

## ABSTRACT

Title of Dissertation: THIS IS THE REMIX: A MATH TEACHER'S REFLECTIVE JOURNEY THROUGH FINE-TUNING HER CULTURALLY RELEVANT TEACHING

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While many educational institutions have updated their strategic plans mandating culturally responsive teaching (CRT) or culturally relevant pedagogy (CRP), mathematics teachers are reluctant to embrace CRT/CRP, approaching the teaching and learning of mathematics from deficit paradigms that reflect the pedagogy of poverty. Culturally responsive mathematics teaching (CRMT) is necessary because it promises to promote meaningfulness for, accessibility to, and high levels of engagement with school mathematics for Black, Latinx, and other historically marginalized students. However, to date, there have been numerous theoretical arguments for, but few empirical examples of CRMT, and, as a result, many mathematics teachers are uncomfortable employing CRMT.

This qualitative case study examines how an experienced and highly regarded Black urban middle school mathematics teacher (Ms. Collier) understands the theoretical and empirical literature on CRP and how she changes her teaching during and after implementing a CRP curriculum unit with her Black and Latinx students. In the context of this study, I offer Ms.

Collier's journey of embracing CRMT by "remixing" her mindset as a mathematics teacher by reading and discussing CRP and CRMT literature and then remixing her curriculum and instruction in response to her "remixed" understandings. In sum, using frameworks such as Culturally Relevant Pedagogy, Culturally Responsive Mathematics Teaching, and Teacher Change Theory, I explored Ms. Collier's theory-to-practice applications of CRT.

The dissertation results are organized into two parts corresponding with different study phases. Part 1 focused on Ms. Collier's fine-tuned understanding of CRP, and Part 2 focused on Ms. Collier's perspectives on her experiences implementing CRMT with her Black and Latinx students. Data were collected from four sources: conversations, semi-structured interviews, written reflections, and memos. Key findings indicate that Ms. Collier was, in fact, a *Dreamkeeper*, understanding Ladson-Billings' foundational CRP tenets of Academic Achievement, Cultural Competence, and Critical Consciousness. Findings also crystallized two new tenets of CRP I advance that are present but not explicitly named in the literature: Classroom Domain and Teacher Mindset. In addition, salient themes demonstrating each domain of Teacher Change Theory emerged, with Ms. Collier experiencing a meaningful change in perspective: *It's about the curriculum AND who the person is.*

With this study, I challenge the idea of reducing CRP to a set of practices. My stance is that CRP is more so a process of *being* for the teacher because this body of work studies the more significant issue of mathematics education for Black and Latinx students. As a mathematics teacher who understands the many stereotypes and stigmas that Black and Latinx students face in the learning and doing of mathematics, Ms. Collier expressed a clear awareness of the impact that culturally relevant instructional and relational practices could have on her Black and Latinx students.

THIS IS THE REMIX: A MATH TEACHER'S REFLECTIVE JOURNEY THROUGH  
FINE-TUNING HER CULTURALLY RELEVANT TEACHING

by

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## **Dedication**

For Kingston and Karissa.

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## Chapter 1: Introduction

*“Remixing is vital to innovation in art, science, and pedagogy, and it is crucial that we are willing to remix what we created and/or inherited” (Ladson-Billings, 2014, p. 76).*

Ladson-Billings (2014) employs the term *remix* from hip-hop culture to describe her open invitation to transform her coined theoretical philosophy, “culturally relevant pedagogy” (CRP) (Ladson-Billings, 1995a, p. 465). In popular culture, the notion of remix involves altering an original version of a song to a revised version of a song. For example, a user’s entry on the [urbandictionary.com](http://urbandictionary.com) website describes remixing as reworking a song to create a new sound while retaining elements from the original song. Furthermore, according to Navas (2018), “[remix] describes the repurposing of something by being both action and object” (p.253).

A number of scholars and educators have responded to Ladson-Billings’ invitation to remix CRP based on their understandings and the contexts in which they work. Known reworkings such as Culturally Responsive Teaching (Gay, 2000), a Culturally Responsive Educator (Villegas & Lucas, 2007), Culturally Responsive Teaching and the Brain (Hammond, 2015), Reality Pedagogy (Emdin, 2016), and most recently, Culturally Sustaining Pedagogy (Paris & Alim, 2018), among others, have all emerged with noted distinctions from Ladson-Billings’ original work fashioning them as remixes of CRP.

In the context of this study, I offer a veteran mathematics teacher’s journey of remixing (verb) her pedagogy to produce a remixed (adjective) urban mathematics teacher mindset during the process of creating and teaching a remixed (adjective and noun) curriculum. I invite education stakeholders who read this study to remix the way we think about the mathematics teaching and learning practices that occur specifically in urban schools. I begin this process with a thought experiment on the importance of pedagogy. Shulman (1987) maintained that one can understand the *wisdom of practice* by observing what expert teachers demonstrate in the classroom while they are teaching + the thinking that underlies the pedagogical decisions that teachers make + the context in which teaching occurs. In this same vein, I propose to explore the wisdom of practice of an expert urban mathematics teacher as encapsulated in the similar expression: CRP + Teacher Reflection + Urban Math Classroom. Here, CRP refers to Ladson-Billings’ culturally relevant pedagogy, which I further defined in the literature review in Chapter 2. For ‘teacher reflection,’ I offer Valli’s (1997) description of teachers’ looking back on moments of teaching events; making judgments about them; and modifying teaching behaviors in light of craft, research, and ethical knowledge. Lastly, in the context of this paper, I use Milner’s (2012) framing of *urban emergent* to describe an urban school - the same characteristics and sometimes challenges as urban intensive schools (schools are those that are concentrated in large, metropolitan cities across the United States) and districts in terms of resources, qualification of teachers, and academic development of students with the amendment that urban math classrooms are “more than

just...mathematics spaces inhabited by people who are largely Black and/or Brown and poor” (Larnell & Bullock, 2015, p. 1289).

Following Ladson-Billings’ (1994) approach to studying culturally relevant teachers and teaching in general (i.e., irrespective of grade level and subject taught), this dissertation examines how a successful and highly-regarded teacher of African American children - a *Dreamkeeper* - a successful teacher of African American children, attempts to make her mathematics instruction more fully and explicitly culturally relevant. Moreover, through this dissertation study, I extend an answer to Ladson-Billings’ (2022) question: “How might a Dream-keeper remix their teaching to ensure they are serving all students well?” (p. xxxiii).

### **Problem in the Urban Mathematics Classroom**

Many authors (Berry et al., 2009; Howard, 2019; Milner & Howard, 2013) have argued that there is an urgent need for culturally relevant pedagogy in the United States, in particular, to combat the longstanding achievement gap between white and minority students in mathematics and other subjects. Although this argument is valid, for example, the 2019 National Assessment of Educational Progress (NAEP) report card for 8th-grade mathematics shows a 20% achievement gap between Black and white students proficient in mathematics (National Assessment of Educational Progress [NAEP], 2019), the need for CRP transcends the achievement gap. Culturally responsive mathematics teaching (CRMT) (Bonner & Adams, 2012) promises not only to improve test scores and close gaps but to improve historically marginalized students’ engagement with and experiences in learning

mathematics. This understanding is consistent with national calls to address equity issues in school mathematics. For example, the National Council of Teachers of Mathematics (NCTM) addresses issues of cultural relevance in their position statement (2014), describing access and equity in mathematics as “creating, supporting, and sustaining a culture of access and equity requires being responsive to students’ backgrounds, experiences, cultural perspectives, traditions, and knowledge when designing and implementing a mathematics program” (p. 1). However, teacher training and quality gaps (Milner, 2011) have contributed to an educational debt (Ladson-Billings, 2006) that directly impacts mathematics teaching and learning in urban schools, restricting the possibility of culturally responsive mathematics teaching.

My position is that culturally relevant pedagogy in the mathematics classroom, called Culturally Responsive Mathematics Teaching (CRMT) (Bonner & Adams, 2012), for the remainder of this document, is necessary to improve teaching and learning in urban schools and really any school with students from historically marginalized backgrounds.

Culturally responsive mathematics teaching (CRMT) is necessary because it promises to promote meaningfulness and accessibility for mathematics content for learners who, for too long, have been denied access to essential mathematics ideas. As detailed in Chapter 2, teachers who use CRMT strive to create a responsive classroom environment that raises historically marginalized students’ status, positioning, power, and achievement in the urban mathematics

classroom. Historically, there have been numerous theoretical arguments for, but not enough empirical examples of, CRMT. A result is that mathematics teachers are uncomfortable using CRMT or other culturally responsive approaches in mathematics (Siwatu, 2011). Hence, the field would benefit from additional empirical illustrations that show teachers centering their mathematics classrooms on the realities of students' racial, cultural, and community identities (Matthews, 2009). Furthermore, studies often highlight the attributes of CRMT but fail to examine teachers' lived experiences and perspectives on CRMT implementation.

### **Purpose of the Study and Research Questions**

This qualitative case study aims to examine how a Black middle school mathematics teacher (Ms. Collier) understands the theoretical and empirical literature on CRP and how she changes in practice and as a teacher having implemented CRP with her Black and Latinx students.

Brown et al. (2019) observe a lack of theory-to-practice research on CRP. Despite a significant amount of theoretical work on CRMT for students in urban and other racially diverse settings, there is very little empirical documentation of urban mathematics teachers, and in particular, those who are experienced or highly respected by the community, attempting to implement CRP or its' key tenets in their classrooms. The existing empirical literature has tended to focus more on preservice teachers; White et al., (2016) and White et al., (2020), illustrations of practice without knowledge of theory - Bonner (2009), accumulating knowledge of theory without illustrations of practice - Aguirre & del Rosario Zavala (2013) and Timmons-Brown

and Warners (2016), or students' perspectives of CRMT - Hobbs (2012) and Hubert (2013). Moreover, only a few empirical studies (see Howard, 2003) focus on teacher reflection. Furthermore, very few studies incorporate urban school teacher reflection or teacher change while incorporating CRP.

In this study, my teacher participant, Ms. Collier, is well-positioned to provide insight because her school community identifies her as a highly successful mathematics teacher for Black students - a Dreamkeeper. During the study, she was in her 16th year of teaching mathematics and had taught at various grade levels, elementary through high school, in various urban school settings. She also welcomed the opportunity to strategically reflect on her pedagogy in ways that would ultimately improve her teaching and her students' math performance.

Before the study, I observed Ms. Collier's mathematics instruction on multiple occasions. It was clear to me, and others (e.g., a fellow graduate student, my dissertation advisor) who observed her, that the teacher exhibited some of the characteristics of culturally competent teachers who work with Black and Latinx students and who implement certain instructional practices consistent with culturally relevant pedagogy (CRP) as described by Ladson-Billings (1995a; 1995b; 2014) and culturally responsive teaching (CRT) practices as described by Gay (2002, 2018). However, from my perspective as a researcher steeped in CRP and CRT theory, although I observed no lack of some core foundational principles exhibited when practicing CRP, Ms. Collier could not specifically name these aspects of her practice.

Based on the researcher's reflections, the following research questions emerged:

1. How does an experienced and highly-regarded Black mathematics teacher (Ms. Collier) understand theoretical and empirical implementations of culturally relevant pedagogy (CRP) within the research literature?
2. What change in practice and change as a mathematics teacher of Black and Latinx students does Ms. Collier experience while implementing CRP in her urban middle school mathematics classroom?

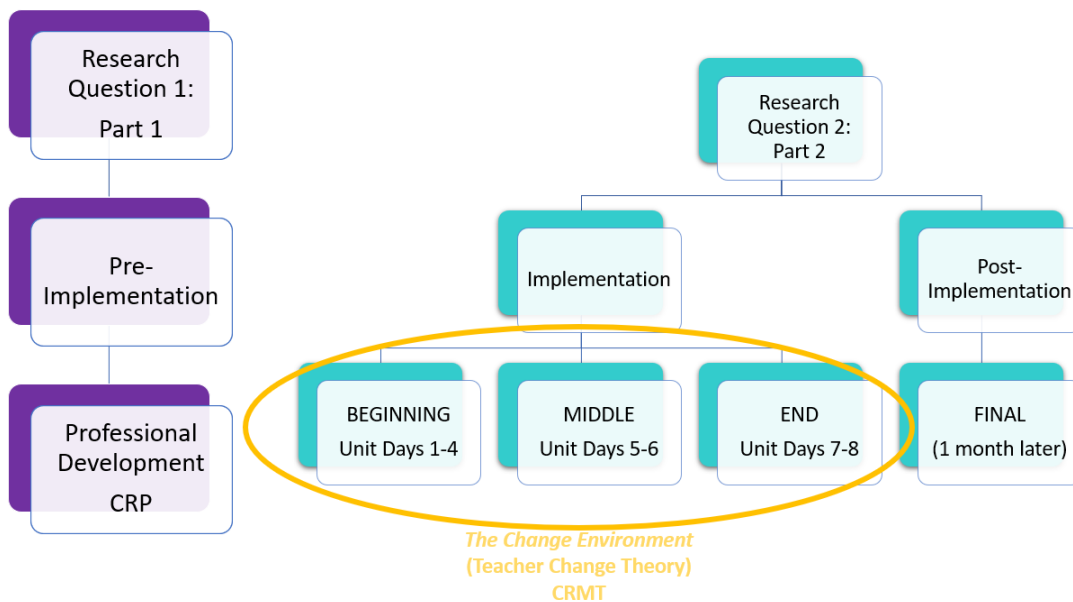
Since teaching mathematics for cultural relevance is a “complex enterprise,” Ms. Collier inspired me to study her practice and add to the conversation and literature on anti-racist pedagogies within the mathematics classroom (Leonard et al., 2010, p. 267). Furthermore, Ms. Collier's observed practice was consistent with certain CRP tenets. It mirrored the National Council of Teachers of Mathematics (NCTM) (2014) stance that teachers must be especially responsive to students' backgrounds, experiences, cultural perspectives, traditions, and knowledge. With this in mind, and since Ms. Collier is a mathematics teacher, it seemed appropriate to examine her practice concerning culturally responsive mathematics teaching (CRMT). Accordingly, CRP provides the theoretical underpinnings for Part 1 of this study, while CRMT (coupled with Teacher Change Theory) provides the theoretical lens for Part 2.

## Organization of Study with Theoretical Framing

This study is organized into two parts to answer each research question. Figure 1 depicts the organization of each part.

**Figure 1**

### *Organization of Study*

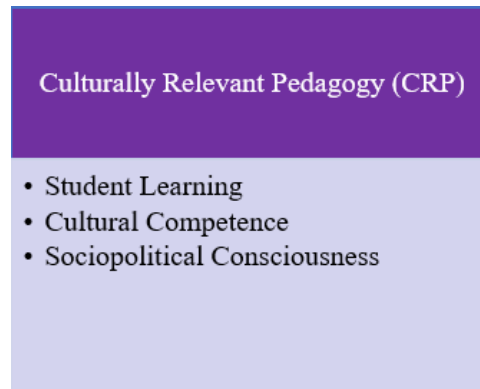


Part 1 focused on Ms. Collier’s understanding of CRP. This first part of the study was situated before Ms. Collier implemented CRP. At this time, I led Ms. Collier in a professional development (PD) covering some theoretical and empirical literature on CRP (for more detail, see Chapter 3). Concluding the PD, I sought to highlight the elements of Ms. Collier’s newly developed understanding (described as a shared vision of CRP between the researcher and the teacher) of CRP and its implications for her urban mathematics classroom. To explore this new understanding, I used the

three tenets of Ladson-Billings' CRP, as shown in Figure 2 and elaborated in Chapter 2.

**Figure 2**

*Part 1 Theoretical Framework: Culturally Relevant Pedagogy*

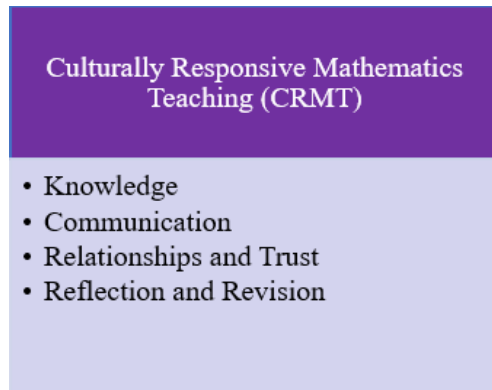


Part 2 of the study focused on Ms. Collier's perspectives on her experiences in implementing CRMT in her urban classroom. Data collection for the second part took place remotely via the Zoom platform due to occurring during the pandemic, which required a switch from in-person to remote learning. At this time, Ms. Collier implemented the 8-day unit plan she and I co-designed in alignment with our shared understanding of CRP and its implications for mathematics curriculum, instruction, and learning (discussed in Chapter 3). To examine Ms. Collier's perspectives on the implementation of CRP curriculum and instruction, I utilized Villegas and Lucas' (2002b) framework for *being* a culturally responsive mathematics teacher (CRMT) (Figure 3). Because Ms. Collier had not formally studied CRP and had not attempted to implement it prior to the study, I expected that her understanding, teaching, and teacher identity likely would change - be "remixed" - over the course of the

study. As such, I also drew on Teacher Change Theory (using The Change Environment as the theoretical lens) (Figure 4) to analyze her perspectives on these and related changes as she fine-tuned her curriculum, instruction, and teacher stance to be consistent with CRP tenets through a cyclical process of enactment and reflection (further explained in Chapter 2). Using these two frameworks, I chose both to create a comprehensive framing that helped explain how Ms. Collier interpreted new knowledge about teaching Black and Latinx students mathematics in an urban school.

