most prevalently described by the mentor teachers were different than originally theorized. Additionally, mentor teachers describe one practice not originally theorized: modeling wondering about teaching to provide opportunities to dissect how empathy informs instructional decisions.

Originally, I theorized that mentor teachers would support the prospective teachers in shifting their critical reflection from themselves to the students in the classroom by putting the focus on students (Feiman-Nemser, 2001). Although mentor teachers did describe shifting prospective teachers' focus from themselves to the students in their classroom, they did not do it by focusing on students. Instead, mentor teachers describe using themselves as a model and provide living examples of how they engage in critical self-reflection. For instance, Skylar describes how she has shared with prospective teachers part of teaching is “being humble enough to… I've had to apologize and be honest about things and that took a lot of learning and growing”. This sharing of one's own experiences in engaging in critical self-reflection helps prospective teachers see that part of being a mathematics teacher is looking outside of yourself and it involves considering those around you.

The second way I had theorized that mentor teachers engage in mentoring for perspective taking empathy was by supporting the prospective teacher to notice the patterns in their own reflections based on their assumptions and/or experiences in the community (Warren, 2018). I argued one way to do this was through creating an environment that provides supportive critical feedback to the prospective teacher such as making sure to highlight the growth over the

mentoring period. Instead of noticing signs of growth in prospective teachers, the mentors described probing novices' thinking to notice patterns in beliefs about what it means to be successful in mathematics. For instance, Dana stated she would "open up the conversation of how could we talk about what Mada could bring to the group? …why did [prospective teacher] put them in a group in the first place". Through probing thinking, it forces the prospective teachers to really think about their beliefs and how it impacts the choices in the classroom.

**Mentoring For Taking Action**

The original theorization for mentoring for taking action included (a) giving a living example to support envisioning taking action from the classroom, (b) reinforcing understanding of theory to expand what counts as mathematics, and (c) finding openings to unpack their relationship with dominant mathematics. Through the analysis of the mentor teachers' descriptions, they did describe engaging in these two activities as ways to mentor for taking action. Specifically, they describe supporting prospective teachers to envision taking action from the classroom and expanding what counts as mathematics. For expanding what counts as mathematics only one mentor teacher engaged in this work specifically. Instead of using reinforcing understanding of theory, the mentor teacher described focusing on students.

In the case of unpacking their relationship with the dominant mathematics, mentor teachers did describe some of this work; however, it happened in conjunction with the mentoring for understanding sociopolitical conditions move of critiquing previous learning experiences. Additionally, this was not a major focus for the mentor teachers, so it was not included in the model for the mentor teachers. In the case of support envisioning taking action from the classroom, the mentor teachers describe giving a living example, similar to theorized. In addition to the various ways of taking up (or not) the theorized examples. The mentor teachers also

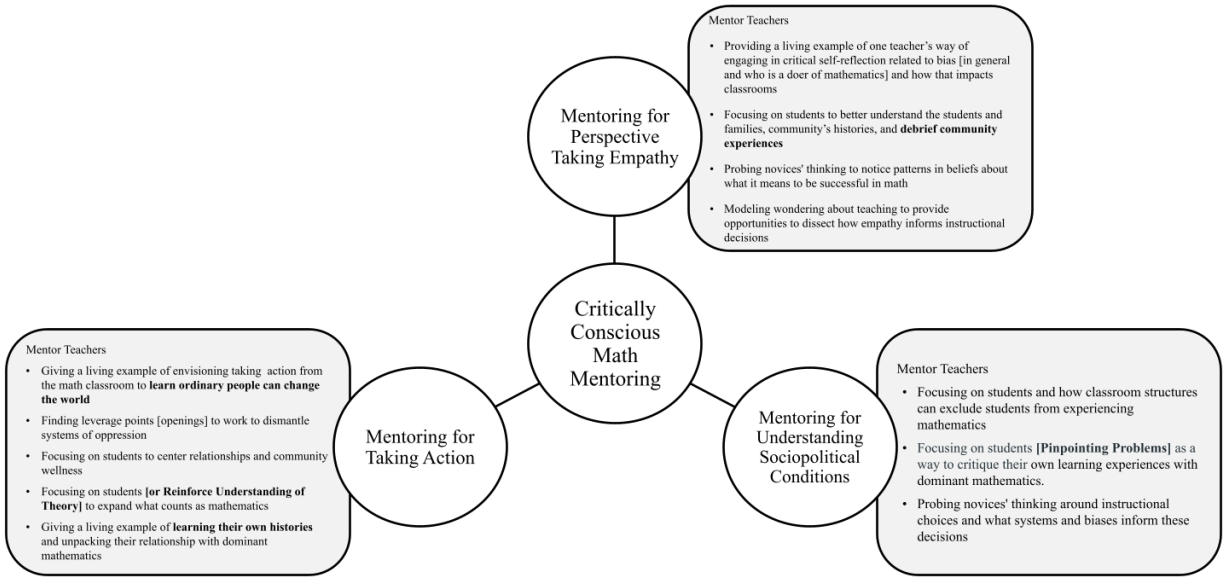
describe two activities that were not previously theorized. The mentor teachers describe focusing on students to center relationships and community wellness and finding leverage points [openings] to dismantle systems of oppression.

## Towards A Refined Theoretical Model of Critically Conscious Mathematics Mentoring

As a reminder the overarching question of this dissertation is *how do mentor teachers support prospective teachers' critical consciousness in mathematics as a way to disrupt the exclusionary practices of mathematics classrooms?* In this section, I share the following refined model of critically conscious mathematics mentoring that was produced to represent both the ideas from the combined model and where I see the missing ideas fitting in (see Figure 7). Additionally, I describe the ways the refined model begins to disrupt the exclusionary practices in mathematics education.

**Figure 7**

*A Refined Model of Critically Conscious Mathematics Mentoring*



In this refined model, mentoring for understanding sociopolitical conditions includes: (a) focusing on students and how classroom structures can exclude students from experiencing mathematics (b) focusing on students [pinpointing problems] as a way to critique their own learning experiences with dominant mathematics, and (c) probing novices' thinking around instructional choices and what systems and biases inform these decisions. These mentoring moves are used to disrupt the exclusionary practices in mathematics. For instance, the hierarchical framing of mathematics ability is disrupted when mentor teachers put the focus on what each student brings to the classroom. This can then lead to an examination of if the classroom structures currently support students to be included in the classroom. Through these conversations mentor teachers are making clear all students belong in the mathematics classroom and that some structures used in classrooms do not include students, particularly students of Color. Additionally, by extending the focus on students and their experiences as a way to critique prospective teachers' own learning experiences with dominant mathematics, mentor teachers are challenging if classrooms invited all students into the mathematics. Additionally, mentor teachers are challenging the traditional ways in which mathematics is taught as a process that stresses rote practice and standard algorithms. This process involves engaging in a pedagogy of questioning (Gutstein, 2007). Mentor teachers not only ask prospective teacher questions to understand the choices being made, but also support prospective teachers to begin to ask those questions themselves.

In the refined model, mentoring for perspective taking empathy includes: (a) providing a living example of one teacher’s way of engaging in critical self-reflection related to bias [in general and who is a doer of mathematics] and how that impacts classrooms, (b) focusing on students to better understand students and families, community’s histories, and debrief

community experiences, (c) probing novices' thinking to notice patterns in beliefs about what it means to be successful in mathematics, (d) modeling wondering about teaching to provide opportunities to dissect how empathy informs instructional decisions. Through these four mentoring moves, mentor teachers work to disrupt the exclusionary practices of mathematics. By focusing on the students' communities, mentor teachers are framing mathematics as multidimensional in terms of both ability and the nature of mathematics. This happens through first, considering all the strengths students bring to mathematics classrooms and various ways of knowing mathematics that are grounded in community. Additionally, by bringing in community aspects of mathematics this reinforces the idea that mathematics classrooms can include problems that connect to students' lived experiences.

In the refined model, mentoring for taking action includes: (a) giving a living example of envisioning taking action from the mathematics classroom to learn that ordinary people can change the world, (b) finding leverage points [openings] to work to dismantle systems of oppression, (c) focusing on students to center relationships and community wellness, (d) focusing on students [or reinforcing understanding of theory] to expand what counts as mathematics, (e) giving a living example of learning their own histories and unpacking their relationship with dominant mathematics. Through supporting prospective teachers to expand their vision beyond the four walls of the classroom to figure out how to take action both inside and outside the classroom (Picower, 2012), mentor teachers find ways to support prospective teachers in disrupting the exclusionary practices of mathematics. For instance, through supporting prospective teachers to find ways to dismantle systems of oppression (e.g. tracking), mentor teachers are disrupting the idea that mathematics ability is hierarchical and only some students are allowed to be in upper-level mathematics. Additionally, by expanding what counts

as mathematics, mentor teachers are disrupting a narrow notion of the nature of mathematics which focuses on rote practice and standard algorithms. Instead, mentor teachers are supporting the ideas of sense making and collaboration in the mathematics classroom.