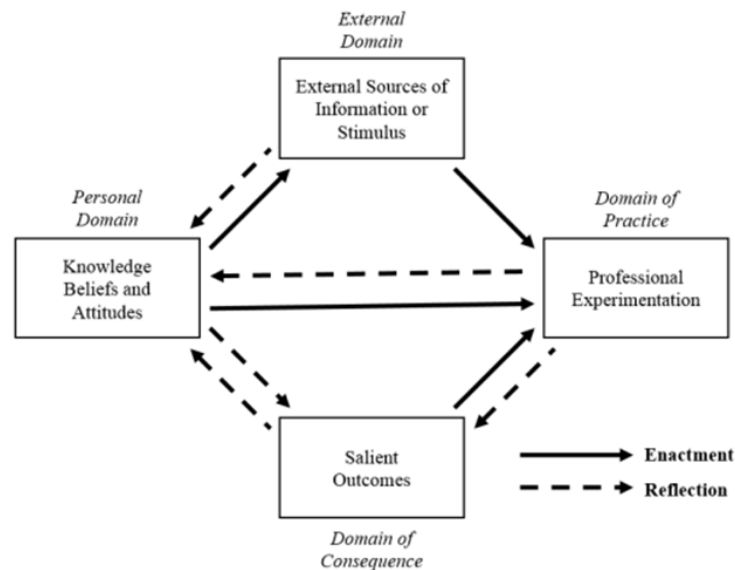
**Figure 3**

*Part 2 Theoretical Framework 1: Culturally Responsive Mathematics Teaching (CRMT)*



**Figure 4**

*Part 2 Theoretical Framework 2: The Change Environment: The Interconnected Model of Professional Growth*



*Note.* The Interconnected Model of Teacher Professional Growth. Adapted from “Elaborating a Model of Teacher Professional Growth,” by D. Clarke and H. Hollingsworth, 2002, *Teaching and Teacher Education*, 18, p. 951.

As described in Chapter 3, I employed a qualitative case study methodology to shed new light on Ms. Collier’s experiences moving CRP theory to practice in the urban mathematics classroom. I chose this research design because it would best position me to challenge the idea that CRP can be reduced to a set of practices. My stance is that it is more so a process of *being* for the teacher because this body of work studies the more significant issue of mathematics education for Black and Latinx students. In upcoming chapters, I offer a literature review that is relevant to

and has informed the research questions and a methodology for data collection and analysis.

## Chapter 2: Literature Review

While many educational institutions have updated their strategic plans mandating culturally responsive teaching (CRT) or culturally relevant pedagogy (CRP), mathematics teachers are reluctant to embrace CRT/CRP, with some approaching the teaching and learning of mathematics from deficit paradigms that reflect the pedagogy of poverty. Culturally responsive mathematics teaching (CRMT) is necessary because it promises to promote meaningfulness for, accessibility to, and high levels of engagement with school mathematics for Black, Latinx, and other historically marginalized students. However, to date, there have been numerous theoretical arguments for, but few empirical examples of CRMT, and, as a result, many mathematics teachers are uncomfortable employing CRMT.

This qualitative case study examines how an experienced and highly-regarded Black urban middle school mathematics teacher (Ms. Collier) understands the theoretical and empirical literature on CRP and how she changes her teaching during and after implementing a CRP curriculum unit with her Black and Latinx students. With this in mind, I also draw on teacher change theory - that is, in addition to CRP/CRMT theory to explain how Ms. Collier changes her teaching due to implementing CRP.

In this chapter, I present a literature review of this study's theories and the frameworks used to explore Ms. Collier's experiences and perspectives during her change process. This chapter is divided into three sections. The first section of this chapter corresponds to Part 1 of the study. Specifically, in that section, I present and

illustrate the three foundational tenets of CRP, which are the theoretical underpinnings for Part 1 of this study. The second section of this chapter correlates to Part 2 of the study. It explores the theoretical frameworks used to examine Ms. Collier's reflections on her practice during and after implementing a CRP curriculum unit that she developed. The frameworks presented and illustrated in this second section of the literature review are Culturally Responsive Mathematics Teaching (CRMT) and Teacher Change Theory. Being specific about applying CRP to mathematics, CRMT helps situate the study in the mathematics classroom. As the name suggests, Teacher Change Theory, and the Interconnected Model of Professional Growth (IMPG) of teacher change, provide a valuable framework for analyzing and describing Ms. Collier's change process as she implemented CRP in her mathematics classroom. Lastly, the third section of this literature review expounds on empirical literature evidencing *being* a culturally responsive teacher and *being* a Black mathematics teacher. I illustrate the characteristics of *being* while highlighting teaching practices associated with each found in the literature.

## **Section One: Theoretical Underpinnings**

### **Culturally Relevant Pedagogy**

Culturally relevant pedagogy is a pedagogical philosophy, outlook, or worldview toward teaching and learning. It is not a recipe or series of steps to be followed. It requires a change of perspective or transformation in thinking about learners, their communities, and their culture. It requires giving thought

to moment-to-moment decisions that all teachers make all day, every day.  
(Ladson-Billings & Dixson, 2021, p. 130)

A movement to teach racially and culturally diverse students more effectively occurred in response to the Civil Rights Movement and school desegregation in the 1960s and 1970s (Aronson & Laughter, 2016). From this, a distinct education intervention and research strand focusing on how teachers can effectively teach racially and culturally diverse students emerged: Culturally Relevant Pedagogy (CRP) (Ladson-Billings, 1994; 1995a; 1995b). This strand can be said to begin with Ladson-Billings (1994), who defined CRP as an approach to curriculum and instruction “that empowers students intellectually, socially, emotionally, and politically using cultural referents to impart knowledge, skills, and attitudes” (pp. 16 - 17). Ladson-Billings, being Black herself, was particularly concerned about developing and disseminating an empirically grounded understanding of what CRP could be specifically for Black students. However, her ideas are undoubtedly relevant to teaching students from other non-dominant and historically marginalized societal groups. Drawing on ethnographic observations of and interviews with highly-regarded teachers, Ladson-Billings (1994; 1995a; 1995b) theorized CRP as a way to move toward a pedagogical model that helps Black students accept and affirm their cultural identities and develops their capacity to ask critical questions about society and its inequities and advances their scholastic achievement. According to Ladson-Billings (1994; 1995a; 1995b), CRP has three core tenets: cultural competence, critical consciousness, and student learning (what she formerly called “academic

achievement” (Ladson-Billings, 1995, p. 475)). I describe each of these tenets in the three sections that follow.

### **Student Learning**

The first tenet of CRP is student learning, defined as “the intellectual growth that students experience as a result of classroom instruction and learning experiences” (Ladson-Billings, 2014, p. 74). Culturally relevant teachers demand and reinforce academic excellence in their students (Waddell, 2014), something that, given systemic racism that pervades US society, all too often is not demanded by teachers of Black and Brown students in US public schools. Culturally relevant teachers do this while valuing students’ skills and abilities as part of their curriculum and instruction; by scaffolding instruction and allowing students to build on the cultural and experiential funds of knowledge, they bring to school. About this, Ladson-Billings (2020) stated that “it is important to look at where students start from and where they end up -- student learning is really about where kids end up” (G. Ladson-Billings, personal communication, June 17, 2020). Consistent with this, Bonner (2014) suggested that culturally relevant teachers must hold high expectations for learning and behavior in such a way that diverse students begin to monitor their own learning and behavior as keys to learning and their academic success. Ladson-Billings also asserts that culturally responsive teaching should center on classroom community. That is, culturally relevant teachers encourage their students to become a community of learners rather than a collection of isolated, individual learners (Ladson-Billings, 1995a; 1995b). Ultimately, Ladson-Billings (1995a; 1995b)

observed that the key to developing academic success among Black and other historically marginalized students is getting them to determine that they want to succeed academically - even in spaces that have not always encouraged and allowed them to do so.

### **Cultural Competence**

The second tenet of CRP is cultural competence and deemed by Ladson-Billings (2020) as “the most misunderstood aspect of CRP” (G. Ladson-Billings, personal communication, June 17, 2020). Ladson-Billings (2014) defined cultural competence as “the ability to help students appreciate and celebrate their cultures of origin while gaining knowledge of and fluency in at least one other culture” (p. 75). Cultural competence “reflects the respect that [teachers] have for the culture, the customs, the language, and the traditions that students bring with them” to the classroom (G. Ladson-Billings, personal communication, June 17, 2020). Creating continuity between students’ home and school experiences forges a bridge where teachers can successfully use students’ cultures as an asset for learning (Villegas & Lucas, 2002b). Particularly, when including aspects of students’ culture in the mathematics curriculum (e.g., mathematics problems and tasks), students and teachers alike can build value in the culture of the local and classroom community (Leonard & Guha, 2001). Fluency in students’ culture (Paris & Alim, 2017) aids teachers in recontextualizing word problems for cultural competence (see (Brantlinger, 2022 for more on recontextualization). Moreover, when teachers

successfully embed culture into mathematics tasks, student engagement, and learning will likely be improved (Matthews et al., 2022).

### **Critical Consciousness**

The third tenet of culturally relevant pedagogy is critical consciousness, also called critical sociopolitical consciousness. Critical consciousness initiates when students ask, “how is what I’m learning in mathematics of any significance for the here and now?” (G. Ladson-Billings, personal communication, June 17, 2020). Ladson-Billings (1995a; 1995b) suggests that critical consciousness develops when students recognize and critique societal injustices and inequalities. Developing a position on injustice and inequality is essential for students because it will help them develop critical inquiry skills that they can use inside and outside of school. Consistent with this, Waddell (2014) asserts that critical consciousness involves uncovering biases and developing an eye to consider inequities with a critical or questioning point of view. Critical consciousness is also imperative because it helps students engage in problem-solving in their community and the broader world (Ladson-Billings, 1995a; 1995b). Ultimately, as part of a culturally responsive curriculum, students must develop the ability to take what they learn in school beyond the classroom's confines by using the knowledge and skills learned to identify, analyze, and solve real-world problems (Ladson-Billings, 2014).

## **Section Two: Framing of Part 2 of the Study**

### **Culturally Responsive Mathematics Teaching**

Ladson-Billings' (1995a, 1995b) original theory, coined *Culturally Relevant Pedagogy (CRP)*, and Gay's (2000) variation, coined *Culturally Responsive Teaching (CRT)*, both provide a theoretical foundation for relevant, responsive classroom teaching that values and incorporates student's culture and community assets. In addition, there have been various remixes (with various interpretations and implementations) of Ladson's CRP and Gay's CRT, including *Culturally Responsive Mathematics Teaching (CRMT)*.

CRMT is built on the basis that culture and mathematics learning are intertwined in that they are both transformed through everyday lived experiences and are shaped by those experiences. According to Bonner and Adams (2012), CRMT focuses on specific characteristics of mathematics instruction that inspire academic engagement and success for Black and Brown students. Although Bonner and Adams were not the first researchers to extend CRP or CRT to mathematics education, they were the first to define the following four cornerstones of CRMT: knowledge, communication, relationships/trust, and constant reflection and revision within a mathematics classroom context. In the following sections, I will describe the four cornerstones while citing relevant research examining school mathematics through the lens of CRP, CRT, or a closely related perspective.

## **Knowledge**

Bonner and Adams (2012) state that, for CRMT, a teacher needs to develop three types of knowledge. First, a culturally responsive mathematics teacher must have extensive knowledge of mathematics content and how to teach it (i.e., pedagogy). Although not writing about CRMT per se, Ball, Thames, and Phelps (2008) refer to the latter as *mathematical knowledge for teaching* (MKT)—the mathematical knowledge, skills, and habits of mind used to do the work of teaching. Second, a culturally responsive mathematics teacher must acquire knowledge of students, particularly cultural, cognitive, and linguistic resources that Black and non-white students bring to the classroom (Larkin, 1997; Orosco & O'Connor, 2011). Knowing students can also include learning about and understanding their extracurricular activities, unique interests, family makeup (e.g., family structure and siblings), or even their status as people (e.g., how they see themselves and are seen) and as students (i.e., their socially assigned perceived mathematics skill in the mathematics classroom) (Shah & Crespo, 2018; Ukpokodu, 2011; Wood et al., 2019). Lastly, knowing students should include knowledge of their school and local communities - and, as part of this, viewing students' families and communities as knowledgeable resources (Ladson-Billings, 1995). Berry (2005; 2008) and Martin (2006a) provide empirical examples of communities where Black parents were proactive participants in their children's mathematics learning. In this sense, it is beneficial for the teacher to know how families and local communities do and can support students' mathematics learning. According to Ladson-Billings (1995a), to be culturally relevant, teachers must maintain a robust knowledge of the

local community where they teach. Ultimately, mathematics teachers must know how to make meaningful connections between the three knowledge areas mentioned above (MKT, sociocultural, and local community) to effectively demonstrate CRMT (Enyedy & Mukhopadhyay, 2007; Rousseau Anderson, 2021).

### **Communication**

Communication is an essential aspect of culturally responsive mathematics teaching: teacher-to-student and student-to-student communication. According to Gay (2018), “communication cannot exist without culture, culture cannot be known without communication, and teaching and learning are more effective for ethnically diverse students when classroom communication is culturally responsive” (p. 89). In addition, Dray and Basler Wisneski (2011) note that “a person’s cultural frame of reference or cultural background, as well as life experiences, guides how a person responds to others” (p. 30). For example, the teacher participant in the Bonner and Adams (2012) study purposefully incorporated cultural connections into her mathematics lessons; she specifically described numbers as being in the same family to draw on students’ funds of knowledge and familiarity with the family unit. She also wove communication techniques such as everyday language throughout her pedagogical practices and allowed her students to use their vernacular(s). Consistent with Ladson-Billing’s emphasis on culturally relevant teaching and learning as being rooted in community, culturally responsive mathematics teachers also create opportunities for their students to communicate with each other by working in groups. As numerous studies have shown, this strategy offers an opportunity for

active engagement where students can communicate mathematics comprehension and consolidate their learning (Enyedy et al., 2011; Jackson, 2013; Quintos & Civil, 2008; Lipka et al., 2005; Rubel & Chu, 2012), especially when paired with culturally relevant and cognitively demanding mathematics tasks (Matthews et al., 2013).

### **Relationships/Trust**

Positive teacher-student and student-student relationships are essential to the academic success of Black and other diverse learners (Milner, 2014). Culturally responsive teachers often exhibit a “warm demander” pedagogy which is described as those who combine “personal warmth” and “active demandingness” in the classroom (Kleinfeld, 1975, p. 326). Within these relationships, teachers make intellectual demands of their students that stem from the teacher’s care for the students (Irvine, 2003; Kleinfeld, 1975; Milner, 2006; Ware, 2006). For example, Bonner and Adams (2012) noted that their teacher participant built relationships with their students by generating student empowerment, mathematical success, confidence in racial and cultural identity, and commitment to learning and showcasing mathematics knowledge. Researchers such as Hubert (2013; 2014) and Brand et al. (2006) concurred, suggesting that, as part of CRMT, meaningful student-teacher relationships positively impact students' levels of mathematical performance and classroom participation. Hubert (2014) also noted that effective communication, as stated prior, strengthens trust in student-teacher relationships.

## **Reflection and Revision**

Teacher reflection and revision of their instructional practice and the learning environment they create are essential to CRMT. Although not concerned with mathematics teaching per se, Howard (2003) noted that “reflection gives attention to one’s experiences and behaviors, and meanings are made and interpreted from them to inform future decision-making” (p. 197). He contended that culturally responsive teachers, inclusive of mathematics teachers, develop their critical consciousness as a critical reflection on society and societal institutions. He urged educators to dismantle issues of inequity and injustice by reflecting with a moral, political, and ethical compass. Consistent with Howard (2003), Bonner (2021) suggested that, as part of CRMT, teachers apply a critical lens to reflect on curricular content in the context of power relationships, status, and students' access to learning.

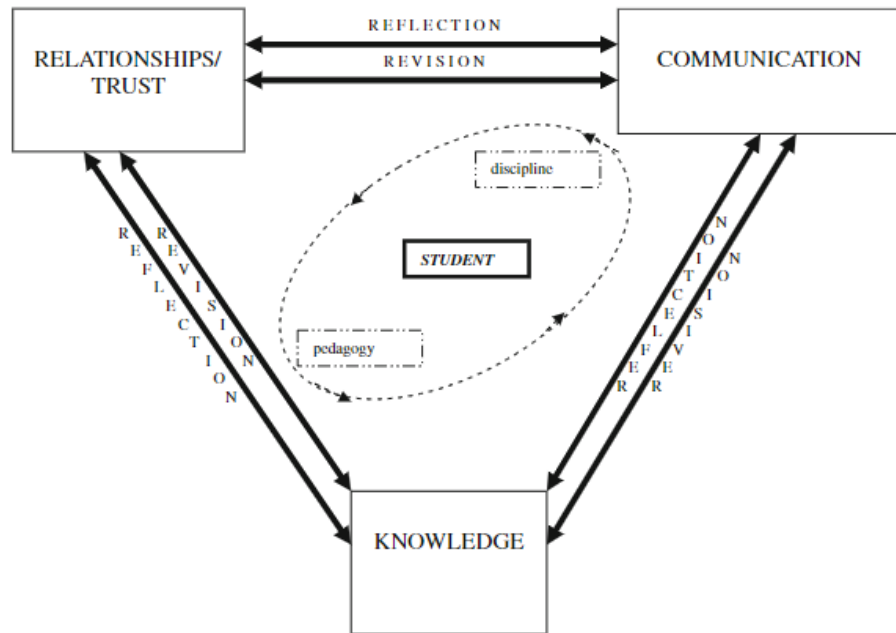
## **Connections Between the Four CRMT Cornerstones**

In Bonner and Adams’ (2012) graphic representation of CRMT (shown below in Figure 5), reflection and revision work between and within each cornerstone of CRMT (i.e., knowledge, communication, relationships/trust, and constant reflection and revision), creating an intimate interconnection. Bonner and Adams (2012) noted that reflection and revision could occur “moment to moment” amid teaching (p. 33) as well as long-term (p. 34). In both cases, a CRMT may reflect on their instruction and students’ classroom experiences, evaluating what worked and what they could improve upon within one class and across all their classes (Bonner,

2021). Ultimately, “reflection is personal,” and a CRMT develops it concerning the cultural congruency of their students over time (Bonner, 2021, p. 13).

**Figure 5**

*Culturally Relevant Mathematics Teaching Graphic Representation* (Bonner & Adams, 2012).



**Teacher Change Theory**

Teacher learning occurs within a complex system that can be described as an ongoing, multidirectional event; it is a process of change (Davis & Simmt, 2007). As mentioned in Chapter 1, based on preliminary observations that I and others made, Ms. Collier exhibited multiple teaching practices consistent with culturally relevant pedagogy described by Ladson-Billings and others. However, she had no prior knowledge of the theory. Teacher change theory posits that, as teachers learn theory

for translation into pedagogical knowledge and practice, they develop and change as educators. Avenues for teacher change often appear in school-based professional development (PD). Teacher change theory provided another lens (in addition to the CRP and CRMT frameworks outlined above) from which to explore the change in practice and changes that Ms. Collier might experience throughout this study, in particular, through her participation in an individualized PD in which she read and discussed CRP and CRMT literature with me and then through her reflections on her teaching of a mathematics curriculum unit that she developed in response to what she learned in that PD.

In response to an ongoing failure of efforts to change teachers' behaviors, Guskey created an early theoretical model of teacher change (1985, 1986, 2002). Guskey's (1986) model suggested that PD activities lead to classroom practice changes, resulting in changes in teachers' knowledge and beliefs. Although it is often assumed that PD leads to changed teaching practice by first changing teachers' understandings and attitudes, Guskey's model is different; according to Guskey, PD occurs first, then a change in a teacher's classroom practice. Next, a change in student learning outcomes occurs, and then a teacher's beliefs and attitudes change. Guskey's (1986) model posits that meaningful and lasting teacher change only occurs through their reflections on student achievement and the practices that the teacher believes lead to improvement.

The drawback of Guskey's (1986) model is that it is too linear and simplistic, implying that teacher change results directly from or after they participated in PD. To

address this shortcoming, Clarke and Hollingsworth (2002) provided an alternative model that infers that teacher change instead results from an iterative and cyclical process. Their model named the Interconnected Model of Professional Growth (IMPG) (see Chapter 1, Figure 4), includes PD activities as a focus and shows possible pathways for teachers' pedagogical knowledge to grow. IMPG is grounded in the idea that teacher change occurs through a mediating process of "reflection" and "enactment" between and within four domains of a teacher's world: the Personal Domain, the Domain of Practice, the Domain of Consequence, and the External Domain (Hollingsworth & Clarke, 2002, p. 950).

The four domains of the IMPG illustrate a cyclical process of change. The *domain of practice* is where professional experimentation of a new instructional approach occurs. The *domain of consequence* consists of salient outcomes inferred from the professional experimentation domain. The *personal domain* includes any changes in knowledge, beliefs, and attitudes associated with professional experimentation. Lastly, the *external domain* represents the sources of information, stimulus, or support that propel professional experimentation.

The four domains of Clarke and Hollingsworth's model, personal, practice, consequence, and external, mirror Guskey's domains, but the importance and impact of reflection, and the nonlinear and bi-directional movement throughout the model, provide a more complex but realistic theory of change (Magee, 2021). Moreover, because of its non-linear nature, the IMPG acknowledges professional growth as an

inevitable and continuing process of learning, which distinguishes this model from others identified in the research literature.

Clarke and Hollingsworth (2002) suggest that researchers and evaluators use the IMPG as an analytical, predictive, or interrogatory tool. For example, some mathematics educators have used the IMPG model to study mathematics teacher change. For example, Witterholt, Goedhart, Suhre, and van Streun (2012) used it to study the development of a mathematics teacher tasked with redesigning lessons. They applied “cycles of change” from the model to describe the teacher’s professional development (p. 661). As a second example, Clarke, Hollingsworth, and Gorur (2013) used the IMPG to analyze changes in mathematics teachers’ knowledge in a study in which video-based PD catalyzed teacher change. In their study, video recordings of lessons served as external sources of reflection for the teachers, which allowed the researchers to explore teacher change.

In a more recent example, Willingham (2016) explored how professional development experiences influenced the characteristics of a veteran elementary mathematics teacher’s growth mindset. Willingham utilized the IMPG model to offer evidence of the teacher’s growth mindset as a mediator of domains represented in Clarke and Hollingsworth’s change environment. However, the potential of IMPG as a theoretical framework is not known for professional knowledge growth in culturally relevant pedagogy or culturally responsive teaching, as a thorough literature review suggests that no prior study has attended to this.

Bonner and Adams' framework for CRMT and Clarke and Hollingsworth's IMPG to explore Teacher Change Theory share a common thread of reflection. Both models illustrate an interconnected relational environment where teachers implement practice(s) and immediately begin a process of reflection (Bonner, 2010, p. 39). Furthermore, as this study examined a mathematics teacher's culturally responsive teaching practices, it was important that Ms. Collier reflect before, during, and after she implemented CRP. Through her reflections, her practice would be examined through the empirical lens of being a culturally responsive teacher.

### **Section 3: Empirical Evidence of Being**

In this section, I discuss Villegas and Lucas' (2002b) framework for *being* a culturally responsive teacher. Ladson-Billings' theory of CRP is essentially student-focused, with tenets of student learning and critical consciousness. Yet, Villegas and Lucas provide a teacher-focused framework derived from their empirical and conceptual literature review, observations in culturally and linguistically diverse classrooms, and their work with preservice teachers. Villegas and Lucas (2002b) say more about what teachers should do to be culturally responsive.

#### **Being a Culturally Responsive Teacher**

Ladson-Billings recognized the need for a theoretical perspective on the relationship between culture and teaching that was collective in its commitment to empowering Black students. As a result, scholars have introduced frameworks for culturally responsive teaching (Gay, 2000; 2010; 2018; Villegas & Lucas, 2002b), outlining the essential elements. For this research, I used Villegas and Lucas's

(2002b) framework for conceptualizing what it means to be a culturally responsive teacher. This framework guided Part 2 of the study. (Their framework was intended for all teachers but, in the context of this dissertation, used to frame a mathematics teacher.)

Villegas and Lucas (2002b) grounded their work of preparing pre-service teachers for “culturally and linguistically diverse students” in culturally relevant pedagogy in the mathematics classroom (p. 21). Unlike Ladson-Billings’ empirical research, Villegas and Lucas (2002b) conducted a comprehensive literature review. They highlighted theoretical and empirical research, which affirmed that the culture, beliefs, and experiences of students from non-dominant backgrounds have a place in the classroom. This should challenge teachers to rethink the curriculum, inclusive of the mathematics curriculum. Villegas and Lucas (2002a; 2002b) understood that teachers who draw on students’ cultural and lived experiences as part of instruction better support their knowledge construction, learning, and engagement.

Advocating for using a culturally responsive lens to reconceptualize curriculum, Villegas and Lucas (2002a; 2002b) also recognized that more than changing the curriculum would be needed to ensure culturally responsive teaching. Consequently, they aimed to provide a framework with six strands for a vision of the culturally responsive teacher. These six tenets frame Villegas and Lucas’s (2002a; 2002b) theory and align with the intentions of the research and outline the dispositions, knowledge, and skills that culturally responsive teachers

should possess. The following six sections will review each tenet through the lens of this research study.

### **Being Socioculturally Consciousness**

A culturally responsive teacher embodies a sociocultural consciousness. Sociocultural consciousness begins with an awareness that one's worldview is shaped by one's life experiences (Villegas & Lucas, 2002a). Having this consciousness comes with an understanding that the way people think, behave, and learn are all profoundly influenced by factors such as race/ethnicity, social class, and language (Villegas & Lucas, 2002b). Sociocultural consciousness further entails an understanding that American society is stratified with variance in social status and power along racial/ethnic, social class, and gender lines, which produces and perpetuates social inequality (Villegas & Lucas, 2002b). A culturally responsive teacher understands that schools have never functioned as equalizers in American society and utilize curriculum, pedagogy, and evaluation practices that privilege upper-class White students and legitimize the connection between social and education inequities (Villegas & Lucas, 2002a; 2002b; 2007). By better understanding sociopolitical consciousness, they better position themselves to understand and respond to culturally diverse students (Villegas & Lucas, 2002b).

### **Has Affirming Views of Students from Culturally Diverse Backgrounds**

A culturally responsive teacher expresses an affirming attitude towards diversity and students who differ from the dominant culture (Villegas & Lucas, 2002a; 2002b; 2007). They recognize student differences and, as part of this,

acknowledge the plurality of ways that students think, talk, behave, value, and learn (Delpit, 1995; Villegas & Lucas, 2002a; 2002b; 2007). While maintaining faith in students' academic ability, affirming and culturally responsive teachers position themselves to add to, rather than replace, what students bring to learning in the classroom (Villegas & Lucas, 2002b; 2007). Teachers' affirming attitudes shape their expectations for their students (e.g., learning and student behavior) and for themselves (holding oneself accountable for what students learn and their treatment of students) (Villegas & Lucas, 2002b). Having an affirming attitude also lends to confidence in exposing students to a rigorous curriculum, teaching students strategies used to monitor one's learning, setting high-performance expectations for students and consistently holding them accountable, encouraging students to excel, and actively building on the unique and cultural resources they bring to school (Villegas & Lucas, 2002b; 2007).

### **Sees Oneself as an Agent of Change**

The third strand of Villegas and Lucas' (2002b) framework challenges teachers to position themselves as change agents in and beyond the classroom. In this research, "change agent" refers to seeing oneself as both responsible for and capable of bringing about educational change that will make schools more responsive to all students (Villegas & Lucas, 2002b, p. 21). Teachers who are change agents know the need for social and educational change and desire to be a part of the change (Villegas & Lucas, 2002a). While culturally responsive teachers are cognizant that schools generally serve to maintain social inequalities, they possess the commitment, skills,

and faith that schools can bring about social transformation (Villegas & Lucas, 2002b). They develop their vision for teaching and education and use it to drive their passion for making a difference in students' lives (Villegas & Lucas, 2002b). Culturally responsive teachers emphasize the moral dimension of education; they serve as educational advocates and seek equity for their students whom schools have traditionally marginalized, ultimately seeing themselves as the intervention that schools need (Villegas & Lucas, 2002a; 2007).

### **Constructivist Views of Learning**

Culturally responsive teachers ground their teaching in the constructivist view of learning (Villegas & Lucas, 2002b). They understand that students generate meaning and new ideas in school based on their prior knowledge, beliefs, and experiences outside of school (Villegas & Lucas, 2002b; 2007). Therefore, culturally responsive teachers support students' learning through bridge-building between school and home (Moll, Amanti, Neff, & Gonzalez, 1992; Villegas & Lucas, 2002b; 2007). Constructivist views of learning also include viewing all students as active, capable learners, considering how students think and speak as classroom resources, promoting collaboration between students while recognizing multiple perspectives and promoting critical thinking and problem-solving in the classroom (Villegas & Lucas, 2002b).

### **Knows About the Lives of Students**

The fifth tenet of Villegas and Lucas' (2002a; 2002b; 2007) framework for culturally responsive teaching insists that teachers know their subject matter and try

to know their students as members of particular communities and as individuals. Knowing who students are is essential in teaching in engaging ways, building bridges between students' preexisting knowledge and experiences and the new material they are expected to learn in the classroom (Villegas & Lucas, 2002b; 2007). This knowledge encompasses students' cultural heritage, family and community lives, hobbies, favorite activities, interests, concerns, strengths, and past learning experiences (Ladson-Billings, 1994). Highly knowledgeable teachers must be able to use what they know about their students' lived experiences, especially in ways that do not link to stereotypical beliefs about cultural and social groups (Villegas & Lucas, 2002b; 2007). This is the foundation for culturally responsive teachers building meaningful relationships with their students, which contribute to learning and teaching and often produce favorable academic results (Gay, 2000; Irvine & Armento, 2001; Ladson-Billings, 1994; 2009; Villegas & Lucas, 2002b; The culturally responsive teacher, 2007).

### **Culturally Responsive Teaching Practices**

Villegas and Lucas (2002a; 2002b; 2007) offer multiple examples of culturally responsive teaching practices: involving *all* students in the construction of knowledge, building on student's personal and cultural strengths, using varied assessment practices that promote learning, and making the culture of the classroom inclusive of all students (Villegas & Lucas, 2002b). Nevertheless, they want to clarify that this framework for being a culturally responsive teacher is not simply technical and about applying instructional techniques, nor is it primarily a matter of

tailoring instruction to incorporate students' cultural characteristics (Villegas & Lucas, 2002b). Culturally responsive teachers represent the tenets mentioned that extend beyond the technical to humanizing qualities of caring and standing up for social justice issues. They have a high degree of sociocultural consciousness, hold affirming views of often marginalized students with diverse backgrounds, position themselves as change agents, understand and embrace constructivist views of learning and teaching, and know their students in their classes (Villegas & Lucas, 2002b). Combining all these dispositions, knowledge, and skills empowers them to design instruction that facilitates learning for Black and Brown students (Villegas & Lucas, 2002b).

In summary, this literature review covered several key characteristics of culturally responsive mathematics teaching that lend to the possibility of the theory being more than a set of practices teachers follow. These characteristics align with Ladson-Billings' (1995) foundational theory of culturally relevant pedagogy and are also embedded in existing research on the teaching practices of Black teachers.

### **Black Mathematics Teachers**

Black mathematics teachers have unique cultural knowledge that informs their instructional practices and dispositions toward teaching mathematics (Frank et al., 2018). While this study centers on Ms. Collier's empirical theory to practice implementation of culturally relevant pedagogy in the urban mathematics classroom, it is also necessary to acknowledge Ms. Collier's positioning as a Black mathematics teacher. Ms. Collier's race and culture impact her mathematics teaching

practice. According to Clark et al. (2009), teachers of color experience teaching mathematics differently than their White professional counterparts. Although there is a limited body of research saluting the assets that Black mathematics teachers bring to the classroom, recently, researchers such as Buli (2022), Frank et al. (2018), and Frank et al. (2019) have sought to highlight Black mathematics teachers' lived experiences. This section will discuss the empirical examples of in-service and retired Black mathematics teachers as presented by Frank et al. (2018) and Frank et al. (2019), and Chapter 6 will discuss findings in the research literature noted by Buli (2022) that directly connect to this study.

Teaching mathematics for cultural relevance is complex (Leonard et al., 2010). The resources drawn upon by Black teachers are also complex in that Black teachers offer unique perspectives on the teaching and learning of mathematics (Frank et al., 2018). Frank et al. (2019) interviewed 13 retired Black mathematics teachers who shared oral stories totaling over 40 years of teaching experience. Themes described as “Dreamkeeper codes” revealed instructional methods such as eliciting student competence, instructional scaffolding, creating an environment focused on instruction, and having deep knowledge of mathematics content and students emerged (Frank et al., 2019, p. 1572). Themes reflecting the African American Pedagogical Excellence (AAPE) framework revealed that retired Black mathematics teachers experienced institutional racism, interpersonal microaggressions, racialized teacher professional development, and mentoring orchestrated within interdependent learning communities whose eye were on the collective success of Black mathematics teachers (Frank et al., 2019).

In response to the AAPE themes, Black mathematics teachers persisted in showing students an ethic of care and continuing to set high intellectual expectations for their students. Frank et al. (2018) interviewed multiple in-service Black mathematics teachers who also described how they exhibited care in the classroom. Caring was expressed through a sense of kinship with their students, where Black mathematics teachers positioned themselves as surrogate parents of their students, referred to as othermothering (Frank et al., 2018). With kinship ties and care varying based on teachers' personal histories, they were often expressed through tough love and demanding high expectations in their mathematics classrooms (Frank et al., 2018).

### **Chapter Summary**

Howard and Milner (2021) implore that teachers understand their students' racial and cultural backgrounds, especially when teaching in urban schools. Valuing student culture is particularly needed in mathematics classrooms where Black and Latinx students are the majority. Bonner (2014) laid the foundation for culturally responsive mathematics teaching, while Villegas and Lucas (2002b; 2007) offer a framework for infusing attention to diversity in the classroom. This literature review offers multiple empirical examples of ways of *being* culturally responsive in the mathematics classroom with Black and Latinx students and offers Teacher Change Theory as a valuable framework for evaluating practice. In the next chapter, I offer a methodology for examining Ms. Collier's understanding of theoretical and empirical literature on CRP while using Teacher Change Theory to investigate her experiences

implementing CRP in her urban mathematics classroom with her Black and Latinx students.

### **Chapter 3: Research Design and Methodology**

The purpose of this qualitative case study was to examine how an experienced, Black middle school mathematics teacher understood the theoretical and empirical literature on culturally relevant pedagogy (CRP) and how she drew on those understandings to implement CRP in a racially diverse urban middle school mathematics classroom - that is, her experiences as she fine-tuned her mathematics instruction to make it more fully and explicitly culturally relevant to her Black and Latinx students. Brown et al.'s (2019) research unpacked elementary STEM teachers' knowledge and practices while implementing CRP, highlighting an effective application of CRP. Similarly, this qualitative case study was designed to highlight a theory-to-practice application of CRP in the urban school mathematics classroom but from the implementing teacher's perspective.

A qualitative case study methodology was employed to investigate the teacher's experiences while implementing CRP from her perspective as she narrated it in conversations with the researcher. Qualitative research emphasizes "thick" descriptions and interpretations incorporating the insider's perspectives on lived experiences (Creswell & Miller, 2000, p. 128). Qualitative research also helps to "make sense of actions, narratives, and the ways in which they intersect" (Glesne, 2011, p. 1). Said conversations were designed to obtain information to address the following research questions:

1. How does an experienced and highly-regarded Black mathematics teacher (Ms. Collier) understand theoretical and empirical

implementations of culturally relevant pedagogy (CRP) within the research literature?