## Summary

This construction of a refined model of critically conscious mathematics mentoring brings together theory (Feimen-Nemser, 2001; Kokka, 2020) and the descriptions of three mentor teachers practices in a praxis-oriented approach. Through the process of generating a newly refined model of critically conscious mathematics mentoring, I not only highlighted the ways the mentor teachers' narratives had various similarities despite their unique positionalities, but I also was able to use the mentor teachers narratives to speak back to the theory. This process of speaking back to theory has resulted in a more robust theorization of critically conscious mathematics mentoring. As described above this refined model of mentoring has the potential to disrupt the exclusionary practices of mathematics classrooms. In considering the ways this model is taken up and enacted by mentor teachers, it is important to note the educative mentoring practices may shift based on the mentor teachers own personal experiences. Even across the three mentor teachers in this study, they describe different educative mentoring practices. Similar to teaching, personality impacts how people will enact critically conscious mathematics mentoring. It is not to be a prescriptive construct, but something to think with when considering how to support prospective teachers.

# CHAPTER 10: DISCUSSION AND CONCLUSION

In this dissertation, I have argued that mentor teachers are a critical part of mathematics teacher education. They serve more than a "placeholder classroom" (Clarke et al., 2014); they operate as mathematics teacher educators providing invaluable insight to prospective teachers in how to engage in justice-oriented pedagogies. In chapter 4, I answered the theoretical research questions by offering the construct of critically conscious mathematics mentoring as a way to consider how mathematics mentor teachers disrupt exclusionary practices in mathematics classrooms. Then in chapters 6, 7, 8, I answered the empirical research questions for each mentor teacher individually (Chapter 6, 7, and 8). In chapter 9, I shared a refined model of critically conscious mathematics mentoring and answered the overarching research question. In this chapter, I will first engage in researcher reflexivity and discuss how this dissertation contributes to the work of praxis-oriented research (Lather, 1986; Mattsson & Kemmis, 2007). Then I will connect the results of this dissertation back to the reviewed bodies of literature. Finally, I will conclude with potential future lines of research and implications of this work.

## Praxis-Oriented Research Design as a Humanizing Research Methodology

Since justice-oriented mentoring is undertheorized by the field, I chose to take a praxis-oriented approach (Lather, 1986). This approach allowed for developing a theoretical construct (critically conscious mathematics mentoring), talking to mentor teachers about how they perceive their practice related to justice-oriented mentoring, and then refined the theoretical construct based on the mentor teacher' descriptions. However, given my own personal connection to being part of a dissertation study, I knew the way I wanted to do research was centered on relationships. This led to me drawing on humanizing methodologies (Paris & Winn, 2014; San Pedro & Kinloch, 2017). This blending of humanizing, storytelling methodologies and

praxis-oriented research allowed for not only mentor teachers stories to be shared in ways that honor their experiences, but also allow for the mentor teachers stories to shape theory.

In order to consider how this dissertation contributes to the work on praxis-oriented research and humanizing research methodologies, I first share the ways I engaged in researcher reflexivity (Haynes, 2012; Milner, 2007). Then I share how this dissertation builds on and extends the literature related to praxis-oriented research described in chapter 2.

## Research Reflexivity

Haynes (2012) describes researcher reflexivity as "an awareness of the researcher's role in the prac-tice of research and the way this is influenced by the object of the research" (p. 72). As discussed in the introductory chapter to this dissertation, my experiences are deeply connected to the conceptualization of this dissertation which means I see many ways my role in the research influenced this dissertation. As part of my methodology, I described engaging in reflexive memoing to be mindful of bias using Milner's (2007) Framework of Researcher Racial and Cultural Positionality as a guide. Following the inquiry meetings and interviews, I recorded audio reflections of my thoughts immediately following the activities. Then following each round of data analysis (as described in Chapter 5), I recorded a written reflexive memo with my reactions, wonderings, and early thoughts of patterns. As I bring this dissertation to a close, I want to provide space for these reflexive memos and how they were part of the dissertation.

### *An Insider Perspective*

Not only am I a previous mentor teacher, who shared some very similar experiences to Dana, Sam, and Skylar. I also was part of the same National Network of Teacher Leaders that the three mentor teachers were recruited from. This meant the four of us (the three mentor teachers and I) knew each other and our classrooms prior to this dissertation. In general, I believe this

familiarity between the mentor teachers and myself led to the rich and meaningful conversations we had across the research activities. However, these two aspects (previous experience as a mentor teacher and previous relationships with the mentor teachers) were something I constantly reflected on across the dissertation.

For instance, at one point during my interview with Sam, the following exchange happened:

Sam ….It's like helping them reflect on how their lesson plans and their actions have helped their students learn. And what are some things that they might do for, do differently to like better support students who like maybe don't get the directions when you see them really quickly in English without like slides and support or like giving them think time or like different structures that we've used both that are like relatively easy to implement or like how we think about using like, roles or like explanation quizzes in ways that might be a little more specific to our students.

Sheila Tell me more about explanation quizzes. I'm just curious.

Sam Um [pause] yeah [pause] I mean, so I think it's probably pretty similar to what most teachers in [The National Network Of Teacher Leaders] do, but we would, uh, we would give them, like for math, we'd give them a couple problems to work on and then we'd say, okay, when you're ready, call us over and we're gonna pick one of you at random to explain it. So this sense of like, the students know the problems and they've worked through it together and then they have to explain it and like, it helps 'em practice their English, it helps, helps them hopefully prepare each other and it helps 'em sort of get the sense of like, it's important for me to know this and I have a chance to show what I know. And then it also gives me or the student teacher some chance to do like, checks for understanding or to push them further or other supports.

Sheila So you do a lot of complex instruction?

Sam Yeah, yeah, yeah. We do it all the time

I completely knew what an explanation quiz was and how Sam used them in his classroom. I will admit this probably confused him, evident in his pause and starting the explanation grounded in the National Network of Teacher Leaders. I made the choice to press him on this issue because I

was aware I would have been resting on my assumptions and knowledge of Sam's teaching later when I analyzed the interviews. I wanted to make sure the way I understood explanation quizzes was the same way Sam understood them. This pressing for clarity during interviews and inquiry groups was one way during the data generation, I guarded against my insider knowledge overshadowing the words of the mentor teachers.

Similarly, this familiarity between the mentor teachers and myself, sometimes meant that things were left unsaid (if I did not press the way I described above). For instance, my previous connection with Skylar tells me she thinks quite a bit about the ways in which whiteness shows up in mathematics classrooms and we have had multiple conversations in previous interactions about this idea. However, during our conversations, this was sometimes left unsaid. For instance, when Skylar was describing the prospective teacher from the Midwest, she focused on how he made different decisions from her. During the interview, I understood this to be Skylar referencing her positionality as a Black woman and his positionality as a white man. In this referencing, she was noting how he was making decisions that uphold systems of power from which he benefits. However, when I began the analysis section, I realized much of this was not actually stated. Both Skylar and I left this unsaid in our conversation because it was evident to both of us based on the norms and conversations we had established from before the research period. In this way the insider perspective hindered the analysis because although these previous conversations allowed us to have deep and meaningful conversations, it also meant that during the analysis much more was left to my interpretation instead of Skylar's words.

Additionally, during data analysis, I found myself also having to grapple with the ways in which I was understanding the data. For instance, Dana's mentor teacher replay was very similar to the situation I described in the opening chapter. We both were in positions where we felt we

could not leave the student teacher alone with our students in the classroom. Following the first round of data analysis for Dana, I wrote the following in my reflexive memo:

> As I reflect on Dana's story, I see so much of my story in Dana's experience. She had a very similar student teaching experience as me. However, the program she is mentoring in is VERY different than the one I worked with. Despite this difference, her struggles are similar. Additionally, I am wondering how much of my noticings are connected to our shared experiences as white women, reflective about our race impacting our experiences, PBL teachers, etc. These experiences are really similar so I am unsure if I am seeing my own story too much in hers….

This concern that I was seeing too much of my own story in Dana's was something I was aware of throughout the analysis process. I continued to memo, reread, and double check the coding on her data in conversations with the others to make sure I was not reading too much into her stories.

***White Woman***

Another thing I reflected on across this dissertation was how my positionality as a white woman showed up across the dissertation process. From my experiences in previous work, I made sure to ask specific questions about their racial positionality and how that impacts their work as a mentor teacher. In some ways this was successful because all three of the mentor teachers were able to explicitly name the way race is involved in their work and how it impacts their mentoring work. Despite the willingness of the participants to share their stories with me, I still see places where my whiteness impacted the ways I asked questions.

One example is in Skylar's individual interview. During Skylar's interview she talked briefly about many micro (and macro) aggressions she has faced in various schools, including being perceived as the "angry Black teacher". However, later in the interview, I was asking her about how she shares some of the identity work she does with her students with the prospective teachers in the summer program and she stated, "let's just say I would if I could". I chose not to

follow up on that statement. At the time, I would have said I did not follow up because she was in a shared space for the mentors participating in the program while she did the interview. However, upon reflection, whiteness also might have been a reason why I did not push her. She had already demonstrated her willingness to be vulnerable with me around challenges she faced in her classroom related to being a Black woman mathematics teacher. Based on this, reflection tells me it is unlikely she would not have answered me if I pressed her on that statement. However, I may have not liked the answer and the discomfort it could have caused me, especially if the answer cut right to the core of my beliefs as a teacher educator. I wonder if in that moment, I prioritize my comfort over racial discomfort. Stewart and Gachago (2022) argue white racial discomfort is necessary if we are to (re)orient the white gaze in education.