2. What change in practice and change as a mathematics teacher of Black and Latinx students does Ms. Collier experience while implementing CRP in her urban middle school mathematics classroom?

Chapter 3 details the research methodology used in this study. It begins with describing the study design and then provides insight into the researcher's positionality. This is followed by an overview of the research context, including descriptions of the district and school, Ms. Collier, and her students (although not direct study participants). Next is a timeline of the research study. The chapter then addresses the types of data collected and the instruments and procedures used, organized by the study part (Part 1 and Part 2 - detailed in Chapter 1). In between each study part is a brief description of how the researcher and the teacher participant negotiated the unit plan for CRP implementation. Lastly, a discussion on the analysis of data sources is organized by study part, again, Part 1 and Part 2. Finally, the processes used to analyze the data to address the study's research questions are put forward and organized by the study part.

### **Case Study**

The process of moving from theory to practice, particularly for culturally relevant teaching, is a present issue for practitioners (Howard & Rodriguez-Minkoff, 2017). Case study research involves the study of phenomena such as these. Yin (2014) defines a case study as a bounded inquiry that “investigates a contemporary

phenomenon (the ‘case’) in depth and within its real-world context” (p.

16). According to Creswell (2013), case study research occurs when “a problem or issue needs to be explored” and when “a complex deep understanding of the issue” is necessary to move research forward (p. 47-48). The urban mathematics classroom represents the bounded context in which the study takes place – the phenomenon (Merriam, 1998).

### **Researcher Positionality**

Like Ms. Collier, I am a Black female who mainly taught Black and Latinx students in the same school district. In this sense, I am, in many ways, an insider. A researcher with a different background and experience likely would have a different relationship with the teacher. Such a researcher might have taken the study - a participatory study in which the researcher plays an active role in dialoguing and planning with the teacher - in a different direction. Even if they had not, they likely would have seen different things in the data and reached somewhat different - if not very different - conclusions. Such is the nature of qualitative research in social settings. Therefore, given my cultural background and history as a mathematics educator in urban schools, I recognize my positionality in this study, established relationship with the participant, and existing knowledge of CRP as an insight rather than a limitation. Additionally, the researcher is considered a key instrument in qualitative data collection (Creswell, 2012).

## **Research Context**

### **District and School**

This study was conducted in a large urban city in the Mid-Atlantic region of the United States. The city's education system comprises public and independently governed public charter schools. The researcher chose this school district because of its large culturally diverse student population and because the researcher is familiar with it, having taught in multiple schools under its public-school-system umbrella. Therefore, the school chosen for this study is under the public charter school umbrella of the city's school system. In the remainder of this document, I use the pseudonym Hummingbird Academy to refer to the participating school.

Hummingbird Academy (HA PCS) is one of the city's largest and oldest charter schools. HA PCS is considered a Title 1 school because 40% or more students qualify for free or reduced lunch. HA PCS funds initiatives to improve student reading and mathematics achievement with Title 1 funding. The school has a grade span of pre-kindergarten three (PK3) through 8<sup>th</sup> grade. At the time of this study, HA PCS had an enrollment of over 350 students representing numerous ethnicities, including Black Non-Hispanic, Hispanic/Latino, Multiracial, White Non-Hispanic, Native American/Alaska Native, and Asian. Many students were categorized as English Language Learners, At-Risk Populations, Economically Disadvantaged students, and having a learning or behavioral disability, among other classifications.

According to its mission statement, HA PCS prides itself on providing rigorous academic instruction and developing strong family relationships to empower students' readiness for college. For the first time in the 2018-2019 school year, HA PCS received a Tier 1 performance score ranking as one of the highest-ranked public charter schools within the district. The district bases this rank (with levels 1-3, with one being the highest) on four categories of performance: student progress, student achievement, future education success, and even school environment, including attendance and re-enrollment rates measuring family satisfaction with the school.

## **Participants**

### *Teacher*

I contacted Ms. Collier (pseudonym), a Black female mathematics teacher, to be the teacher participant in this research study. She and I were mathematics majors and secondary education minors at a historically Black college university (HBCU). We took several teacher education and mathematics courses together and worked at the HBCU's middle school (as a teacher and intern) in the last year of our degree program. In addition, we were trained by well-known educational researchers at the HBCU and simultaneously completed a student teaching internship in the research city's public school system. Due to our similar educational backgrounds and shared love for mathematics, I chose Ms. Collier to participate in this research study.

Ms. Collier was in her 16th year of teaching mathematics in the study year (2020-21). At that point in her teaching career, she had taught at all three grade levels, elementary, middle, and high school, for five, four, and seven years,

respectively. In addition, Ms. Collier taught eighth - and sixth/seventh-grade honors mathematics in the study year. As she clarified in pilot study interviews, Ms. Collier had been a lead teacher of record and co-teacher, with class sizes ranging from ten to thirty students. She often incorporated music, technology, business, and English into mathematics lessons to make them more engaging for her students. Ms. Collier also reported utilizing differentiated instruction, cooperative learning, and peer feedback to improve her lessons. Ms. Collier also developed a mathematics curriculum that aligned with the Common Core State Standards. As an indicator of her expertise and respected-ness, she led mathematics departments at multiple schools to improve the instructional practices of her teacher colleagues. In her current school, she worked closely with the administration to do so.

Ms. Collier entered the research study with a solid foundation to build on as she demonstrated cultural competence in interactions with her Black and Latinx students and an initial intuitive awareness of culturally relevant pedagogy. During the pilot study, I observed, as did others (e.g., dissertation advisor, fellow graduate student), occurrences of Ms. Collier that aligned with the principles of culturally relevant pedagogy (CRP), namely, student learning and cultural competence.

I observed Ms. Collier attend to students' academic needs exhibiting the *student learning* tenet of CRP. While she taught, I watched her call on students and invite them to share their answers aloud with their peers. If Ms. Collier called on a student who was hesitant to share or uncertain of their answers, she would question that student in a way that affirmed the student and helped them arrive at the correct

answer with understanding. She empowered her students to take ownership of their mathematics learning by verbalizing academic and behavioral expectations. These characteristics of practice were very reminiscent of CRP.

Ms. Collier also displayed cultural competence in her interactions with students and others in her classroom and school settings. I observed a relationship of respect when Ms. Collier interacted with her students. It was evident that she respected them and that they respected her, her classroom, and their peers. Ms. Collier spoke to her students with firmness yet care. I observed her know background information about her students. Personally, Ms. Collier revealed that some of the students were in her class for a second time. She had them when they were sixth graders and now as eighth graders. This foundation of their relationship is apparent in her interactions with them. I can easily observe that she *knew* them and cared about them.

Ultimately, Ms. Collier exhibited qualities Ladson-Billings (1995) suggested as essential to successfully teaching students of color, such as care, commitment, preparedness, and student-centered instruction. Ms. Collier's display of these teaching practices revealed a baseline understanding of culturally relevant pedagogy (CRP) despite not having experienced formal training or professional development on CRP. Ms. Collier was unaware of CRP and unable to name any teaching practices or teacher dispositions reflective of CRP in the literature.

## *Students*

Although Ms. Collier's understanding of and experiences with culturally relevant mathematics teaching are the focus of this study, it is also important to describe Ms. Collier's students at the time of this study. To clarify, they are not participants in the study as it was teacher-focused, focused on understanding what culturally responsive mathematics teaching means through Ms. Collier's eyes as an experienced Black mathematics teacher. At the time of this study, most of Ms. Collier's 8th-grade students were also mathematics students of Ms. Collier's when they were in 5th and 6th grades. Her students ranged between 13 and 14 years old, were both males and females, and encompassed a variety of ethnic/racial backgrounds. Most of her students identified as Black and Latinx populations. The classes in which Ms. Collier implemented the (co-created) CRP remixed unit plan were categorized as (1) on grade level and (2) advanced placement in eighth-grade mathematics courses.

## **Timeline of Study**

In this section, I briefly discuss the major event timeline of the study (touched upon in Chapter One) so that the upcoming sections describing data source collection and analysis are clear. This research study encompasses three main events, each involving the researcher and the teacher participant, Ms. Collier. The first event was a professional development (PD) on CRP led by the researcher. The second event was the co-creation of a mathematics unit plan designed following CRP principles (and embedded with Ms. Collier's students' cultural characteristics, and the third

event was implementing this unit plan. Data sources for Part 1 of this study were collected during the first event (the CRP PD), and data sources for Part Two were collected during the third event (CRP implementation).

### **Data Sources: Collection and Analysis by Study Part**

In case study research, data collection is typically extensive and draws on multiple sources of information for data triangulation (Creswell, 2013; Yazan, 2015). For example, case study researchers look at documents, conduct observations, and interview study participants in their natural environment, all of which help researchers to gain a richer and deeper understanding of the phenomena (Merriam, 2002). In this study, the data came mainly from four sources, namely: conversations (between Ms. Collier and the researcher), semi-structured interviews, written reflections (by Ms. Collier), and memos (by the researcher). Since this study was composed of two parts, I describe each data source based on when it occurred and, therefore, which part it was most relevant to, acknowledging that some data sources are relevant in both parts. The chart below identifies which data source was collected in each study part (listed in its order of appearance). I describe each data source in detail in the sections that follow.

The data sources of conversations between Ms. Collier and me and my interviews with her were video recorded. The saved recordings and written reflections were stored in a password-secure folder on my computer. In addition, all conversations and interviews were transcribed and given to Ms. Collier to read for member-checking and trustworthiness of data prior to coding. Member checking not

only affirms the accuracy, reliability, and validity of the data (Creswell & Miller, 2000; Creswell, 2013; Lincoln & Guba, 1985) but was essential as I sought to share Ms. Collier’s reflections on her experiences prior and during implementation reflected through her voice. The entire organization of data sources for the complete research study is shown in Table 1.

**Table 1**

*Data Sources Organized by Study*

Part 1	Part 2
Interview (1 Pre-CRP Professional Development)	Conversations (6; each one following daily CRP implementation)
Written Reflections (4 Reflections of CRP Articles)	Interview (1 Post-CRP Implementation)
Conversations (4 Conversations about CRP Articles)	
Written Reflection (1 Post-CRP Professional Development)	
Conversation (1 Post-CRP Professional Development)	

**Part 1 of the Study: Data Sources and Collection**

As indicated in Chapter 1, Part 1 of this study focuses on Ms. Collier’s understanding of theoretical and empirical literature on culturally relevant pedagogy (CRP) that she developed in our professional development. The data collected throughout Part 1 helped to answer the first research question (presented in Chapter 1 and noted at the beginning of this Methodology chapter) concerning Ms. Collier’s newfound understanding of CRP. Data sources for Part 1 of the study included one initial interview with Ms. Collier before our CRP professional development (PD), four written reflections, and four conversations collected during the CRP

PD. Finally, one written reflection and one conversation were collected after the CRP PD. I describe each data source in detail and discuss their sequencing within Part 1 of the study in the following sections.

### ***Semi-Structured Interview (Pre-CRP Professional Development)***

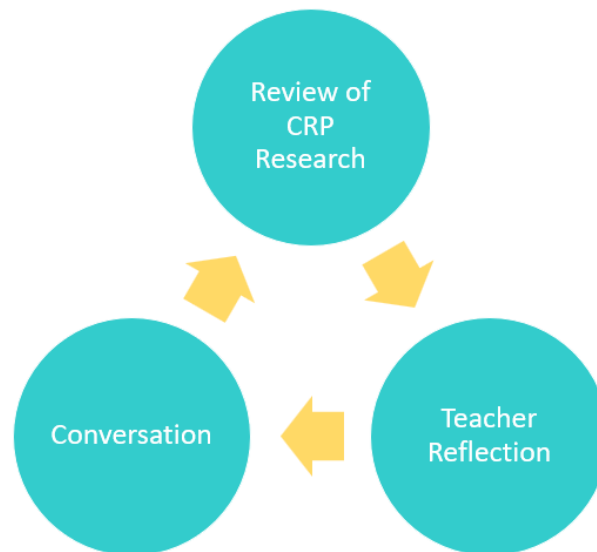
For Part 1, the first data source was a semi-structured interview with Ms. Collier, listed as Interview (1 Pre-CRP Professional Development) on the data sources chart (Table 1). This initial semi-structured interview included questions on why Ms. Collier wanted to become a mathematics teacher, her approach to teaching mathematics, and how her approach was similar to or differed from that of other mathematics teachers she had worked with [protocol included in Appendix B]. In this interview, I asked Ms. Collier to describe if and how teaching mathematics in urban schools had impacted her pedagogy for culturally diverse students, particularly Black and Latinx students, who comprise the majority of students she has taught in her 16 years in the classroom. I also asked Ms. Collier if and how she incorporated culture (using Ladson-Billings' (2010) definition - the sum of all human experiences as a reference) into her classroom. Finally, I concluded the initial interview by asking Ms. Collier to describe what culturally relevant pedagogy meant to her (prior to designing and teaching the aforementioned curriculum unit) and if she felt her current mathematics curriculum and instruction were culturally relevant. I also asked her if she had ever received training or professional development in culturally relevant pedagogy or culturally responsive teaching.

## *Culturally Relevant Pedagogy Professional Development*

Following the initial interview, Ms. Collier and I began a professional development (PD) on culturally relevant pedagogy (CRP). The purpose of the PD was to expose Ms. Collier to research that discussed theoretical and empirical implementations of CRP. This exposure would build Ms. Collier's understanding of CRP to identify its' tenets in aspects of her practice with an overall goal of her being able to fine-tune/remix/improve on her mathematics teaching and pedagogy for Black and Latinx students. The PD specifically aided in answering the first research question concerning Ms. Collier's understanding of CRP. The complete PD process is shown below, represented by Figure 6.

### **Figure 6**

#### *Culturally Relevant Pedagogy Professional Development Process*



This process included a sequence of events that included: (1st) simultaneously (Ms. Collier and I) reading an article/book chapter on CRP, (2nd) Ms. Collier's written

reflection on what was read, and then (3rd) a conversation (between Ms. Collier and I) about both the research and Ms. Collier's reflections of the reading. This cycle repeated four times, occurring one time for each of the four readings. The CRP PD produced two primary sources of data, more specifically, four written reflections (from Ms. Collier) and four conversations (between Ms. Collier and I). I will discuss each part of the CRP PD process in the upcoming sections.

**Review of CRP Research.** The PD process started with reading theoretical and empirical research on CRP. I planned the review of research to be reminiscent of participatory action research (PAR). According to Rodriguez and Brown (2009), PAR repositions local informants concerning expertise, authority, and decision-making while, in the context of this study, the teacher and the researcher actively participate in and exercise influence over the production of official scholarly knowledge. My goal as the researcher was to relinquish the role of sole expert and engage in genuinely collaborative research with Ms. Collier (Rodriguez & Brown, 2009). I wanted us situated as co-researchers actively participating in and exercising influence over the production of the CRP mathematics unit plan that Ms. Collier implemented. For this to occur, Ms. Collier and I simultaneously read and discussed each piece of CRP research. The readings described CRP from well-known researchers in urban education, teacher education, K-12 education, multicultural education, and critical race theory. The readings were either recommended by CRP researchers or were chosen because of their rich and deep descriptions of CRP in the classroom, specifically with in-service teachers.

The first article we read and discussed was “But That’s Just Good Teaching! The Case for Culturally Relevant Pedagogy,” where Ladson-Billings (1995a) argued for the centrality of CRP in schooling African American children. The second article was “Operationalizing Culturally Relevant Pedagogy: A Synthesis of Classroom-Based Research,” where authors examined 45 classroom-based research studies of CRP with in-service teachers enacting CRP teaching practices (Morrison, Robbins, & Gregory Rose, 2008). The third reading was an excerpt from the book *Culturally Responsive Teaching: Lesson Planning for Elementary and Middle Grades* discussed teacher reflection on culturally responsive teaching practices and ten beliefs of culturally responsive educators (Irvine & Armento, 2001). Finally, “Mathematics Teachers’ Use of the Culturally Relevant Cognitively Demanding Mathematics Task Framework and Rubric in the Classroom” was the fourth reading (Jones, 2015). These conference proceedings discussed the need for teachers to implement culturally relevant pedagogy while maintaining the cognitive demand of mathematics tasks and best practices for designing and implementing culturally relevant cognitively demanding (CRCD) mathematics tasks.

**Written Reflections.** Written reflections represented the next step within the CRP PD process. Ms. Collier answered the questions for each reading: (1) What are your overall reflections and thoughts about the article? (2) How does this article reflect your current teaching practice? and (3) What did you read about that you are not enacting in your mathematics classroom? Ms. Collier needed to identify her new, “theoretically grounded” understanding of CRP and then reflect on its presence or absence in her own classroom [protocol included in Appendix C]. The answers to

these questions provided Ms. Collier with a new knowledge base of CRP and how said research compared to her current teaching practice. This information aided Ms. Collier and I in making pedagogical decisions while planning the mathematics unit embedded with CRP that Ms. Collier implemented.

**Conversations on Understanding CRP.** Lastly, Ms. Collier and I conversed about the research and Ms. Collier's reflections on the readings. These conversations represented the last step within the CRP PD process. After Ms. Collier completed each written reflection, we engaged in conversations about the readings. I begin each conversation with either the leading question, "What were your thoughts about what you learned" or by asking Ms. Collier about a topic she addressed in her written reflections. These conversations allowed Ms. Collier and I to reflect on our newly developed and shared understanding of CRP, acquired through the CRP PD. We also reflected on which tenets of CRP Ms. Collier felt that she was and was not currently enacting in her mathematics classroom.