Although there were moments of whiteness that crept into this dissertation through the use of Milner's (2007) framework, I worked to "contextualize and ground [my] personal" in a larger contextual racialized society that this dissertation exists within. As I viewed the data through a lens of exclusionary practices in mathematics education, I constantly asked myself who is being excluded and why. On the flip side, when I felt like the mentor teachers were challenging the exclusionary practices, I was asking myself how the mentor teachers were advocating for something that challenges the exclusionary practices and promotes racial justice. For instance, when Sam was talking about including more voices in the classroom, I had to cross reference his statements in the mentor teacher replay, the inquiry group, and the notes he shared with me from the original mentoring moment to ensure the voices he was seeking to include were students who had been marginalized due to proficiency with English.

### *Stories Not To Tell*

As I discussed in Chapter 2, there are stories that Frances could share from my classroom that could be seen as reifying deficit narratives about urban communities. Across this dissertation, I sought to make sure I was respecting the mentor teachers, their students, and the communities in which they live and work. This meant that sometimes, I chose to not share full stories because they did not feel like they were mine to tell. One example that appears in this dissertation is Sam was describing how he supports prospective teachers in considering students' experiences and gave a very specific example. Since the example was not important to my analysis and the student did not give me permission to share it, I chose to exclude the story from this dissertation.

Another way I chose to not share stories was based on if it was relevant to the focus of this dissertation. Given my previous experience with all of the mentor teachers, we had many conversations within the context of "researcher activities" that provided me with an insight into their experiences; however, it was clearly not part of their answer to the question. For example, Skylar and I had begun talking about graduate school and then she made reference to a teacher preparation program. In that moment it was clear this was not part of the answer to the questions I was asking, but two people being in conversation. Although these comments helped me contextualize other comments which are included in the dissertation; I chose not to share moments that were clearly from moments of conversation between people who have known each other for a while.

### *Research Design Choices*

The final aspect of research reflexivity that I am including relates to the choices made across the methodology of the empirical study. To create this refined theorization of critically

conscious mathematics mentoring, I was very intentional in the selection of the mentor teachers and the choice to focus on their descriptions of practice instead of classroom observations. Education research has a long history of understanding the work of exemplary teachers to understand how they approach their practice (Darling-Hammond et al., 2007; Ladson-Billings, 1995). I intentionally recruited mentor teachers who engaged in justice-oriented pedagogies and had significant professional learning related to having conversations around equity and justice (both inside and outside of the classroom). Given the focus of humanizing research methodologies, I extended and honored previous relationships to find these exemplary mentor teachers.

Additionally, since the focus of this dissertation is to theorize and describe how mentor teachers can support justice-oriented pedagogies, I very intentionally choose to not observe mentor teachers enacting their mentoring practice. Similar to classroom teachers, mentor teachers practice is developed over years and involves implicit knowledge. Through focusing on their descriptions, I was able to uncover their goals and rationales for specific moves which would not necessarily be observable. The willingness of the mentor teachers to share their stories stems from the relationships built before, during, and the promise they will continue after.

Across the three mentor teachers, they had various goals and rationales behind the ways they enacted critically conscious mathematics mentoring. For instance, Skylar sought to model how important critical self-reflection is when teaching, specifically sharing her reflections around the unlearning process. From her descriptions, we see that Skylar's goal is to make clear to the prospective teacher that this is work everyone needs to do, even teachers who grew up in the city in which they work. Similarly, Sam and Dana's descriptions highlight the rationale behind the choices they make. At the core of their descriptions is a commitment to the high

school students in their classrooms and making sure those students feel welcomed in mathematics. Through these mentor teachers' descriptions of their practice and rationales for the choices being made, the ways mentor teachers are seeking to support prospective teachers to challenge the exclusionary practices become visible.

**Contributions to Praxis-Oriented Research Literature**

As described in Chapter 2, praxis-oriented research is not new to education research. It has been taken up as teacher action research (Cochran-Smith & Lytle, 1999; Manfra, 2019), a way of considering a multiplicitous of possibilities in research (Stinson & Bullock, 2012), and as a way to consider longer term partnerships with educators (Herbel-Eisenmann, 2023). For each of these types of research it is important to note that praxis is more than just reflection and action; it involves critical theories and "is undertaken with a view to changing praxis for individuals and for groups" (Mattsson & Kemmis, 2007). This conceptualization of praxis rejects neutrality and objectivity; it instead centers a commitment to justice (Herbel-Eisenman et al., In press).

In practice, this dissertation contributes to this long body of research by demonstrating how praxis can be used as a methodology to guide a larger study. Across this dissertation, highlight the beginning ways of how praxis research "is conceptualized as an on-going spiral of practice, self-reflection, scholarly inquiry and theorizing which leads to changed practice, further reflection, scholarly inquiry and theorizing about practice" (Fahy, 1996, p. 55). Initially, this dissertation began with my own self-reflection related to my practice and experiences as a teacher, mentor teacher, and research participant (Chapter 1). Then I engaged in a review of the literature to construct an initial theorization (Chapter 3 and 4). Following the theorization, I designed and conducted an empirical study to document narratives from mentor teachers to

better understand the ways they engage in this type of mentoring (Chapters 5-8). Finally, praxis-oriented research involves theory being shaped through a reciprocal relationship with the data in praxis-related research (Lather, 1986). In chapter 9, I took up this idea to refine the theoretical model based on the empirical study. In doing so, we see the practice shaping the theory.

Prior to this dissertation, there were a few pieces that theoretically described what it would look like to describe a praxis-oriented study from the researcher point of view (Lather, 1986, Mattsson & Kemmis, 2007) or describing the ways in which praxis-oriented research informed studies after the fact (Herbel-Eisenmann et al., In Press); however, I did not find anywhere the methodology was employed as part of the research design. Through making the methodology explicit in this dissertation, this study contributes to the ways in which praxis-oriented research can be used as research design.

## Contribution to the Mathematics Education Literature

In the literature review, I highlighted the ways the field has documented how race and gender shape prospective teachers' noticing of students' written mathematical work (Jackson et al., 2023), evaluation of students' mathematical thinking in classroom video (Battey et al., 2021), and justification participation in whole-class discussions (Byun et al., 2023). As discussed in the previous section, critically conscious mathematics mentoring has potential to disrupt the exclusionary practices of mathematics education. Now, I will share how this dissertation contributes to the literature in mathematics education.

### Disrupting Exclusionary Practices in Mathematics Education

Critically conscious mathematics mentoring supports prospective teachers in disrupting the ability hierarchy in mathematics education. The general notion of an ability hierarchy is not new in mathematics. By pressing prospective teachers to name specific strengths of students and

focus on what they know about the students, mentor teachers begin to disrupt this idea that some students do not belong in mathematics classrooms. Additionally, mentor teachers disrupt the hierarchical nature of mathematics classrooms by focusing on the experiences students have in mathematics classrooms. Through centering ways of knowing that do not focus on rote learning and standard algorithms, mentor teachers are inviting other ways of knowing into the classroom which challenges the traditional hierarchy. Finally, by focusing prospective teachers to reflect on on their bias related to who is a doer of mathematics and how that is impacting participation in the classroom, the mentor teacher is disrupting that some students are not capable mathematicians (Joseph et al., 2019; Martin, 2009; Yeh, 2023) or they are excluded for excelling beyond the perceived standard (Chen & Buell, 2018; Shah, 2019).

Building on this exclusion of students related to ability, critically conscious mathematics mentoring supports the disruption of other exclusionary practices in mathematics education. Gutiérrez (2017) highlights, there is a long history of people doing mathematics in ways that stand apart from the western notions of mathematics. By choosing to ignore the ways in which mathematics has been done across the globe (Joseph, 1987), mathematics education is not only excluding people from its ranks but also ideas. Through broadening prospective teachers' conceptions of what counts as mathematics, mentor teachers engaging in critically conscious mathematics mentoring are disrupting the notion that the only way of doing mathematics is the western notion of mathematics. Additionally, by supporting prospective teachers to find leverage points to disrupt oppressive systems (e.g. tracking), mentor teachers are disrupting an exclusionary aspect of mathematics. Battey (2013) demonstrates how through the use of test scores to separate students' mathematics has been able to also exclude, disproportionately impacting students of Color from being placed into advanced mathematics courses.

Battey and Leyva (2016) discuss mathematics as a white institutional space. As described earlier, they theorize this includes three dimensions: structures and systems which limit access (institutional), enforce expectations to regulate their behavior and emotions (labor), and delegitimize their mathematical ability (identity). The previous sections discuss systems which limit access and delegitimizing ability. Critically conscious mathematics mentoring also disrupts the labor dimension of mathematics as a white institutional space. The labor dimension of white institutional spaces includes reinforcing the notion that mathematics is a neutral space void of emotions. Critically conscious mathematics mentoring disrupts this idea through supporting prospective teachers to understand the students and their experiences. Through understanding these experiences, prospective teachers are able to recognize and begin to name why students are frustrated or upset in the classroom.

**Social Justice Mathematics Teacher Education**

The review of the literature synthesized the ways in which mathematics teacher education has worked to prepare prospective teachers to engage in justice-oriented pedagogies; an example is the edited volume by White and colleagues (2016) which has over seventy contributors discussing justice-oriented pedagogies in mathematics education. However, almost all of this work which involves preparing prospective teachers, involves the university-based mathematics teacher educator. Critically conscious mathematics mentoring contributes to this body of literature by expanding the work done by university-based mathematics teacher educators to the field experiences, specifically student teaching.

A component of critically conscious mathematics mentoring includes becoming familiar students and their communities to understand students' experiences in the classroom. This extends the work on the Community Mathematics Exploration Module (CME; Roth McDuffie &

Foote, 2019). Through implementation, university-based mathematics teacher educators have found Prospective teacher increased their desire to make mathematics more relevant to students and expressed the importance in finding opportunities to learn about students, their families, and their communities (Stoehr, 2019; Turner et al., 2013; Willey & Pinheiro, 2019; Zavala & Stoehr, 2019). However, university-based mathematics teacher educators also found that when adapting tasks to incorporate ideas of students and communities, prospective teachers adapted the task to not specifically attend to social justice issues (Harper et al., 2018; Zavala & Stoehr, 2019). Through critically conscious mathematics mentoring, mentor teachers can support prospective teachers to attend to these social justice issues. This is evident in the empirical study through the work of Dana and how she has supported prospective teachers to design projects that connect to school communities. Additionally, she has pushed the prospective teachers to consider their biases when they design "community-oriented projects" which are outside of the kids lived experiences (e.g. the drone project where Amazon drones would not actually deliver packages to areas where students lived).

Another aspect of critically conscious mathematics mentoring is to support prospective teachers to understand their biases related to who can be a doer of mathematics and how that is enacted in the classroom. Similar to Byun and colleagues (2023) work as university-based teacher educators, mentor teachers could use tools like Equip to reflect on the equity in their questioning patterns (Reinholz & Shah, 2018). This is similar to the work Sam described with Javvy (the prospective teacher) where he tracked students' participation and supported Javvy in noticing that he was only calling on students who had a stronger command of English. In this way, the mentor teachers are working in conjunction with the university-based teacher educators to support prospective teachers in noticing their biases.

As Dana discussed, part of critically conscious mathematics mentoring is supporting prospective teachers to have challenging conversations with parents, field instructors, or other educators in the building. Specifically, Dana discussed advocating for students. Similar to the activities described as "In My Shoes" (Gutiérrez et al., 2017) or critically analyzing the supporting difficult situations (Marshall et al., 2020), the mentor teachers are supporting prospective teachers to think and talk through situations and work collaboratively to develop strategies to subvert systems of power in schools. The power of these conversations happening in field placements are the issues being discussed feel more urgent to prospective teachers since they are not hypothetical situations. Instead, the mentor teacher is able to support prospective teachers in real time to think about ways of engaging in advocacy work.

**Extending Mentoring Literature in Mathematics Education to include Critical Consciousness**

In mathematics education, much of the focus has been on how mathematics can be used to cultivate critical consciousness for PK-12 students (Frankenstein, 1983; Gutstein, 2006, Kokka, 2020) through the use of teaching mathematics for social justice. Teaching mathematics for social justice has been used in mathematics teacher preparation to support prospective teaching in designing tasks that are relevant to students and their communities (Felton et al., 2012; Turner et al., 2013; Parker et al., 2017). Through engaging in these tasks, prospective teachers begin to do what Carter Andrews and Castillo (2016) describe as "raise questions about current policies and procedures unintentionally serve as gatekeeping mechanisms for allowing access" (p. 114). In this dissertation, the role of supporting critical consciousness development in prospective mathematics teachers was extended to the role of mentor teachers in teacher education.

Previous work on mentor teachers has focused on mentor teachers' perceptions of their roles (Wilson et al., 1999), their beliefs on the purpose of student teaching (Leathem & Peterson, 2010), and how to support mentoring conversations (Roller, 2019). Additionally, Ramsay-Jordan (2022) describes a need for the field of mathematics education to understand the role of mentor teachers in supporting prospective teachers to engage in justice-oriented pedagogies. This dissertation explicitly responds to this call by not only theorizing a construct for which the field of mathematics teacher education can use to document practice of mentor teachers, but it also provides insights into how mentor teachers narrate their experiences attempting to mentor prospective teachers to use justice-oriented pedagogies.

Building on this work, this dissertation focuses on the practices mentor teachers describe when supporting prospective teachers to enact justice-oriented pedagogies. Outside of mathematics education, Orland-Barak and Wang (2021) described a critical transformative approach to mentoring. They argue that in this approach mentor teachers support prospective teachers to teach against the grain, problematize various teaching practices, and support prospective teachers to challenge the experiences they had as students. In doing so, mentor teachers help preservice teachers critically reflect on their practices and propose alternative ideas to teach for social justice (Gardiner, 2011). Critically conscious mathematics mentoring brings this type of mentoring into mathematics education research. For instance, examples of mentoring conversations included mentor teachers and prospective teachers talking about the types of questioning happening in classrooms (Smith, 2009). However, through this dissertation, mathematics mentor teachers share stories of how they have engaged in mentoring conversations related to tracking, participation equity, and not making assumptions about students. Through

this work, mentor teachers are demonstrating they have conversations with their prospective teachers to specifically address systems of oppressions.

This focus on addressing systems of oppression shows up across the empirical study. The mentor teachers' narratives highlight how they have prospective teachers problematize aspects of mathematics (e.g. speed and correctness), challenge their own experiences as mathematics students, and engage in critical reflection on their positionality and classroom practices. Additionally, the mentor teachers through critically conscious mathematics mentoring extend this approach by pushing prospective teachers to consider ways to advocate for their students from inside the classroom. By modeling what it looks like to take action from both inside the classroom (challenging what counts as mathematics) and outside the classroom (by advocating for detracking), mentor teachers are describing ways of engaging in teacher activism (Picower, 2012; Kokka, 2018, 2023). This support of prospective teachers engaging in teacher activism expands Orland-Barak and Wang (2021) discuss the critical transformative approach to mentoring.

Additionally, the work of Wood and Turner (2015) this study often highlighted the ways mentor teachers contributed complexity to the situations by providing valuable insight from the classroom that the prospective teacher may have missed. Through critically conscious mathematics mentoring, mentor teachers engage in probing novices thinking around instructional decisions and students experiences in the classroom. This complicating moments for prospective teachers allow them to consider what is happening in the classroom from different perspectives. Additionally, through critically conscious mathematics mentoring, mentor teachers invite prospective teachers to consider the students' communities as a way to understand the mathematics classroom. By inviting prospective teachers to learn about communities and how it

impacts the classroom, they are providing another lens to view the complexities of the classroom and provide valuable insights.

## Future work

I intend to continue to build on the work of this dissertation in the coming years. As I mentioned in chapter 3, I had initially intended to engage in participatory research. Although this study was not grounded in participatory research, I recently was in conversation with Dr. Ricardo Martinez during his visit to Michigan State University. Through our conversations about participatory research, Dr. Martinez led me to understand, this dissertation is a first step in a larger, longer term participatory exploration with mentor teachers. In viewing this project as a first step in a longer-term participatory exploration, I now understand how this project upholds the idea that humanizing research "doesn't end when the study ends because it is built on true and authentic relationships". In this section, I will expand on two of the questions that were raised for me across this dissertation as potential future lines of inquiry in my career which will continue the relationships and research from this study.

### A Community-Based Approach to Critically Conscious Mathematics Mentoring

The first line inquiry I would like to take up relates to the roles of communities and families in mentoring prospective secondary mathematics teachers. Across all three mentor teachers, they spoke about a commitment to the community in which they work. Dana describes a "level of trust" between the students, their families, and her due to the previous experiences in the school. This is echoed by both Sam and Skylar when they talk about their histories and connections to the communities. This commitment of the three teachers to their school community and the families the school serves inspired this line of inquiry which is the basis for my proposed NSF Individual Postdoctoral Fellowship in STEM Education.

In this work, I propose building on my dissertation to investigate how mentor teachers collaborate with students and families, to engage in critically conscious mathematics mentoring. Specifically, I will collaborate with four mentor teachers in secondary mathematics, who will in turn collaborate with four groups of students and their families from their respective schools, to explore critically conscious mathematics mentoring in more depth. Research will proceed through two phases, guided by principles and processes of critical participatory action research (CPAR; Fine & Torre, 2021; Osibodu et al., 2023). In Phase I, the four co-researcher, mentor teachers and I will collaboratively investigate and document the ways that they enact critically conscious mathematics mentoring across a yearlong inquiry community (drawing on many of the activities initially proposed for this dissertation). Analysis from Phase I will achieve the first research objective: to document the ways mentor teachers enact critically conscious mathematics mentoring. In Phase II and the second year of the project, mentor teachers will invite students and their families to join the inquiry community to explore findings from Phase I CPAR work through new perspectives and to generate new insights through a second round of CPAR done collaboratively with mentor teachers, students, and their families. Analyses from Phase II will achieve the second research objective: to understand the needs of families related to critically conscious mathematics mentoring. Finally, through a comparative analysis across Phases I and II, I will address the third research objective: to make visible how the mentor teacher-family partnership impacts the shared vision for critically conscious mathematics mentoring.