***Final Written Reflection and Final Conversation (Post - CRP Professional Development)***

The last data sources for Part 1 of the study were a final written reflection from Ms. Collier and a final conversation between myself and Ms. Collier. Both the reflection and the conversation were motivated by the questions: (1) After diving into research on the theory of culturally relevant pedagogy, how do you now describe/define culturally relevant pedagogy? (2) What did you learn today about culturally relevant pedagogy that was the most interesting? (3) What did you learn

today about culturally relevant pedagogy that was the most difficult to understand/process? and (4) Based on the readings, what teaching practices associated with culturally relevant pedagogy are you not currently enacting? [Protocol included in Appendix C].

### **Part 1 of the Study: Data Analysis**

In the following sections, I describe the qualitative data analysis process for Part 1 of this research study. I also discuss plans developed for the reliability and validity of data sources.

#### ***Analysis of Interviews and Written Reflections***

The transcribed interview and written reflection data underwent the same data analysis process.

The first cycle of transcript analysis utilized CRP's central tenets: student learning, cultural competence, and critical consciousness. I used these three tenets as my primary theory-driven codes (DeCuir-Gunby et al., 2011; Saldaña, 2009) for hypothesis coding (Saldaña, 2009; Bernard, 2013). Theory-driven coding requires three steps: (1) generating the code, (2) reviewing and revising the code in the context of your data, and (3) determining the reliability of the coders and the code (DeCuir-Gunby et al., 2011). The second step is significant because themes may emerge that illustrate CRP but may not particularly fall into the pre-determined codes. Bernard (2013) suggested that hypothesis coding enables researchers to perform a content analysis that tests hypotheses by building explanatory models from existing

texts. Hypothesis models are appropriate when looking for explanations in data (Saldaña, 2009).

In the second cycle of the transcript analysis, I used pattern coding, an exploratory method of analysis that allowed for new understandings and connections to develop. Pattern coding is the process by which the researcher develops meta-codes from the codes developed in the first cycle (Saldaña, 2009). These meta-codes identify similarly coded data by grouping them to generate significant themes; stated differently, researchers employ pattern coding to find patterns or relationships among previously generated codes, analyze commonalities, and group them by their similarities (Miles & Huberman, 1994; Saldaña, 2009). Pattern coding was appropriate for developing significant themes from the first cycle of coding by attributing new meanings to groups of themes (Miles & Huberman, 1994; Saldaña, 2009).

### *Analysis of Conversations*

The conversational data also required two different cycles of coding. The first data analysis cycle focused on hypothesis coding (Saldaña, 2009). Just as in coding interview and teacher reflection data, I used the tenets of CRP as the pre-determined scheme to code the conversational-typed data transcripts. In addition, I highlighted any instances in the data that confirmed the coding scheme while allowing new themes to emerge. Using hypothesis coding was a strategic choice because this qualitative data analysis method acknowledges the theoretical background as a focus of the study (Saldaña, 2009).

The second data analysis cycle focused on the literacy and language data analysis method of verbal exchange coding. Verbal exchange coding allows the researcher to explore cultural practices (e.g., speech mannerisms, non-verbal communication habits, and rich points of cultural knowledge (slang, jargon, etc.)) between the researcher and participant (Goodall, 2000; Saldaña, 2009). During coding, I utilized two forms of verbal exchange coding, namely: (1) dialogue and (2) personal narrative (Goodall, 2000). Dialogue is described as conversations that are “unordinary” because their talk moves and new understandings reveal a higher level of dialogue that transcends the usual boundaries of self and other, producing a “lived experience” for interactants (Goodall, 2000, p. 204). Goodall (2000) described personal narrative as conversations marked with individual and self-disclosure, wherein the episodes of the disclosure are used to situate, coordinate, detail, and explain or retell personal and pivotal life events. Using verbal exchange coding allowed me to examine and interpret conversations holistically. This coding method was vital as I sought to examine Ms. Collier’s experiences with implementing CRP and her reflection on moving CRP theory to practice. Verbal exchange coding was beneficial in this examination by truly showcasing Ms. Collier's voice in answering the first research question. The previous two cycles of coding revealed answers to the first research question.

### **In-Between Parts 1 and 2: Negotiation of Unit Plan for Implementation**

Between Parts 1 and 2 of this study, Ms. Collier and I utilized our new shared understanding of CRP to co-create a mathematics unit plan. Notably, we negotiated

how Ms. Collier could translate CRP theory into practice in her urban mathematics classroom. This conversation began with the prompt: Based on your new understanding of CRP, what are some ways that you could incorporate CRP into your classroom? To create the unit plan, Ms. Collier and I “remixed” (e.g., rethought, rewrote) her scripted 8th-grade mathematics curriculum (Illustrative Mathematics) and infused it with the unique cultural characteristics and aspects of Ms. Collier’s students’ mathematics identity (gathered from a Mathography created by the researcher). The Mathography included questions about the students’ hobbies and places they had lived, as well as questions about their favorite movies and sports teams, proud accomplishments, and their heroes. Lastly, Ms. Collier and I also negotiated the degree to which Ms. Collier would implement CRP.

***CRP Unit Plan Overview***

The unit plan, taught over eight days, introduced students to linear functions and accompanying models (unit plan details in Appendix A). Ms. Collier and I planned the unit to include a gradual increase in the degree to which CRP was being implemented, shown in Table 2.

**Table 2**

*CRP Unit Daily Implementation Chart*

	Beginning		Middle		End	
Day(s)	1/2	3/4	5	6	7	8
Degree of CRP Implementation	None	Minimal	Complete	None	Complete	Complete

For example, at the beginning of the unit, on the first and second days of the unit plan, there was no CRP implementation. In contrast, Ms. Collier began her initial

implementation of CRP on the third and fourth days. In a sense, days one through four were considered the control days within the unit due to the intentional absence and minimal amount of CRP. In the middle of the unit, day five was the first day of complete CRP implementation. On day six, there was no CRP implementation due to the content being a review and extension of day five. The unit ended with days seven and eight, with complete CRP implementation. Ms. Collier implemented the product of our negotiation, the unit plan, in Part Two of this research study.

## **Part 2 of the Study: Data Sources and Collection**

As indicated in Chapter 1, Part 2 of this study focuses on Ms. Collier's experiences and perspectives on implementing the CRP curriculum she developed and teaching in a manner consistent with CRP tenets. The data collected throughout Part 2 helped to answer the second research question (presented in Chapter 1 and noted at the beginning of this Methodology chapter) concerning Ms. Collier's change in practice and change as a mathematics teacher of Black and Latinx students. Data sources for Part 2 of the study included six conversations concerning CRP implementation and one interview after CRP implementation. In the following sections, I describe each data source in detail and discuss their sequencing within Part 2 of the study.

### ***CRP Implementation Conversations***

The primary data source for Part 2 was transcriptions of six conversations that Ms. Collier and I had about her daily reflections on CRP implementation and enactment. Each conversation occurred daily when Ms. Collier and I would meet

following her CRP implementation (in person or via the Zoom platform). These conversations generally began with an open-ended question such as “What were your experiences with implementation today?” Based on her responses, I asked Ms. Collier to clarify further, elaborate, or reflect on specific statements. Each conversation was designed to allow Ms. Collier to reflect verbally on her CRP implementation. Ms. Collier’s reflective thinking also impacted her opportunity for growth within her process of teacher change (Valli, 1997). Reflective teachers can reflect or think back on their teaching behaviors and experiences in the context in which they occur, e.g., the event or phenomena (Dewey, 1933).

### ***Post-CRP Implementation Interview***

The following data source within Part Two was the final interview after Ms. Collier completed CRP implementation (e.g., the co-created eight-day mathematics unit plan). This closing interview focused on Ms. Collier’s overall experiences implementing CRP in her urban mathematics classroom. During this interview, Ms. Collier answered questions that required her to reflect on and compare her approach to teaching before, during, and after CRP implementation. She ultimately discussed if and how implementing CRP impacted her approach to teaching outside of this study. In addition, Ms. Collier answered questions about culture in the mathematics classroom and if implementing CRP changed how she embedded culture. In this interview, I also asked Ms. Collier to share her overall perspective on her experiences implementing CRP and if these experiences impacted her knowledge, beliefs, or attitude about being a mathematics teacher for Black and Latinx students. Lastly, I

asked Ms. Collier to verbally reflect on if CRP impacted or provided her professional growth as a mathematics teacher.

## **Part 2 of the Study: Data Analysis**

In the following sections, I describe the qualitative data analysis process for Part Two of this research study. I also discuss plans developed for the reliability and validity of data sources.

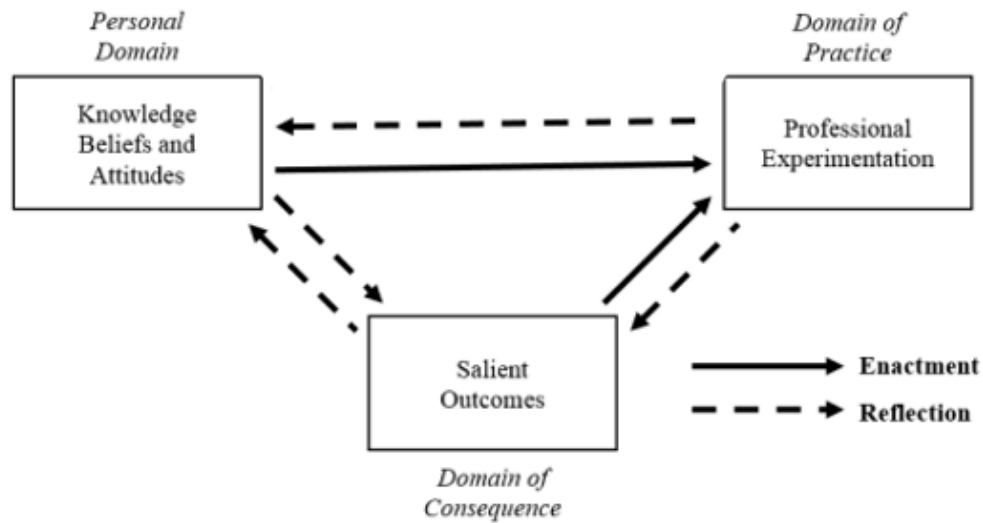
### ***Analysis of Conversations and Interview***

The transcribed conversations and the final interview data from Part Two of the study underwent the same data analysis process.

I analyzed Ms. Collier's experiences of moving CRP from theory to practice and implementing CRP, through the theoretical lens of Teacher Change Theory (Guskey, 1986). More specifically, I created an adapted framework (Figure 7) from Clarke and Hollingsworth's (2002) Interconnected Model of Professional Growth (IMPG) to aid in examining Ms. Collier's mediating processes of reflection and enactment throughout, within, and between three domains of change, namely, the: Domain of Practice, Domain of Consequence, and Personal Domain.

**Figure 7**

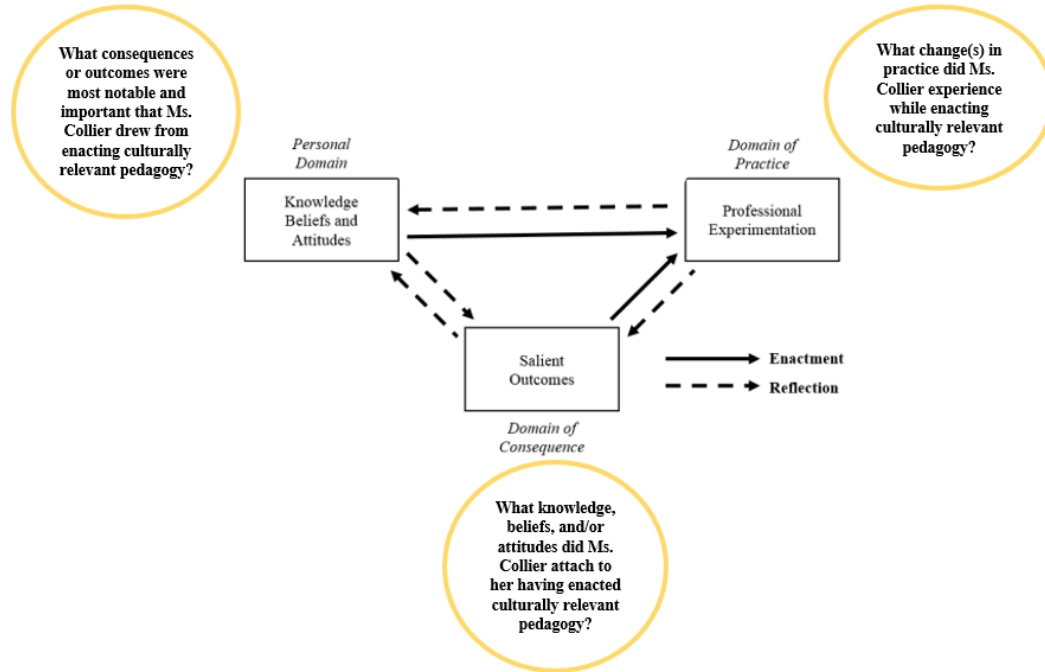
*Adapted Interconnected Model of Professional Growth (IMPG)*



Each conversation and interview transcript underwent three coding cycles for analysis. For the first cycle, I used the three Domains: Personal, Practice, and Consequence (from the Adapted IMPG) as my primary theory-driven codes (DeCuir-Gunby et al., 2011; Saldaña, 2009) for hypothesis coding (Saldaña, 2009; Bernard, 2013). Then, using Clarke and Hollingsworth's (2002) descriptors of each Domain (explained in Chapter 2), I created an overarching question to represent each domain, as shown in Figure 8.

**Figure 8**

*Adapted IMPG with Overarching Domain Questions*



These overarching questions led the first coding cycle in data analysis. The second cycle of coding involved classifying Ms. Collier’s experiences during CRP implementation as either Enactment or Reflection, the mediating processes within the Adapted IMPG. Lastly, for the third coding cycle, I embarked on verbal exchange coding (explained in the data analysis for Part 1).

It is also important to note that, in addition to the mentioned coding strategies, I engaged in memoing at each data analysis stage for Part Two. Memoing is described as the writing of detailed notes, observations, and personal feelings and reflections regarding the interview and conversational data (Miles & Huberman, 1994; Saldaña, 2009). The memoing process helps ensure researcher transparency and reduce bias – thus strengthening the study's confirmability (Lincoln & Guba,

1985). Memos also provided contextual clues for coding data and thoughts for discussion with Ms. Coleman as she reflected on her process of fine-tuning her cultural relevance (Miles & Huberman, 1994). Memoing helped to make sense of the data and reflect and analyze the data's meaning while developing emergent themes and assertions. The three coding cycles in Part 2 and memoing revealed answers to the second research question.

## Chapter 4: Findings of Part 1

### Findings Chapters (4-5) Organization

This chapter presents my findings organized into Part 1 and Part 2. One research question guides each part and is shown at the beginning of the section. It is important to state again (as stated in Chapter 3) that Part 1 occurred pre- Ms. Collier’s CRP implementation, and Part 2 took place throughout and post- Ms. Collier’s CRP implementation, as shown in Table 3.

**Table 3**

*Visualization of Study*

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Part 1	In between Parts 1 & 2	Part 2
Pre-Implementation: Professional Development on CRP	Co-Creation of CRP Unit Plan	Throughout and Post- Implementation: Implementation of CRP Unit Plan

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### Findings Part 1

Part 1 of this qualitative case study aimed to answer the first research question (see Chapter 1) by examining how Ms. Collier, a veteran and highly-regarded Black female mathematics teacher, understood the theoretical and empirical literature on CRP in light of her background and experience. I answered the first research question by documenting and analyzing the conversations that Ms. Collier and I had about several theoretical and empirical descriptions of CRP in the literature, some specific to mathematics and some not. I also answered the first research

question by analyzing my interviews with Ms. Collier before and after discussing empirical and theoretical CRP literature.

The analysis of Ms. Collier's written reflections and the transcripts from our videotaped conversations resulted in five themes that each spoke to how she understood the translation of CRP tenets from the CRP literature into her mathematics instructional practice. I begin this chapter by discussing three of the themes, namely: academic achievement/student learning, critical consciousness, and cultural consciousness. As indicated in Chapter 2, these three themes are well-known tenets of CRP. And as indicated in Chapter 3, the first round of coding was structured to elicit Ms. Collier's perceptions of these themes. I end this chapter by presenting two themes of CRP that emerged in the second round of analysis (see Chapter 3) as part of Ms. Collier's CRP vision and that seemed "new" or, in some ways, different from themes in the extant literature, namely: (1) the classroom domain, and (2) the teacher mindset. For each of the five themes, I discuss the development of Ms. Collier's new knowledge and unpack her evolving and increasing understanding of CRP as well as her inherent stance on the characteristics of a culturally relevant (CR) mathematics teacher who teaches Black and Latinx students in an urban school context.

### **Student Learning**

In our conversations about the CRP literature and its implications for her urban mathematics classroom, Ms. Collier and I extensively discussed the characteristics of CR teachers in general and those who teach mathematics specifically. As a mathematics teacher who understands the many stereotypes and stigmas that Black and Latinx students face in the learning and doing of mathematics,

Ms. Collier expressed a clear awareness of the impact that culturally relevant instructional and relational practices could have on the Black and Latinx students she taught in Hummingbird Academy PCS.