This project will contribute to the field of mathematics education by providing insight into the ways in which various partners will be brought into the secondary mathematics teacher education space. Previous work in community-engaged teacher education has focused on finding community mentors for prospective teacher to learn from in order to shape their understanding of

justice-oriented pedagogies (Zygmunt et al., 2018), or supporting elementary prospective teacher to engage families around mathematical tasks (Mistretta, 2013). With a few exceptions (Aguirre et al., 2013; Civil & Bernier, 2006), parent engagement is often conceptualized as involvement or participation in school-sanctioned activities, such as parent-teacher conferences, with other forms of engagement favored by families of Color going unrecognized (Barton et al., 2004; Jackson & Remillard, 2005). Building on these two bodies of work, I seek to bring together the mentor teachers and families in order to support secondary mathematics prospective teachers in learning about justice-oriented mathematics pedagogies. This project will provide invaluable insight into the ways mentor teachers and families can collaborate to engage in critically conscious mathematics through the following outcomes: (1) a theory of community-engaged mentoring for prospective mathematics teachers, (2) an increased understanding of mentoring practices related to justice-oriented pedagogies, and (3) a new model for secondary mathematics teacher education which centers community engagement.

**Mathematics as Property**

The second line of inquiry that has developed out of this dissertation is actually the construct of *mathematics as property* which was initially proposed as part of this dissertation. Initially, I proposed drawing on the work of Harris (1993), mathematics operates as property, akin to whiteness, through upholding the same four rights of property: (1) rights of disposition, (2) right to use and enjoyment, (3) reputation and status property, and (4) the absolute right to exclude. Some of this initial theorization appears in the text of this dissertation; however, during the process of completing this study, I came to the realization that the design of this study did not support the analysis of the ways in which mathematics operates as property, akin to whiteness. Mathematics' role in schools as a tool for constructing racial hierarchies and exclusionary

practices has a long history and is intertwined with several reform movements (Martin, 2013). Unpacking this history and connecting it to property rights involved a deep historical analysis which would include an examination of policy documents and the work of mathematics education scholars and activists, like Bob Moses.

Since the core focus of this dissertation was on the construct of critically conscious mathematics mentoring and the role of mentor teachers, I chose to pause my thinking around this construct. Initially, I had planned to use the construct of culture of exclusion (Louie, 2017) to analyze the ways mentor teachers challenged the exclusionary forces in mathematics education. However, during my analysis, I found that the framework was too focused on the classroom and mentor teachers were describing ways they disrupted the exclusionary practices on a more systemic level (see Chapter 6 and Dana's descriptions of detracking). This led me to draw on Adiredja and Louie's (2020) work around the webs of deficit discourses in mathematics education. For the purpose of this dissertation, this work, when connected with Louie's previous work on the culture of exclusion, was able to provide a lens to analyze the data. However, in my reflections, I still found something missing.

As discussed, the mentor teachers rarely described engaging in practices that reinforces exclusionary practices in mathematics education. When exclusive practices were reinforced, it was always related to the prospective teachers' learning of mathematics teaching and not related to the K-12 students' role as a mathematics student. My initial thoughts around this are that these deficit framings of the prospective teachers' learning of mathematics teaching is connected to the ways in which mathematics operates as property. This argument leans on the idea that learning to teach mathematics is a form of mathematics, similar to the arguments around Mathematics Knowledge for Teaching (MKT; Hill & Ball, 2004). For future work, I would like to deepen my

understanding of these ideas and develop a robust theoretical argument, supported by examples from this data set, for the concept of *mathematics as property*.

## Conclusion

Through this dissertation, I sought to illuminate and elevate the ways in which mentor teachers describe their work. I have argued that mentor teachers operate as school-based teacher educators and through this work they engage in important work of supporting prospective mathematics teachers' critical consciousness development. Through the stories of Dana, Skylar, and Sam, as well as from drawing on the work of Feiman-Nemser (2001), Kokka (2020), Gutstein (2006), Warren (2018), and Kokka (2018; 2023), I have constructed and refined critically conscious mathematics mentoring as a lens to use when considering mentoring practices.

Critically conscious mathematics mentoring provides the field of mathematics teacher education with a new theoretical construct to use to examine mentoring practices across teacher education. With there now being a way to name specific mentoring practices related to supporting the enactment of justice-oriented pedagogies in mathematics classrooms, mathematics education researchers have a new tool to use in the work of examining mentoring practices. Additionally, although critically conscious mathematics mentoring was developed based on descriptions of mentor teachers working with secondary prospective mathematics teachers, this construct could be extended to use in instructional coaching, mathematics specialists, and induction programs. Through employing this construct mathematics teacher educators can support those in mentoring roles to consider how to best support teachers in enacting justice-oriented pedagogies.

In considering the ways critically conscious mathematics mentoring is taken up following this dissertation, I hope it is done through listening to mentor teachers' voices and finding ways to support them within this work. While not all mentor teachers have done the professional learning that Sam, Skylar, and Dana have done, each mentor teacher enters this practice with their own identities, histories, and experiences. Through honoring these experiences, the field of mathematics teacher education can find ways to support mentoring practices that center equity and justice.

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## APPENDIX A: NOMINATION EMAIL

A copy of the email sent to the national network of teacher leaders directors asking for recommendations for mentor teachers as part of my dissertation study.

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Hi Network Directors,

I am reaching out in relation to my work as a graduate student at Michigan State University. I have progressed to the dissertation stage. For my dissertation, I am interested in how math mentor teachers (of student teachers) mentor for racial justice. As I have been thinking about how I want to find mentor teachers to work with, my advisor suggested I reach out to National Network to see if there are math folks (both senior fellows and current teaching fellows) who you know that are/or have previously mentored math student teachers (they don't need to be located in Michigan).

I am reaching out instead of posting it to the Network Boards because I was hoping to be strategic in who I invite to collaborate with. I want to make sure the people I am inviting have thought deeply about their positionality, racial justice, and want to improve their mentoring practices. As you think about this question, I would be more than happy to set up a time to talk about what I am thinking and why I actually think National Network fellows are a perfect group of teachers to collaborate with to do this work.

Warmly,

Sheila

## APPENDIX B: RECRUITMENT EMAIL TO MENTORS

A copy of the email sent to the mentor teachers to ask them to be part of my dissertation study.

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Hello Name,

My name is Sheila Orr, a 2011 National Network Fellow, and a doctoral candidate at Michigan State University. I am in the process of working on my dissertation, and National Network Director recommended I reach out to you to see if you would be interested in participating in my research project.

For my research, I am looking to understand how math mentor teachers engage in critically conscious math mentoring. To support this work, I am facilitating an inquiry group of three to five mentor math teachers this summer to think about and reflect on their mentoring practices related to critical consciousness. I would like to invite you to participate in joining this research inquiry group.

As part of this inquiry group, we will discuss mentoring practices related to critical consciousness and share struggles you face in this work. This will include generating written reflections of mentoring moments ahead of time to share with the group. Additionally, you will be asked to participate in some individual interviews to further understand your individual mentoring practice.

We will meet five times, biweekly during the months of July and August 2023. Meeting times and duration will be decided based on the group's availability. In gratitude for your completed participation, you may receive up to $300 if you complete all the activities of the research project.

There is room in this inquiry group for 5 teachers. If you are interested in participating or have any questions, please either respond to this email or email me at smorr11@msu.edu.

Warmly,

Sheila Orr

## APPENDIX C: INITIAL DEMOGRAPHIC SURVEY

A copy of the initial demographic survey the participants completed. This included both the consent form and the demographic survey information.

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**Consent Form**

June 2023

You are being asked to participate in a research study regarding your mentoring practices related to critical consciousness. For this project, we will meet biweekly —with the time and duration of meetings decided by the group—in July and August 2023. These meetings will be video and audio recorded. You will be requested to create various artifacts and engage in one-on-one or small group conversations and/or interviews. The interviews will be between 60-90 minutes.

All recordings and material collected as part of this research project will be anonymized—your real name will not appear in any presentation or publication that comes out of the study. Your confidentiality will be protected using a code for your real name and securely storing all data. Names and other identifiable markers will be changed when the audio files are transcribed so that the transcriptions will maintain confidentiality. Video files will be stored and only accessible to project personnel. Your information will be kept confidential to the maximum extent allowable by law. Although we will make every effort to keep your data confidential there are certain times, such as a court order, where we may have to disclose your data. The results of this study may be published or presented at professional meetings, but the identities of yourself and the institutions you attended and work, and any other identifiable markers will be anonymized.

Participation in this research project is completely voluntary. You have the right to say no. You may change your mind at any time and withdraw. You may choose to stop participating at any time without consequence. You must be at least 18 years old to participate in this research.). In gratitude for your completed participation, you will receive $300 after the final meeting.

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the researcher (Sheila Orr, smorr11@msu.edu). If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 5173552180, Fax 5174324503, or email irb@msu.edu or regular mail at 4000 Collins Rd, Ste. 136, Lansing, MI 48910.

**[ ] Check this box to indicate that you voluntarily agree to participate in this study.**

**Demographic Survey Questions**

- How do you identify (i.e. racial, gender, sexual orientation, dis/ability status, socioeconomic status, etc.)?
- For how many years have you taught at each of the following levels
    - Middle School?
    - High School?
- How would you describe your school context?
- What mathematics courses have you taught?
- Approximately how many student teachers have you mentored? Have you mentored across different identities (i.e. racial, gender, sexual orientation, dis/ability status, socioeconomic status, etc.)?
- What professional learning (both formal and informal) have you engaged in related to developing social justice in your classroom?
- When I share this work professionally, what pseudonym would you like me to use for you?