In our early conversations, Ms. Collier was clear that to promote student learning, CR teachers recognize and build on students' strengths, understandings, cultures, language(s), and experiences. In multiple conversations and interviews, Ms. Collier stressed that irrespective of the subject matter they teach, CR teachers should build on students' assets in order to arrive at high levels of student learning. She understood that, although state requirements and testing are not unimportant, these can be narrow, restrict, and reinforce deficit perspectives about Black and Latinx students like those she taught. Her view was that, rather than focus narrowly on tested skills, CR teachers need to focus broadly on their students' intellectual growth in mathematics and other areas. This did not mean that she ignored curriculum requirements and tests, but that she believes that when mathematics teachers use holistic, asset-based instruction, students will perform just as well on tests while also understanding more mathematics than they would when teachers teach narrowly to the test. Ms. Collier has a track record in this area. She explained that she "invest[s] and take[s] personal responsibility for [her] students' learning" and that she does this "by purposefully using students' strengths as starting points" for instruction. Ms. Collier asserted that, to the extent possible, CR teachers need to build upon students' prior knowledge – an understanding that aligns with Ladson-Billings' (2014) perspective that student success is measured by their intellectual growth and not by standardized testing.

Ms. Collier and I also discussed that her attention to student learning (and not student test scores) coincided with her “high academic expectations” for her Black and Latinx students. She considered this to be part and parcel of equitable and CR teaching practice. Ms. Collier asserted that CR teachers first need to internalize the belief that their students can meet high expectations and then externalize those beliefs to be audible and visible to students. Ms. Collier reported that she regularly voices her esteem for her students’ abilities and communicates her academic expectations for them in whole-class conversations, small-group settings, and in individual conversations with individual students inside and outside the classroom. She described making a routine of cultivating a learning environment where she could openly demand success from her students in her mathematics classroom and outside of it.

Ms. Collier also stressed the importance of CR teachers using formative assessment to further their student’s intellectual growth and academic success. Ms. Collier explained that she uses formative assessment to gauge her students’ “in-the-moment” understandings and to tailor her teaching to their specific learning needs. An in-the-moment modeling and scaffolding example is described in Chapter 5, where Ms. Collier realized that her student exhibited a learning gap in subtraction and responsively changed her line of instruction to meet the student’s needs and built them up to the current learning goal. Ms. Collier felt that the pandemic and online learning made her more conscious and intentional with her evaluation of student learning. She expressed that “the virtual setting had created some barriers [with teaching and learning]” that she recognized in her students’ work. Therefore, she felt

that formative assessment (such as having her students share their work and explain their answers for teacher and peer check) and summative assessment (such as cool down, exit tickets, and mid-unit exams) had become even more necessary in her instruction than it was pre-pandemic and in online learning. She recalled her frequent use of instructional techniques such as “modeling and scaffolding” as a way for her to assess her students’ mathematical growth.

Ms. Collier also felt that differentiating instruction is something that CR teachers use. In particular, it provides her Black and Latinx students greater access to the mathematics she invites them to learn. “When I tailor my instruction to meet the needs of my students is when I can actually see them learning math and doing math.” With differentiated instruction being about Ms. Collier meeting her students’ individual needs, strengths, and interests, she noted she often differentiated to meet their needs and strengths yet occasionally their interests. She hoped that using CRP would help her to do so.

### **Cultural Competence**

In our conversations and her writing, Ms. Collier described her “remixed” (e.g., progressing and evolving) understanding of cultural competence, its importance to CR mathematics teaching, and how to enact it in her mathematics classroom. This remixed understanding centered on who her students were as people - their cultures, identities, and experiences inside and outside of school. Ms. Collier reported that she teaches her students based on the premise and experiential understanding that “culture is connected to education.” Hence, she strongly desired to integrate aspects of her students’ lived experiences and cultural backgrounds into her mathematics curriculum

and instruction. She explained that this desire stems from her recognition that their current district/school-required mathematics curriculum lacked meaningful connections to her Black and Latinx students' lived experiences and diverse cultural backgrounds. She noted that, over the past three years of using the current curriculum, she has noticed that the real-world application problems repeatedly incorporate stereotypical images and names for Black and Latinx students - something that her students apparently also comment on. Based on her observations, Ms. Collier observed that “the publisher’s way of being culturally competent is to include [cartoon pictures of] students of different skin colors into the slides for the daily lesson plans. They also use ethnic names such as Diego, Jada, Han, and Lynn.”

Ms. Collier asserted that the best way for teachers to become and practice cultural competence is to get to know their students as people. She noted that this process should occur “inside and outside the mathematics classroom.” Ms. Collier discussed how she gets to know her students and their families by being an active school community member. She specifically recalled that through organizing and participating in school activities and events, “the relationships [she] built [with students] were some of the most authentic [she has] ever had.” In an early interview, she reflected on how, following the death of a former student, relationship-building with her students had become even more critical to her as a teacher. She recalled that, before that event, particularly in her early teaching career, she was so concentrated on “just teaching the math” that her relationships with students were surface-level. However, her former student’s death compelled her to make a more substantial effort to get to know her students both inside and outside her classroom. She reported that,

through specifically developing relationships with her students outside of the classroom, she had built the mutual trust and respect necessary and beneficial for her to teach mathematics in a way that her students find more accessible.

As Ms. Collier continues to refine her cultural competence with her students, their families, and the community, she plans to “remix” (e.g., adapt, augment, recontextualize) the prescribed curriculum to make it more culturally relevant to the Black and Latinx students she teaches at Hummingbird. She also strongly desires to integrate into the mathematics curriculum what she learns through student and family interactions.

### **Critical Consciousness**

While learning about CRP, Ms. Collier realized that she could provide instruction on social justice issues and accompanying activities for her mathematics students. Rubel (2012) advocates for this effort, suggesting that when teachers develop students’ critical consciousness with mathematics, it implies investigating societal power issues through mathematical analysis. In our conversations, Ms. Collier expressed that she believes schools and teachers should help make students “aware of injustice in their community” and agrees with offering them opportunities to voice their opinions on matters of inequity, “giving them a voice” and position in the case while affirming that “despite their age, they hold power.” Ms. Collier has gained a new understanding that a CR teacher “encourages their students to be social change agents,” starting in their classrooms but transcending beyond their community. Ms. Collier noted that she was not currently enacting social justice mathematics as she desired. Nevertheless, she hoped to use mathematics to engage

her students in social justice work in general and during the CR mathematics curriculum implementation phase covered in Chapter 5.

Reflecting on issues of social justice and consciousness-raising, Ms. Collier expressed that she sees school as a “geography of opportunity,” that is, that place and context matter to students, and curriculum and instruction should reflect this. She understood that teachers looking to teach in a manner consistent with the tenets of CRP and models of effective teaching cited in the CRP literature need to understand the geographies of opportunity that the communities in which they teach present. More specifically, she viewed her classroom and school as locales - and spaces nested in larger locales - where her teaching practices “make mathematics accessible” to Black and Latinx students.

### **Developing New CRP Tenets**

According to Ladson-Billings (1995), the three principal tenets of culturally relevant pedagogy are Student Learning, Cultural Competence, and Critical Consciousness. Within mathematics education, other scholars have added to these tenets suggesting that *culturally relevant mathematics teaching* also includes themes of caring, high expectations, and cultural identity (Matthews, Jones, & Parker, 2022). Based on the analysis of interviews and conversations with Ms. Collier, I wish to advance two new tenets (themes) of CRP: *Classroom Domain* and *Teacher Mindset*. These two themes show connections to literature. In particular, the theme of Classroom Domain connects to the ideas about culturally responsive classroom management presented in Milner et al. (2018) “*These Kids Are Out of Control*”: *Why We Must Reimagine “Classroom Management” for Equity*. The Teacher Mindset

theme is connected to literature that explicitly connects teaching practices to mindset (e.g., Boaler, 2016; Dweck, 2006; Sun, 2018). I claim that while others have suggested or implied that culturally responsive teachers consider these ideas, they have not explicitly named or stated either of them in the way Ms. Collier named and understood them. In this section, I describe both tenets based on conversational analysis and using excerpts from Ms. Collier.

### ***Classroom Domain***

The theme of *classroom domain* emerged from Ms. Collier's discussions of the inter-relationship between her classroom environment and classroom community. As she explained, Ms. Collier strived to "create and nurture an environment" that was welcoming and respectful, where students confidently work productively on mathematics content individually and with each other. Ms. Collier envisioned a communal classroom environment, or what she sometimes also called a "cooperative learning environment." As indicated earlier, she did so by "maintain[ing] high behavioral expectations" for her students while not being overly rigid or harsh. She strived to be demanding yet nurturing in her interactions with her students, what Kleinfield (1975) describes as *warm-demander pedagogy*.

Warm-demander pedagogy involves accepting students' misbehavior as normal yet believing in their ability to improve (Bondy & Ross, 2008). However, Ms. Collier was clear that once her students understood the norms of her classroom domain, she rarely experienced misbehavior or off-task behavior. To this point, Ms. Collier reported seeing the same students behaving - and misbehaving - very differently with other teachers in Hummingbird Academy. By her accounts and that

of others (e.g., her administrators, myself, and other researchers), Ms. Collier creates a classroom domain in which her students learn how to conduct themselves as individual mathematics learners, focused on growing and learning and as members of a supportive classroom community. As she described it, the culture of Ms. Collier's classroom entails students holding themselves and holding each other "accountable" for their behavior and their mathematics learning. She understood that welcoming students to become "active participants in the[ir] classroom community" makes them highly engaged in their own individual learning and that of the whole class.

To ensure participation, Ms. Collier reported making it a habit to "call on each of [her] students within one class session." Her stance was that this lets students know their voice mattered in her classroom and strengthens inclusion and community. As a result, she found that her students anticipate being included, which "promotes student readiness" and preparation to explain and debate the mathematics aloud in small groups and whole class settings. Ms. Collier's ethos centers on sharing her authority and power with her students. One of the ways she described doing this was by switching roles and having her students teach her and each other. She felt that this empowered them to lead and learn.

### ***Teacher Mindset***

*Teacher mindset* is another "new" CR tenet that emerged from my analysis of the interviews and conversations with Ms. Collier. To explain this, I apply Kunz's (2020) description, a "teacher's mindset influences the actions and choices teachers make on how things will be done in their classrooms" (p. 61). Based on Ms. Collier's established set of beliefs, previous actions, and reactions in the mathematics

classroom, she enters her urban mathematics classroom with a specific mathematics teacher mindset. *Teacher Mindset 1*: Ms. Collier identified teaching in predominantly Black and Latinx urban schools as a way to give back to her community. In an early conversation, she told me, “Schools that don’t have a lot of Black kids recruit me all the time, and I continue to turn them down because that’s just not who I need to teach.”

Regarding instruction, Ms. Collier clearly made purposeful choices (which I noted as being grounded in CRP) to benefit her students. *Teacher Mindset 2*: Ms. Collier builds on students’ funds of knowledge. “I build personal relationships with my students, and it helps me to learn about them—and their families lived experiences. So then, because I know my students, it’s easy for me to make connections between who they are, what they already know, and what I teach them.” *Teacher Mindset 3*: Ms. Collier sets up situations for students to think critically about mathematics. For example, Ms. Collier planned a project for her sixth-grade students in which she gave them complete creative control to plan a summer trip for themselves and a friend. Her goal was for her students to think critically about their planning based on how much they could finance their trip based on their chosen location.

This ain’t your typical trip. My babies [we]re in here researching and comparing multiple airlines’ flight costs, deciding which Air BnB best accommodate[d] their wants and needs while staying in budget, as well as activities, meals, and transportation while at their destination. They picked their own cities. I gave them the tools. I let them go off and be great. To say

they are in here having a ball while learning real-world skills would be an understatement.

*Teacher Mindset 4:* Ms. Collier held herself responsible for her student's success in mathematics. She evaluated this success based on what her students learned and their learning progress. In each aspect, Ms. Collier "invest[ed] in and t[ook] personal responsibility." This mindset was an attribute of her warm-demander pedagogy situated in the mothering-type relationship between Ms. Collier and her students.

### **Conclusion of Part 1 Findings**

This chapter answered the first research question concerning Ms. Collier's understanding of CRP before her development and implementation of a CR curriculum unit, in part, based on her "remixed" understanding. These findings emerged after a PD in which Ms. Collier, and I reviewed various empirical and theoretical literature on CRP (some situated in mathematics classrooms). Findings suggested that Ms. Collier clearly understood the three central tenets of CRP: Academic achievement (student learning), critical consciousness, and cultural consciousness. Findings also crystallized two new tenets of CRP that are present but not explicitly named in past research: classroom domain and teacher mindset. These findings support the stance that CRP is more than a set of practices but a way of *being*. With this new understanding of CRP, Ms. Collier and I reflected and co-planned its implications for instruction in her urban middle school mathematics classroom.

## Chapter 5: Findings of Part 2

The purpose of Part 2 of this qualitative case study was to investigate how Ms. Collier, an experienced and highly-regarded Black mathematics teacher, perceived the changes in her teaching and herself as a teacher (e.g., teacher mindset) that she believed were the result of her attempt to translate the theory of culturally relevant pedagogy (CRP) into her mathematics instructional practices, with the help of the Black and Latinx students she taught in her urban school setting. As indicated in Chapter 3, to understand this change process, I interviewed and conversed with Ms. Collier daily as she taught the CRP curriculum unit; she and I developed it in response to the literature we reviewed and discussed in Part 1 of the study. Part 2 of the study focused on Ms. Collier's newfound understandings of CRP and what it would mean to implement CRP curriculum and instruction with her racially diverse students in her urban middle school mathematics classroom - that is, the changes in practice, understandings, and mindsets that she experienced, having remixed her mathematics curriculum and instruction to make it more fully and explicitly aligned with the tenets of CRP and culturally relevant mathematics teaching. Through conversations and interviews with Ms. Collier, I gathered the information necessary to answer the second research question about Ms. Collier's perceived changes in practice and to herself as a teacher that she believed resulted from engaging with CRP and teaching it in her classroom.

As stated in Chapter 3, Part 2 of this study occurred during and after Ms. Collier implemented our co-developed CRP curriculum unit. As Ms. Collier implemented CRP, she used a cyclical process of enactment and reflection to

articulate (to me) her experiences with and thinking about CRP and CRMT as a result of attempting it in her classroom.

### **Ms. Colliers' Reflections on CRP Implementation**

This chapter presents the results from my analysis of Ms. Collier's reflections on her implementation of CRP organized by the domain of teacher change that it fell within, namely, the: Domain of Practice, the Domain of Consequence, and the Personal Domain (see Chapter 3, Figure 6 and Table 4, below). I include examples of each of the thematic underpinnings (i.e., the themes that Ms. Collier focused on) (see Table 4) in the following stages of the CRP unit implementation, namely: *beginning* (unit days 1- 4), *middle* (unit days 5-6), *end* (unit days 7-8) and *final* (after the unit implementation) stages. These stages were meaningful as Ms. Collier's understandings of CRP and herself as a CR teacher changed while she taught the CRP unit and after she taught it and, as an apparent result of this, focused on different themes during these different stages. The final stage was necessary to include as it situated Ms. Collier's culminating reflections on implementing CRP. Table 4 presents one-word themes to describe Ms. Colliers' evolving perceptions of her practice, its consequences, and herself as a person-teacher during each stage.

Before reviewing Ms. Collier's themes within each domain, I offer a brief reminder of each domain's meaning (also found in Chapter 2) in the context of this study. The Domain of Practice is where professional experimentation takes place; for Ms. Collier, the implementation of a new instructional approach, i.e., CRP. The Domain of Consequence consists of salient outcomes, Ms. Collier's inferred

consequences of implementing CRP. Lastly, the Personal Domain includes any change in Ms. Collier’s knowledge, beliefs, and attitudes.

**Table 4**

*Thematic Underpinnings of CRP Implementation*

<b>CRP IMPLEMENTATION</b>	<b>BEGINNING</b>	<b>MIDDLE</b>	<b>END</b>	<b>FINAL</b>
DOMAIN OF PRACTICE	REALIZATION INTENTIONALITY REFINEMENT			
DOMAIN OF CONSEQUENCE		REALIZATION	REFOCUS	REMIX
PERSONAL DOMAIN	AWARENESS	BELIEVING	KNOWING BEYOND	HUMANIZING

The co-created CRP unit curriculum plan is included in the Appendices, as it will help to understand some of the included themes.

**Domain of Practice**

To explain Ms. Collier’s reflections on her professional experimentation with CRP, I used the guiding question (i.e., a sub question of my second research question): What change(s) in practice did Ms. Collier experience while enacting culturally relevant pedagogy? I describe Ms. Collier’s descriptions of these experiences and her reflections on them in the beginning, middle, end, and final stages of her CRP unit implementation as *realization, intentionality, and refinement*, respectively.

***Beginning of CRP Implementation: Domain of Practice Realization***

In Part 2 of this study, at the beginning of implementing CRP, Ms. Collier experienced a *realization* about her teaching and professional practice. First, as a

result of reflecting on the CRP literature she read, Ms. Collier concluded that, to create more connections between the required mathematics curriculum and students' lives, she needed to utilize CRP and incorporate real-world problems responsive to her students' lived experiences, cultural backgrounds, and identities. Reflecting on her current curriculum, Ms. Collier commented that the involvement of money "is as real world as this context for this curriculum gets, but it's still not real world enough where [her students] can ... see themselves in it." During our joint reflection in this early stage, Ms. Collier developed a real-world problem example that she saw as more relevant to her students' experiences, backgrounds, and identities than those in the required mathematics curriculum. Incorporating Greenlight Debit cards (a debit card for kids), Ms. Collier created the following linear functions and models task:

Kianna starts with a \$400 Greenlight Debit Card balance. Her balance decreases by \$5 per week. MiKayla starts with an \$800 balance. Her balance decreases by \$7 per week. Write an equation for both Kianna and MiKayla. Who started with the highest balance? Who is losing money at a higher rate? How do you know? Draw a graph of both of their functions.

The example was interesting because it still involved money. However, Ms. Collier believed that, despite this, it was more reflective of her students' lived experiences than the money-related and other real-world problems in the mass-produced curriculum she was teaching - a curriculum that she felt was generally a good one.

In the beginning stage, Ms. Collier reported experiencing increased confidence about her ability as a CR teacher and joy through developing this contextualized mathematics problem. She told me that by making the problem

responsive to her students by incorporating a debit card that many of them have and including her students' names in the problem, she increased her confidence that she could, in fact, make the required mathematics curriculum culturally relevant. She reported feeling jubilant when she saw how her students worked on this problem, believing it increased their understanding and engagement. As she expressed it, "I experienced joy when I heard very thoughtful explanations of things, very thorough explanations from students where they took into account things that they had learned from previous units, like slope and Y-intercept, and being able to utilize that."

Through her reflections on her implementation of the Greenlight Debit Card problem, Ms. Collier came to the realization that her teaching practice was more teacher-centered than she would have liked it to be; specifically, that her instruction featured more teacher talk and voice than student talk and voice. She reflected that "being able to be a facilitator, versus a dictator, is always a joy because I feel like I do a lot of teacher talk. And so that's part of my frustration that I feel every day. It's too much of my voice, not enough of theirs." (To be fair, the switch to online teaching during Covid made it more difficult for Ms. Collier - and apparently most teachers - to engage students and to have them work collaboratively.) Ultimately, in this early stage of her CRP implementation, Ms. Collier asserted that in part due to seeing how this problem played out with her students, she was experiencing her CRP instructional and implementation as joyful and a great opportunity to reflect and grow as a teacher.

### ***Middle: Domain of Practice Intentionality***

During the middle stage of CRP unit implementation, Ms. Collier experienced *intentionality* with regard to reflecting on and improving her teaching practice. More specifically, she reported becoming better aware of and intentional about verbalizing goals for student participation, using modeling of expected student practices as a pedagogical tool, and affirming students' contributions to class discussions of mathematical problems and ideas. In interviews and conversations, Ms. Collier clarified that she has always encouraged class participation but that, following our initial sessions, for the first time, she became particularly motivated to demonstrate (i.e., model) and make explicit to her students how she wanted them to participate in mathematical activities. In a middle-stage conversation with me, she expressed that, moving forward, her students would “have a requirement to share their answer *and* to explain – it’s [our new] normal classroom dynamics that’s built into them.” She also told me that, before the CRP unit, her students were used to sharing their ideas but not necessarily explaining and justifying them. Ms. Collier attributed this change in her practice and expectations for students to the reading and discussing of CRP literature we had engaged in before the CRP unit implementation.

In one middle-stage interview, Ms. Collier reflected on her intentional use of students' explanations to model how to formulate their responses to specific questions for the class. She discussed this intentionality when we discussed how she chose a specific student, Sandra, to model her explanation for the rest of the class.

Sandra will flourish no matter what. And I told you the other time I was like, I [always] use her. I know exactly when to call on her. And then you saw it

happen perfectly. Every time. It never fails. She is about to come with the most brilliant explanation, and it's going to make sense. And you're going to be like, Oh, thank you! And these are the complete sentences that you need to say to explain your answer. And then they were like, Oh, okay! And it was like, I won't take anything less from you because this is how you need to be able to explain your answer.

Having observed this lesson, I noticed that while Ms. Collier (and Sandra) modeled how to construct a mathematical explanation, she also modeled life skills that could be used in content areas or outside the classroom. For example, she told the class, “State your claim, provide an explanation, listen to other [students’] claims, [and] be ready to verbally agree or disagree with others' claims.”

Related, Ms. Collier also appeared to become more intentional about affirming her students during the middle (and end) stages of teaching the CRP unit. CRP gave Ms. Collier a new language of *affirmation* and *affirming* to describe how she verbally motivated her students to engage with school mathematics and expressed appreciation for their in-class contributions.

I was just hyping them up!... I was not aware that affirming students was a part of CRP. I didn't know. I figured the high expectations part was, but I didn't know that really verbalizing and emphasizing your belief in your students and their abilities was a component.

Reviewing the literature on CRP gave Ms. Collier the language of affirming her Black and Latinx students that she was not fully aware or conscious of

prior. Incorporating CRP in the middle stage of the curriculum unit implementation helped Ms. Collier to learn how to affirm her students with intentionality.

Ms. Collier's intentionality to use the language of affirmation and affirming with her students was timely, given her use of the Illustrative Mathematics curriculum. The curriculum actually encouraged teachers to seek verbal explanations from students. When giving explanations, the curriculum also encouraged teachers to affirm students' mathematical thinking, even if it is mistaken. This provided multiple opportunities for Ms. Collier to engage in affirming her students.

***End: Domain of Practice Refinement***

At the end stage of the CRP curriculum unit implementation, Ms. Collier described experiencing a *refinement* of pedagogy (i.e., her *domain of practice*) in the sense that she felt that she was learning to position her students better to analyze mathematical problems and express and explain their own mathematical ideas. As part of this, Ms. Collier described "remixing" her teacher-talk to make it less dominant and to increase the volume and quality of students' mathematical discourse. In particular, Ms. Collier planned two end-stage lessons where she would severely limit her teacher talk with the goal of increasing and altering student talk. In sum, she sought to switch roles with her students so they, rather than she, taught each other - for example, positioning them to ask each other to explain their mathematical ideas. As an apparent outcome of this, Ms. Collier noted that she had discovered a newfound "strength [in] utilizing some students as student teachers. [She] noticed that [her students] really enjoy[ed] that...[and] not just the people being the teacher, but also the people who [were still positioned as] students."

Ms. Collier also arrived at the new understanding that a culturally relevant mathematics curriculum could improve the volume and quality of student talk in her classroom. In an end-stage conversation with me, Ms. Collier also explained that she had become better at analyzing her current lessons and overall curriculum for its cultural relevance - its relevance to the cultures and lives of the Black and Latinx students she taught at Hummingbird. She reflected that “in comparison to an earlier lesson without CRP curriculum integration, [this end of unit] lesson went well because it was already accessible for [her] students.” When using the term accessible, Ms. Collier referred to the lesson (Day 7: Lesson 8 on Linear Functions; the lesson prior to the final lesson) as mathematically and culturally accessible. I inquired if “CRP [was] adding to [her] lens of evaluating the curriculum before [she even] touch[ed] it,” and she confirmed this as a truth. Lastly, using CRP, Ms. Collier could *remix* her classroom teacher-talk (e.g., everything she said in the classroom). By the end of implementation, she described becoming more thoughtful about what she said to her students and how she said things (e.g., her tone). In particular, Ms. Collier noted that she speaks with “power and force” intentionally in order to hold her students’ attention. However, Ms. Collier has a strong tone of voice that some people may have interpreted as intimidating if they were unfamiliar with her or her speaking voice. She reflected that when correcting or interacting with her students that she “tr[ie]d not to demean [her students] if they get an incorrect answer. But making sure [her] tone of voice used [was] a positive one.” Throughout CRP implementation, Ms. Collier became more aware of her voice and reported her considerations above at the end of implementation.

## **Domain of Consequence**

To explain Ms. Collier’s reflections that pertained to the domain of consequence, I used the guiding question: What consequences or outcomes were most notable and important that Ms. Collier drew from enacting culturally relevant pedagogy? I describe Ms. Collier’s experiences in the middle, end, and final reflections of her implementation journey as *Realization*, *Refocus*, and *Remix*, respectively. To clarify, there was no beginning phase within the domain of consequence due to her minimal implementation of CRP at the beginning of the unit plan.

### ***Middle: Domain of Consequence Realization***

During the middle stage of the CRP unit implementation, Ms. Collier described experiencing *realization* about the outcomes or consequences of her instruction (i.e., the domain of consequence) on herself and her students. She specifically expressed that, as she integrated CRP into her practice, she began to realize that she and her students experienced what she described as certain “inevitable” consequences. The first of these consequences involved her perception that, through CRP, she was gaining additional knowledge of her students, specifically, their cultural heritage, and that they seemed to realize that the mathematics curriculum could reference that heritage in ways it generally did not. In a middle-stage conversation, she explained how, on certain days, she used her increased knowledge to adapt the curriculum to be clearly relevant to some of their heritages. In particular, in the lesson plan for the 5th day (Lesson 5: More Graphs of Functions), Ms. Collier noticed that the Illustrative Mathematics prescribed lesson

included graphs representing the population of babies born in various US states. In response to several students' Latinx heritage, Ms. Collier decided to “remix” (i.e., adapt and recontextualize) this graph and the activity so that they included data and prompts about babies born in several Latin American countries.

So when I got to the first graph about the Latin babies born and I was like, "Raise your hand if you feel represented now"... I did not know that [so] many of them were of Latin descent. You saw my face? In my mind, I thought it was [only three of my fifteen students]. But no, THERE WERE SIX HANDS! I was like oh, OH! I said that in my reflection...enacting CRP today help[ed] [me] to know [my] students more and learn things about them that [I] don't even know.

Ms. Collier expressed her amazement at how her implementation of the CRP unit had compelled her to develop new understandings of her students, their home communities, and their cultural heritage. In the middle stage of the CRP unit implementation, it seemed that she was developing a greater urge to discover more about her students' backgrounds as a way to be more inclusive of them in her curriculum and instruction.

The second consequence or *realization* was that, as a result of her CRP implementation, Ms. Collier reported becoming more aware of her levels of stress as a teacher and, in particular, that she was less stressed out about her students and their mathematics learning than she had been prior to the CRP unit. She explained that this was because she no longer dreaded introducing a new topic to her students.

I usually feel stressed. [Even if] the lesson is disastrously bad...I'll still be able to manage to get through...[but] I'm struggling. To the point where I'm texting my coach, please save me. She's like, what is going on? And I'm like, they've been like this for three months. Except for that one time you came in and co-taught with me, they've been like this for three months on and off. Like yesterday they were good because I did the CRP lesson, but other than that, nope, nope...I got stressed again because I was like, their ability to formulate complete thoughts just really, really stresses me out. [I just want them to] create complete sentences when they're talking about math. I [work on] it every day Kelly. I do it every day. Every day of their lives. Since I've met them!

She described this particular stress as resulting from a combination of her students' understanding or not understanding a given lesson and, in particular, her students struggling to formulate a complete conjecture in response to their understanding of these lessons. Ms. Collier seemed stressed, in part, because she wanted her students to develop the skill of formulating complete conjectures. She told me she was motivated to have her students work on this skill until they mastered it and demonstrated it in their mathematical discussions. To be clear, it was not that CRP added to her stress. Ms. Collier noted feeling less stress when she implemented CRP than when she did not.

Ms. Collier came to a third *realization* about the consequences of her engagement with CRP, specifically, her having developed a stronger desire to be a change agent for her students so that they too might become change agents. She

expressed to me that she would like to become a teacher who works to change systems and practices that keep Black and Latinx students like those she teaches from reaching their full potential as students in school and sociopolitical beings outside of school. In the middle stage, Ms. Collier returned to her goal of building students' life skills alongside their mathematical skills. In one of our middle-stage conversations, I commented to her that she was ultimately asking her students to “think beyond the math.” To this, Ms. Collier responded:

I think it translates to - it's bigger than math for me. Math is just a stepping stone. You're in my math class, but you're in my life class. You're in my life class. You're learning how to be a better person overall... Yeah, you're going to be a better mathematician. You're definitely going to do that. That's a given. It's not even up for discussion. That's going to happen... I'm going to teach you some other things, too, because I want you to take these things with you for the rest of your life.

It seemed clear to me that, through reading about and discussing CRP literature, Ms. Collier had learned about what a teacher as a *change agent* might look like and was becoming more intentional about how she might enact that understanding. Before reading CRP literature, it was clear that “change agent” was not in her vocabulary. She lacked a term that perfectly described her commitment to her students and helped her articulate why she ‘went to bat’ for them over the years.

***End: Domain of Consequence Refocus***

During the last days of the CRP unit implementation, Ms. Collier reflected on how using her newly developed CRP lens allowed her to *refocus* her teaching on the

responsiveness of classroom discourse. Specifically, by attempting to facilitate student talk and center student voices better, she believed she became more focused on humanizing her students as learners and people. Earlier, I described a middle-stage lesson in which Ms. Collier had positioned her students as teachers and herself as a silent observer. Reflecting on that experience, she noted that “...what [CRP] allow[ed] me to do... I think I said this the other day, trust [my students] more, right? And trust the process.” As Ms. Collier described it, becoming more of a facilitator led her to two powerful and related realizations: (1) to trust her students with teaching the class and (2) to trust her students to “own” their learning. Consistent with this, she reflected that she did not always have to act as “the G.P.S.” to navigate students to understand the mathematics; they could be trusted to do that for each other. Consistent with CRP, she believed that positioning her students as facilitators of their own learning both empowered and humanized them.

At the end stage of the CRP unit implementation, Ms. Collier also described that her *(re)focus* amplified her holding high expectations for her students both inside and outside of her classroom with the goal of empowering them for life inside and outside of school. She was very adamant about teaching her students life skills and integrating them into every unit plan; her high expectations for her students were to aid in their growth as citizens with a focus on them as persons. While reflecting on why she set expectations apart from school, Ms. Collier expressed:

It [i.e., high expectations] translates over to - it's bigger than math for me. Math is just a stepping stone. You're in my math class, but you're in my

life class. You're in *my life class*. You're learning how to be a better person overall. Yeah, you're going to be a better mathematician. You're definitely going to do that. That's a given. It's not even up for discussion. [But] I'm [also] going to teach you some other things, too, because I want you to take these things with you for the rest of your life... Yes, it's not academic. And it goes back to, I'm developing an entire person, right? That's why I'm focused on the math. And, yes, this is all rooted in the math, but the reality of it is, I want you to be better overall.

Ms. Collier recognized that, by refocusing her practice to make it more culturally relevant, she could embody a passion for creating better mathematicians and molding her students as people. When I inquired about what specific life skills a class project in mathematics might advance, Ms. Collier pointed to a classroom episode where she expressed the following affirmation statements to her students:

I improved the way I express myself.

I improved my confidence in general.

I improved my ability to speak in front of a group of people.

I improved my ability to explain something to somebody else and have it make sense.

I improved my ability to write a complete sentence.

I improved my ability to create a presentation for a class and present it.

Although applicable to mathematics education, these affirmations transcended mathematics teaching and learning. Ultimately, through implementing CRP, Ms.

Collier became more aware of how mathematics education could be used as a conduit for developing her students' life skills.

Finally, through engaging with CRP, Ms. Collier reported having established a new desire to strike a “balance” between her being a master of mathematics content and a master of cultural competence regarding her students. In our third-to-final interview, she shared her thoughts on the importance of striking a balance between these two kinds of teacher/instructional mastery:

You will be effective because you are considering students in everything you do. You're considering them and like, what they actually care about versus just being like, okay, let me just teach this curriculum because it's Tuesday and this was on the lesson plan or this was in [the] pacing guide for Tuesday. I think a lot of people go down that road, and it's just like, that's not how you connect with kids. So even if I build relationships with kids, if I'm not competent in my content *and* competent in what they actually need to know, [*and* also know] how to connect that to who they are, it goes out the window again... You gotta have that balance of I'm a master of my content, and I'm a master of being a culturally competent teacher.

In sum, through engaging with CRP and a cycle of enactment and self-reflection, Ms. Collier became more intentional about balance. She felt this balance described the culturally relevant educator she desired to be.

### ***Final: Domain of Consequence Remix***

In Ms. Collier's final-stage reflections concerning the notable consequences of her implementation of CRP, she discussed her *remixed* and increased attention to

student voice and the value she had for them as students and people both inside and outside the classroom. When asked how CRP impacted her approach to teaching, Ms. Collier responded:

It has definitely made me think more about student voice in a way that I didn't think about it before... But I think that it definitely has shifted my thinking about how to really push students to use their voice not only to communicate ideas, help each other, but also to create change. Like how do we transition that into the social justice piece and get to using these numbers to create change.

By the end of the study, Ms. Collier saw that CRP had helped her to *remix* her practice from one that, moving forward, would be very much mathematics-focused while also striking a balance between developing her students as mathematicians and as whole people - even change agents. She had arrived at a *remixed* mindset that she no longer just taught mathematics but taught *people* mathematics. She believed this new mindset would aid her in making the mathematics curriculum more relevant and accessible to her students.

In the final stage, it was clear that Ms. Collier's remixed focus on her students also contributed to the importance that she now associated with *remixing* the curriculum. Ms. Collier noted one of the reasons she was excited to continue to remix the curriculum to make it more culturally relevant was because her school had used this particular curriculum for three years, which meant that, since her students were currently 8th graders, "they ha[d] [never before] seen themselves in the curriculum." During our final interview, she observed that her Black and Latinx

students “[were] able to really see themselves in problems or connect these math concepts to their everyday lives and the things that they're interested in.” Ms. Collier concluded that a *remixed* curriculum could be a “powerful tool.” A consequence of integrating CRP into the mathematics curriculum was that Ms. Collier came to recognize the value of student representation in the curriculum, having used both a prescribed curriculum with surface-level cultural representation and a *remixed* curriculum that was intentionally representative – a reflection of who her students were as people and members of specific communities.

### **Personal Domain**

To explain Ms. Collier’s reflections within the personal domain that seemed to result from her engagement with CRP, I used the guiding question: What knowledge, beliefs, and attitudes did Ms. Collier attach to her having enacted culturally relevant pedagogy? I describe Ms. Collier’s reflections on her personal domain in the beginning, middle, end, and final stages of the CRP unit implementation. As elaborated below, in each stage of the CRP unit implementation, Ms. Collier generally reflected on one theme in particular: *awareness* in the beginning stage, *believing* in the middle stage, *knowing beyond* in the ending stage, and *humanization* in the final stage.