## APPENDIX D: INQUIRY SESSION 1

Below are the activities completed for inquiry session 1 - asynchronous.

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**Agenda**

If you haven't already complete this intro survey & consent form- https://msu.co1.qualtrics.com/jfe/form/SV_cCGRPwyZ4aSJZNY

| Focus | Links |
|---|---|
| For this asynchronous session, we will be working in Jamboard. As you engage with the two activities, record your thoughts on the jamboard as directed in the slide decks.<br><br>We will discuss your recorded ideas during the individual interviews you have scheduled | Jamboard for this Session |
| Belief Mapping | Mentoring Belief Mapping |
| Critical Math Conscious Means to You | What is CMC Mean to You? |

**Figure D.1**

*Mentoring Belief Mapping Activity Slides*

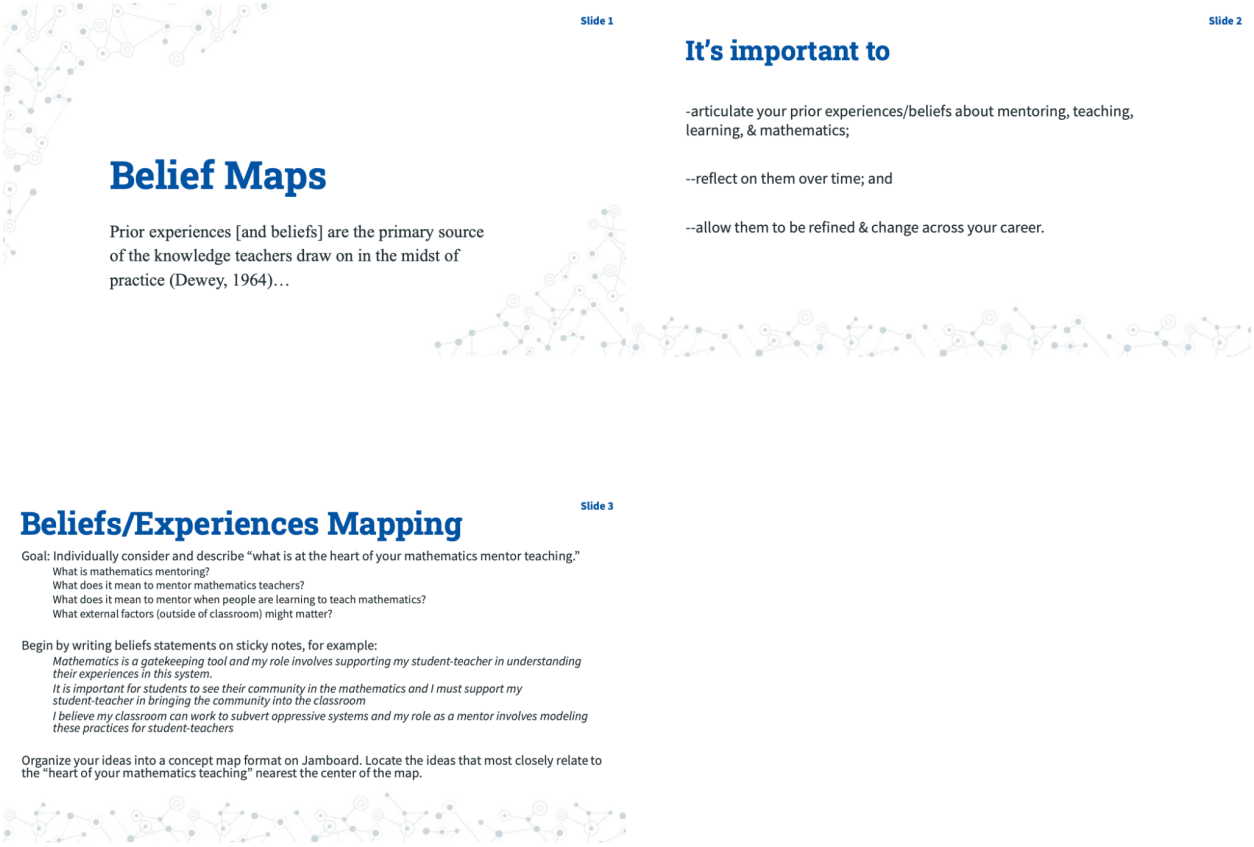
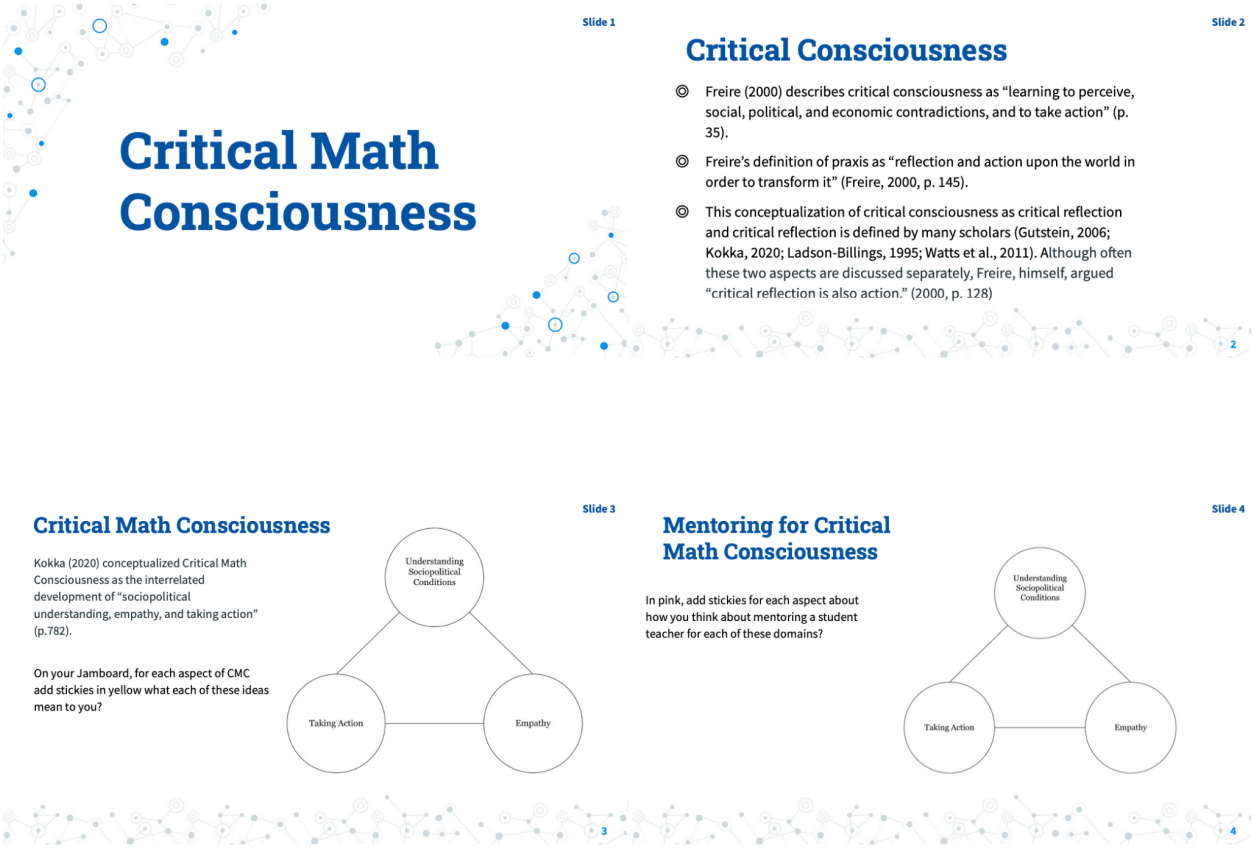


**Figure D.2**

*What is CMC Mean to You Activity Slides*



## APPENDIX E: INDIVIDUAL INTERVIEW

Below is the protocol used for the initial individual interviews.

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### General Questions

I first have a few questions related to the information provided in your initial demographic information.

- You stated you identify as …..How has this identity impacted your classroom?
    - In teaching students?
    - In mentoring prospective teachers?
- Tell me a bit more about ….. Professional learning you engaged in.
    - How has this impacted your work with students?
    - In mentoring prospective teachers?

### Mentoring Questions

Now I have some questions related to your overall mentoring practice.

#### *General Mentoring Questions*

- Tell me about why you decided to become a mentor teacher.
    - Follow up statements:
        - Purpose of student teaching
        - What you want student teachers to learn from their experience
        - How you think you as a mentor teacher do these things
- Tell me about the ways being a mentor teacher has impact your own teaching
    - What do you think is the relationship between the mentor and teacher role?

#### *Math Mentoring Questions*

- Tell me a bit about one of the best lessons you have observed by a student teacher
    - What made it a good lesson
    - What contributed to that lesson

### Mentoring for Critical Math Consciousness

I now have some questions about your thoughts related to mentoring for Critical Math Consciousness. Take a moment to look back over stickies you put on the jamboard. As you do feel free to add stickies or whatever you like to the jamboard to clarify your thinking or reactions to what you wrote.

- If stickies got added ask about those

Now, I am going to ask you a bit about your experiences with each of the domains. For each experience, I want you to describe in as much detail as possible what happened, where you were, who was involved, what you did, and what you were thinking and feeling. Think of the pink and yellow stickies as a place to start, but you don't need to stick to those ideas.

***Mentoring for Sociopolitical Understanding***

Tell me about ways in which you mentor for sociopolitical understanding. I want you to describe in as much detail as possible what happened, where you were, who was involved, what you did, and what you were thinking and feeling.

Notes from the Framework: follow up with questions related to these topics if they aren't touched on during the stories

- Questioning and critiquing previous school experiences
- Support critical personal reflection
- Connections being experiences and biases and instructional decisions

***Mentoring for Empathy***

Tell me about ways in which you mentor for empathy. I want you to describe in as much detail as possible what happened, where you were, who was involved, what you did, and what you were thinking and feeling.

Notes from the Framework: follow up with questions related to these topics if they aren't touched on during the stories

- Support understanding of students, families, and communities
- Engage and debrief community experiences, including sociohistorical aspects
- Support noticing patterns in beliefs

***Mentoring for Taking Action***

Tell me about ways in which you mentor for taking action. I want you to describe in as much detail as possible what happened, where you were, who was involved, what you did, and what you were thinking and feeling.

Notes from the Framework: follow up with questions related to these topics if they aren't touched on during the stories

- Learn how teachers have engaged in creative insubordination
- Examining and dismantling systems of oppression

- Find commonalities with oppressed people
- Envision themselves taking action

## APPENDIX F: INQUIRY SESSION 2

Below are the activities completed for inquiry session 2 - synchronous.

---

**Agenda**

| Time | Focus | Links |
|---|---|---|
| 5:00-5:10<br><br>10 min | Welcome (Introductions if needed)<br>Check In<br>- Access Needs<br>- Mentoring Experience<br><br>Norms<br>- Step Up and Step Back<br>- Engage in ways you are able<br>- Assume Positive Intentions, but take Responsibility for Impact | |
| 5:10 - 5:40<br><br>30 min | Imagined Mentoring Scenario<br>- Introduce where it came from<br>- Present scenario & discuss actions could take<br>- Share Danielle's goal & discuss how it shapes responses<br>- Share reflection & discuss supports | Mentoring Danielle |
| 5:40 - 5:55<br><br>15 mins | Launch Mentoring Replays<br>- Goal: To surface a specific mentoring moment and create an artifact for us to discuss (similar to Danielle) | Mentor Teaching Replay |
| 5:55-6:00<br><br>5 min | Wrap Up<br>- Five word take away or "notable nugget" from today | |

**Figure F.1**

*Images from Mentoring Danielle Slide Deck*

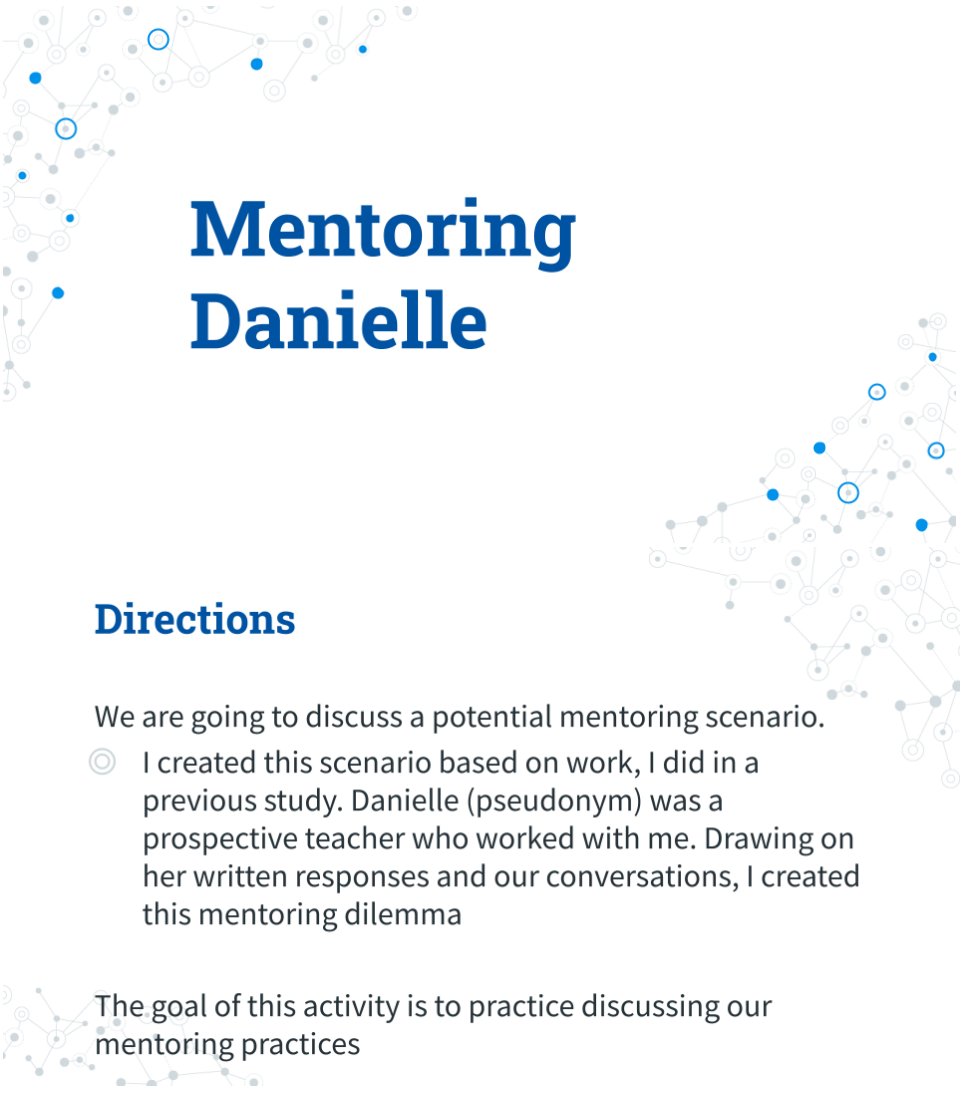
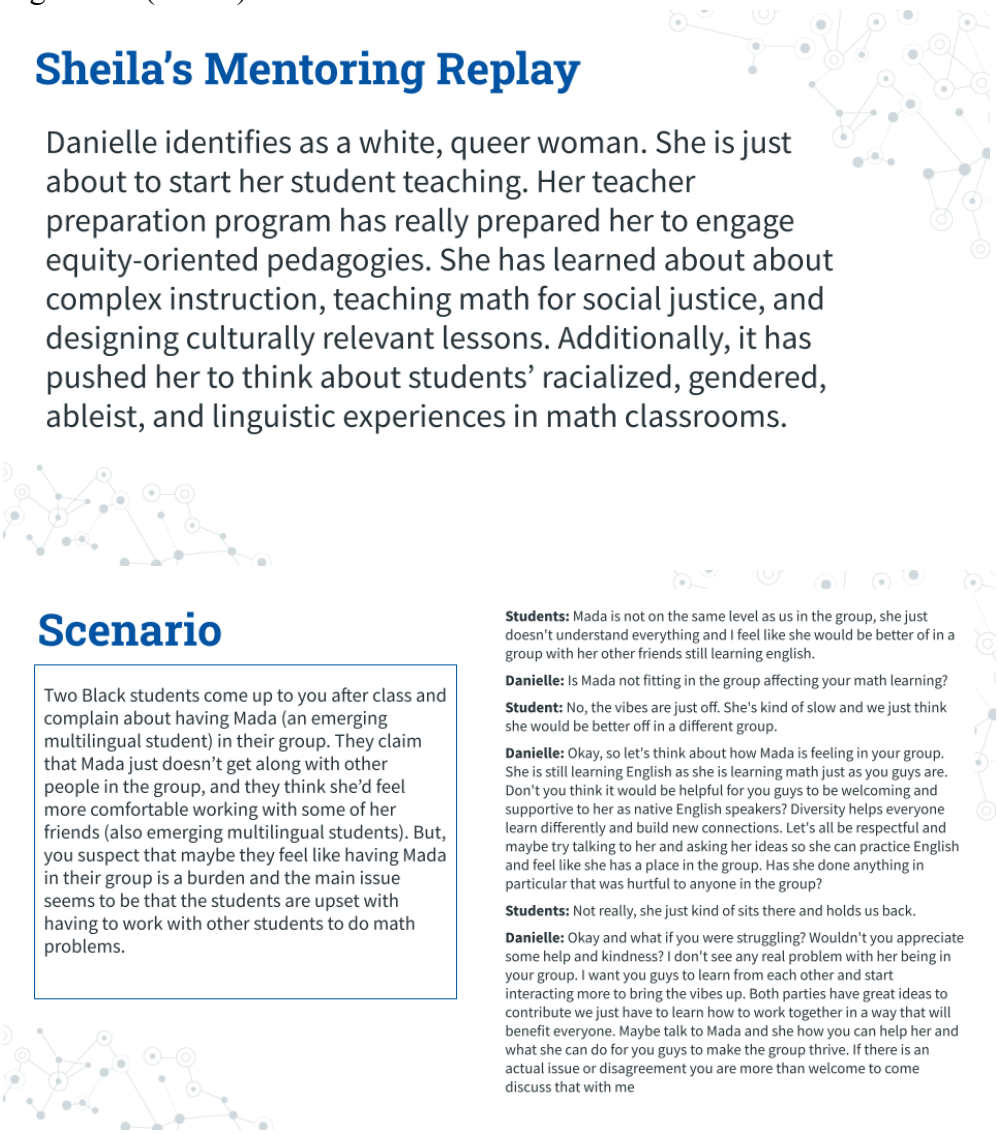
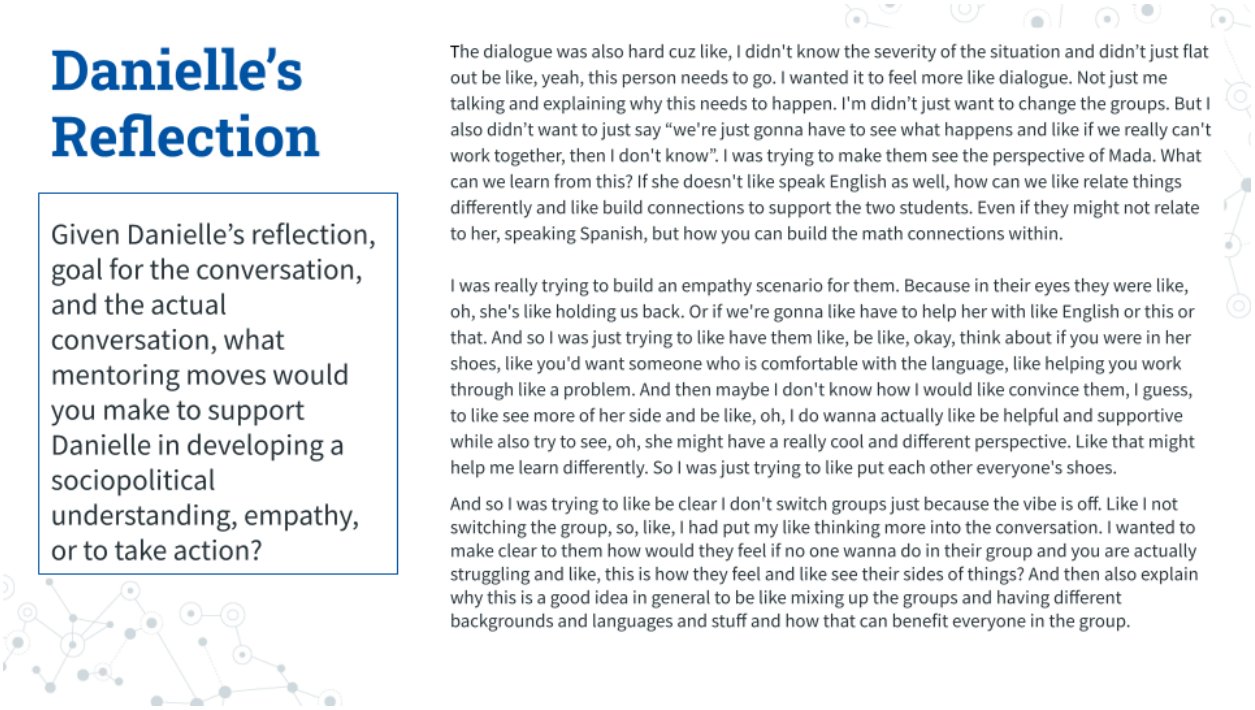


Figure F.1 (cont'd)



Figured F.1 (cont'd)

Figure F.1 (cont'd)



## APPENDIX G: MENTOR TEACHER REPLAY

Below are the directions provided for constructing a mentor teacher replay.

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### What is a Mentor Teacher Replay?

A mentor teacher replay is a narrative description of a classroom scene. It includes descriptions of what the mentor is doing, the student-teacher was doing, what the students were doing, what may have been happening in the background. Pieces of the conversation(s) may be incorporated. Interpretations of the scene are allowable; that is, it can include your thoughts and feelings about the event. In other words, it describes what was happening in the classroom, so that the reader of the replay can envision the classroom during those moments.

### How Do I Write a Mentor Teacher Replay?

Think of a mentoring situation where you have faced a dilemma, internal conflict, or tension related to supporting your student teacher in either understanding sociopolitical conditions, empathy, and/or taking action. Consider the following questions:

- How were you feeling?
- What were you doing? What was the student-teacher doing?
- What choice did you make at the moment? Were there other options you were considering? How would you respond next time (similarly or differently)?

Once you have thought of a moment, the following may be help for you to write a replay:

- Choose a relatively small piece of your mentoring (perhaps one conversation).
- Set the stage for the readers, letting them know information, such as when did it occur, what aspects of critical math consciousness were you attempting to support, what your overall goals were, background information that may help them understand your students, your student-teacher, your school.
- Write about the scene, including lots of description.
- As a guide to help you think about what size piece of instruction to look at, as well as how much detail to write, your Replay should probably be max 2 single spaced pages.

## APPENDIX H: INQUIRY SESSION 3

Below are the activities completed for inquiry session 3 - synchronous.

---

**Agenda**

| Time | Focus | Links |
|---|---|---|
| 1:00-1:05<br><br>5 min | Welcome (Introductions if needed)<br>Check In<br>- Access Needs<br>- How are we feeling?<br><br>Norms<br>- Step Up and Step Back<br>- Engage in ways you are able<br>- Assume Positive Intentions, but take Responsibility for Impact | |
| 1:05-2:20<br><br>75 Minutes | Looking across Teaching Replays | Mentor Teacher Replay Protocol |
| 2:20-2:25<br><br>5 min | Wrap Up<br>- Five word take away or "notable nugget" from today | |

**Protocol for Data Analysis**

# Data Analysis Protocol

Informed by the Atlas Protocol & Data Mining

Focusing question for this analysis:
*What are ways we have mentored our student teachers with a bend towards justice?*

**Mentor Teacher Replay 1: Sarah-**
https://docs.google.com/document/d/1N7_PwpdtAzwPgN9fOBWuuRtwoCRaj9ArT2JqaN4pE_s/edit

1. (3 min) **Providing context for data collection:**
   - Individually and quietly, read the background information provided by the teacher.
   - Appoint a timekeeper for the remaining parts of the protocol.

2. (5 min) **Examining the data:**
   - Participants silently examine the data source, making notes about aspects you particularly notice, with the focusing question in mind.

3. (5 min) **Describing the work via observations:** During this period the group gathers as much information as possible from the data.
    - The timekeeper asks the group *"What do you see?"*
    - Participants offer non-evaluative observations and describe what they see in the data and state where in the activity they see it (e.g., "On page 3, under Homework assignments…") They are careful not to provide any judgments or interpretations.

4. (5 min) **Interpreting data**: During this period, the group tries to make sense of what the data says and why.
    - The timekeeper asks the group
        - *What wonderings do you have about the data?*
    - Participants talk together about the partial or provisional answers that emerged from the data analysis related to the focus question. Think broadly and creatively. Assume that the data, no matter how confusing, makes sense to some people; your job is to see what they may see.
    - Here are some sentence starters that you can use to help you talk about your interpretations.
        - A pattern I notice in the data is that…, which makes me think…
        - I noticed that a lot ..., which leads me to think...
        - I noticed that …, suggesting that…
        - I believe that the data suggests...because...

**Mentor Teacher Replay 2:Nick - https://docs.google.com/document/d/1Bidbi3RkychKlV0LQ_8-j5tBCyXtyN6nVYbbF5ULzQY/edit**

1. (3 min) **Providing context for data collection:**
    - Individually and quietly, read the background information provided by the teacher.
    - Appoint a timekeeper for the remaining parts of the protocol.

2. (5 min) **Examining the data:**
    - Participants silently examine the data source, making notes about aspects you particularly notice, with the focusing question in mind.

3. (5 min) **Describing the work via observations:** During this period the group gathers as much information as possible from the data.
    - The timekeeper asks the group *"What do you see?"*
    - Participants offer non-evaluative observations and describe what they see in the data and state where in the activity they see it (e.g., "On page 3, under Homework assignments…") They are careful not to provide any judgments or interpretations.

4. (5 min) **Interpreting data**: During this period, the group tries to make sense of what the data says and why.
    - The timekeeper asks the group
        - *What wonderings do you have about the data?*
    - Participants talk together about the partial or provisional answers that emerged from the data analysis related to the focus question. Think broadly and creatively. Assume that the data, no matter how confusing, makes sense to some people; your job is to see what they may see.
    - Here are some sentence starters that you can use to help you talk about your interpretations.
        - A pattern I notice in the data is that…, which makes me think…
        - I noticed that a lot ..., which leads me to think...
        - I noticed that …, suggesting that…
        - I believe that the data suggests...because...

**Looking Across the Replays:**

5. (15 min) **Implications for teaching and learning**: The group talks together about what intersections are evident in the data set and what dissonances arise in the data.
    - Here are some questions that you can use to help you talk about your implications. The timekeeper asks the group:
        - *What are your current thoughts about our focusing question?*
        - *Did any new questions emerge?*
        - *What more would we want to find out to continue to pursue our question?*
        - *What steps could be taken next?*
        - *What does this conversation make you think about in terms of your own practice? About teaching and learning in general?*
    - Participants share thoughts they have about their own teaching, mentoring, or ways to support student teacher in understanding their practice.