#### ***Beginning: Personal Domain Awareness***

Due to the gradual increase in the degree to which CRP was being implemented, there was no CRP implementation within days 1-2; however, during these conversations, Ms. Collier reflected on an internal awareness of her students. This awareness was brought forth by reviewing her students’

Mathographies and planning the CRP unit. Ms. Collier described an aspect of knowing her students as being aware of their “levels of achievement, engagement, and class participation.” She also expressed that she had an awareness of her students “as mathematicians” and, as a part of creating the unit plan for this study, being able to “forecast” their mathematical conceptions and misconceptions both prior to and during teaching a lesson.

Developing and teaching the CRP unit seemed to award Ms. Collier with a better understanding of herself as a teacher and person. In the early stage, as a personal goal for her teaching, Ms. Collier reflected on her desire to increase her awareness of her usage of voice and tone while teaching. When reflecting in the Domain of Practice, she mentioned her tone dealing with her word usage, and in the Personal Domain, she referred to how she could use voice and tone to exhibit care for her students during instruction. This mattered to Ms. Collier because, as she attested, “I’m coming from a place of love. Everything that I do and I say... And I tell them that every day, you know I love you.” However, Ms. Collier knew regulating her voice and tone would be challenging. As she explained:

I know what [my voice] sounds like. And I think people don't think that I know what it sounds like, but I know exactly what it sounds like. I've watched myself teach, I've watched recordings of myself, and I go, "Wow, that's really intense". ... And I think that if you were just an outsider looking in, and if you had no context on me and you've never really watched my class, it might seem like my whole purpose is to intimidate people's children. It might seem like I'm the biggest bully of life. But my students know [me

personally], and they never feel bullied because they know that my tone is the same tone all day, every day. That's the first thing. This is not an intentional tone, this is just what I sound like.

Ms. Collier expressed that she was aware that her voice and tone might display a persona that may be perceived by some students and others differently than how she perceives herself - that is, her true self and true intentions. Even though Ms. Collier was aware that her students knew that she cared about them (i.e., she was a *warm demander*), she still desired for others (i.e., teachers, administration, or other education stakeholders) who viewed her teaching to recognize that same care when they observed her.

***Middle: Personal Domain Believing***

In the middle stage of the CRP unit implementation, there were certain personal *beliefs* that Ms. Collier reported intentionally seeking to update and fine-tune. The first was her belief in her students' mathematics ability and how she communicated this belief to them.

Reaffirming their abilities, like, "You can do it. You can do it." So even when they stop and they choke, because sometimes Sandra trips over herself. It happens. They all do it. And so even when they stop or they go, "Wait, I don't even know what I'm talking about. Forget it." No, no, no, no, no, no, no. Stop. Think -" "We're going to get through this together." And so affirming for them, letting them know like, "You can, and you will be successful."

To clarify, based on my observations of her teaching prior to the CRP unit, it was clear to me and others that Ms. Collier has always believed in the mathematical

ability and assets of her Black and Latinx students. However, in her engagement with CRP, this belief became crystalized for Ms. Collier, and she became more intentional about verbally affirming her students, assuring them that she believed in them during instruction.

At the outset of the study, Ms. Collier expressed the belief that she effectively met the academic needs of her students. She described herself as an “advocate” for their academic success. However, as she implemented CRP, she intentionally took time to reflect on how she had already met her students’ academic (and other) needs and why she felt it was vital for her to do so. In one middle-stage conversation, she reflected on *how* she became conscious that she met her students’ needs by offering them “grace” during the lesson:

Meeting [students] where they are is a big thing. Not always, I don't make assumptions that kids remember anything. Because people forget stuff. You don't use it, you lose it. That's the rule. And sometimes they lose the very next day...so I always take into account that there are going to be situations where I'm going to have to talk about something that was not in this lesson plan. I'm gonna have to go back...

In the same middle-stage conversation, Ms. Collier provided a second example of how she offered a different student grace, in this case, taking 30 seconds during a whole class discussion to review a skill that she felt was important that this student should master as part of advancing their current learning and understanding:

I had to go back and teach a kid how to borrow and carry in a subtraction problem because when we were talking about the number of [music] streams,

[and] we were using decimals. We were talking about, this is [how] many intervals apart from each other, so they ended up being decimal numbers. And so when [my student] was trying to subtract, [they] got stuck. And I was like, "Okay, so what do we do?" And so I had to end up doing a 30-second review on subtraction. So I was like, You know what? If I just leave [the student] there, there's a gap unfilled. So acknowledging [they] need that gap filled real quick, it doesn't take that long to trigger that reminder in your brain, "Let me take that moment to do it." And so meeting them where they are, and then pushing them back to the point where I want them to be.

Reflecting on the "why," Ms. Collier recalled being so focused on meeting students' (mathematical) needs by providing them grace that she naturally enacted a tenet of CRP without realizing it. In a middle-stage conversation, she stated that "just making that effort [at providing grace was] a part of being culturally relevant. Not letting any [student] just fall by the wayside or fall behind, but really considering, like, "Hey, I see you. I recognize you. I want you to be successful, too."

In the middle stage, Ms. Collier also resolved to reposition herself as a true facilitator of student learning and, as part of that, share some of her institutional power with her students. This remixed positioning, she believed, would not only benefit her students but would be a better and more beneficial personal experience for her as a teacher. During a middle-stage interview, she confirmed:

What I've learned in this process is ...The greatest teachers walk with their students. You walk with them, you don't walk in front of them, you don't

walk behind them; you walk side by side with them. Until they don't need you anymore, then you let them lead. But you ain't really ever in front. If you think you're in front, you're doing the wrong type of teaching. And so one of the things that I'm trying to do less or do more of is lead from the back. I want to be in the back. I want them in the front. That's my overall goal, is that they're in the front. And I'm just watching and smiling, letting them lead.

Apparently, through engaging with and implementing certain CRP tenets, Ms. Collier grew to believe that if she provided her students with the skills they needed to perform well, they could take greater ownership of their mathematical learning. Thus, by the middle-stage, Ms. Collier described how she had become consciously committed to leading from the back by helping her students when necessary but by allowing them the space and authority to lead their learning.

***End: Personal Domain, Knowing Beyond***

At the end stage of implementing CRP, Ms. Collier reflected on how she would like to improve how she got to *know* her students *beyond* the classroom. As a result of the transition to full-time online learning during the pandemic at the time of the study, she described a particular needing to know more about her students' families - their traditions, make-up, and current circumstances. To be clear, she did this before the study, but teaching the CRP unit virtually inspired her to do even more in this regard. During a lesson towards the end of the CRP unit, I observed Ms. Collier speaking to one of her students' siblings by their name while she was teaching. Later reflecting on that interaction, she told me, "I know everybody's

siblings.” She then compared situations where two of her students had a younger sibling in their presence during her class, noting:

Emily who [was the student who] had the child in her lap doing her hair. And I was like, I know you're not responsible for this child. I know there are adults in your household, and you are not responsible for the child right now. Which is why she quickly removed the child [from her lap]... Where it's like, Sandra, I know your parents. I know your parents work all day and all night. I know they do. So it's very likely that you, and that little baby, are in there by yourselves. And you are responsible because you are the oldest.

As part of getting to know her students beyond the classroom, Ms. Collier did not condemn Sandra for her sibling's presence while she was trying to learn. However, as she later told me, she did call out and redirect Emily because she knew that her parents were physically in the household at the time. Ms. Collier seemed to know the situations and circumstances of each student's family, yet, even though she understood that many faced hardships, she did not view them or treat them or those hardships as a hindrance to her teaching.

Knowing students beyond the classroom also involved Ms. Collier developing relationships with her students' parents. In the end stage, during a lesson observation, I witnessed Ms. Collier take a brief phone call with a parent while one of her students led the lesson. Reflecting on this interaction with me afterward, Ms. Collier noted that this student's father rarely called, even though she had had his daughter in her class for the previous two years. Given this, she did not want to miss an opportunity to speak to him, even though it caused a brief disruption to her teaching. She stated

that “he just called me about a summer job [for his daughter]. And he's a great parent, so I did not want to not talk to him and miss his call. I knew he ha[d] a busy schedule.” For this father to reach out to Ms. Collier about a job for his daughter exhibited a level of trust in their teacher-parent relationship. For the parent to feel comfortable enough to diverge, the information of his work schedule also contributed to Ms. Collier knowing her students, their families, and their communities beyond the norms of how a teacher commonly knows their students. Hence, she attached further *knowing beyond* to implementing CRP.

***Final: Personal Domain Humanizing***

After implementing the CRP unit, Ms. Collier offered a final reflection on changes to her personal domain concerning a newfound commitment to humanizing the Black and Latinx students in her urban mathematics classroom. As she described it, this involved her reflecting on the experiences she provided for them in her classroom.

I think a lot of the times teachers unintentionally create environments where students become dependent on them. I want to teach students independence. You don't need my brain to think for yourself. You really don't. I'm here to fine-tune. I'm not here to create the thought. I'm here to fine-tune the thought. So, I think that CRP allows for students to explore things a little bit more than this direct instruction approach that most math teachers have.

Here, Ms. Collier contrasted the apparent dehumanizing consequences of traditional instruction and how CRP can help to make school mathematics more humanizing for

students. Ms. Collier recognized and believed that traditional mathematics classrooms – which might even be described as a “pedagogy of poverty” – generally do not allow students to think for themselves, much less learn through exploration. Ms. Collier’s description of traditional mathematics instruction depicted the opposite of what she wanted for her classroom and her students. When I asked Ms. Collier her overall perspective on implementing CRP in her math classroom, her response attributed to her newfound personal belief in humanizing students.

I think it's important to do because students need to feel valued, and feel recognized, and feel seen, and heard, and as though they're a part of something bigger than themselves. I think that CRP provide[d] an avenue to do all of those things.

This illustration evoked how Ms. Collier wanted to position students as empowered learners. She felt that CRP enabled her to position students in this way. She implied that, when practice is rooted in CRP, particularly for Black and Latinx students in urban mathematics classrooms, it makes humanization possible, if not inevitable.

Ms. Collier also believed that the changes she made in the curriculum and in her practice amounted to a humanizing experience for students, which she coined rich learning experiences. As Ms. Collier reflected on her need to provide rich experiences, she noted her reasoning being,

... just like, it allows for just deeper things to occur. Students might not walk away remembering every single math topic I've taught them ... But for me, it's like, you get to provide rich experiences. It's not just these curriculum written generic experiences. Where kids come in every day, open up your textbook,

go to page 14, do slides five through ten. It's more than that. It's more than that. And it creates joy. It creates accountability. It creates a lot of good things that kids need to experience that I don't think they're getting to experience a lot these days.

Ms. Collier centered these rich learning experiences on her students. However, I would argue that they were personally centered. Her newly acquired knowledge of CRP personally impacted her need to want to remix the curriculum in a way that humanized her students, an aspect of her innate othermothering and belief that if the content were culturally assessable to students, then it would impact student learning. CRP created an environment where Ms. Collier acquired new knowledge of the importance of creating rich learning experiences for her students, which impacted her belief in an ideal learning context, which altered her personal attitude concerning the needs of her students, which affected her joy.

### **A Change in Perspective**

As an apparent result of this study, Ms. Collier sought to further develop her expertise with CRP by enrolling in a Master of Arts in Education program. While reflecting on her experiences implementing culturally relevant pedagogy, she began planning for and writing her Master's Thesis on the topic. More specifically, centering her concern for her Black and Latinx students, she focused her thesis project on translating the theory of culturally responsive pedagogy into practice. It was not until our final interview that I learned this research study inspired Ms. Collier and chose to use culturally relevant pedagogy and culturally responsive teaching as the foundation for her research. Ms. Collier's Master's Thesis research positioned her

to be even more reflective of her practice while participating concurrently as a reflective teacher practitioner in this study; she fulfilled the attributes of a reflective teacher according to Valli (2007) as described in the Literature Review.

Ms. Collier’s overall goal for participating in this study was to “develop [her] teacher toolbox.” In doing so, she examined herself, her practice, and the consequences she experienced with having implemented CRP. Throughout the study, we had numerous conversations about her ever-changing perspective on implementing CRP. In Table 5, I organized the results of her perspective at specific times during implementation.

**Table 5**

*Ms. Collier’s Perspectives Throughout CRP Implementation*

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<b>POINT WITHIN IMPLEMENTATION</b>	<b>DAY</b>	<b>PERSPECTIVE</b>
BEGINNING	DAY 3	It’s not about the curriculum, it’s about the teacher.
MIDDLE	DAY 5	It’s not your personality; it’s your pedagogy.
END	DAY 8	It’s about the curriculum AND who the person is.

---

As discussed in the Conceptual Framework, Ms. Collier entered this research already embodying some of the dispositions, knowledge, and skills Villegas and Lucas (2002b) named in their framework of being a culturally responsive mathematics teacher. The three perspectives named in Table 5 were her responses to the question: Did implementing CRP today impact your personal knowledge, beliefs, or attitudes

about teaching math in an urban school? To clarify, this question was grounded in teacher change theory, understanding that Ms. Collier could experience change while implementing CRP in her mathematics classroom.

Ms. Collier's perspective on CRP in the beginning stage of the unit implementation was that *it's not about the curriculum, it's about the teacher*. She reflected:

I've always known I'm a great teacher. I don't question that, right. And I always thought it was like, oh, it's because you have a cool personality. And it's because you care. Because that's just the type of person that I am.

At this point, it was Day 3 of the CRP unit implementation. As such, Ms. Collier had not yet experienced a change that she deemed significant personally or in her practice teaching math while implementing CRP. That is, she solely attributed her and her students' success to who she was as a person and as a teacher rather than her attempt to make her mathematics curriculum and instruction more culturally responsive.

Ms. Collier's middle-stage perspective was that *it's not your personality; it's your pedagogy*. At this stage, she stated:

[It must be] based on the fact that I'm really, really good at explaining math... But what it really is, is I've subconsciously considered all of these factors about these kids, and incorporated and infused that into the practices that I deliver when I teach these children. And so doing this process with you (the researcher) has allowed me to see like, okay, it's not your personality; it's your pedagogy. It's how you act - Right? It's like, it's the practices that I do on a daily basis, the things that I didn't have...I wasn't able to put names to, like

affirming my students' abilities. I would never call it that before right now. I was just hyping them up!

On Day 5, Ms. Collier expressed to me that she had come to recognize that she was experiencing change by engaging seriously with CRP. Ms. Collier reflected that her teaching style and approach to teaching both impacted her and her students' success. She calculated that it must be about how she positions herself within the classroom and her purposeful incorporation of students' culture void her personality being a variable.

At the end stage of CRP implementation, on Day 8 of the unit, Ms. Collier concluded that *it's about the curriculum AND who the person is*. She recalled an observation she made about her whole class and one specific student's excitement during a lesson:

I saw the most genuine smiles today. They smile at me sometimes, but [today] they were like [just different] ...When I said, "Melanie Martinez" (a current music artist) and Camille's face lit up like Christmas morning, I was like, "Oh, I did something right."

For Ms. Collier, the smiles and Camille's excitement were confirmation. She felt that she successfully remixed the curriculum for cultural relevance to her students; the pedagogical move resulted in the mathematics not only being accessible but engaging for her students.

Ms. Collier further described her meaning behind her statement *who the person is* by reflecting on her personal authenticity and warm-demander respect for students:

I think that there's the fact that I'm authentic and I hold kids accountable, but also, ... I build and create this mutual understanding between me and my students of, number one, respect. We going to keep it respectful. Honesty. I'm going to tell you the truth. I don't have a reason to lie to you, and I hope you wouldn't lie to me. Now, are you going to lie to me? Yeah. Because you're a kid, and that's what you all do. So now I'm going to call you out on it and be like, so, you know I know you just lied, right? And so, I think even doing things like that with my students. Holding them accountable no matter what, no matter what.

Ms. Collier described her authentic self as a respectful, honest teacher and, most importantly, someone who holds their students accountable to the utmost. She holds her students accountable as people but also holds them accountable as mathematicians.

It's just certain things where [my students] know "Ms. Collier is going to do that." But I think it also creates a very safe space for learning. When it's like, "if I get this wrong, I know this lady about to tell me I got this wrong, and she going to make me do it again." It's not like, "I'm just going to sit here and get it wrong, and we going to all move on. She's never going to leave me behind. And she's never going to get off my case."

Ms. Collier referenced the attitude that her students believed she took on during instruction. She pushed them to learn and to do their best, and they knew that this was part of her authentic self, who she was as a person. She pushed them because she knew that they were capable.

It is important to look at Ms. Collier's change in perspective cumulatively over the course of her CRP implementation. Each of her three perspectives individually will not illustrate the impact of her change. When weighing her change in perspective from beginning to end, only then will you understand this inner tug-of-war that Ms. Collier experiences on what has the most impact on student learning for Black and Latinx students in the urban mathematics classroom.

### **The Reality of CRP Implementation**

It is crucial to note theory-to-practice implementations of CRP, particularly in the mathematics classroom, are complex. While Ms. Collier set out to implement each tenet of CRP (i.e., *student learning, cultural competence, and critical consciousness*), that was not the case; that is, not the reality of her implementation. While co-creating the CRP curriculum unit plan for implementation, Ms. Collier and I decided that the unit would include her students' cultural referents (to focus on her *cultural competence* as a teacher and the cultural relevance of the curriculum) and that she would, in addition, attend to *student learning* throughout Days 1-8 of implementation. We also decided to co-create a separate mathematics project to attend to the development of students' *critical consciousness*.

The project started by introducing students to the idea of *social justice mathematics* and its importance. They would watch a video on the subject and learn about its characteristics through a "Prezi" presentation created by Ms. Collier. Next, students would choose one topic from the list: Black Lives Matter, deaths by police, or immigration, or a topic that they chose (e.g., students suggested access to healthcare); all of the topics were chosen based on their cultural and critical impact in

the city where the students lived. Students were given the following instructions based on their choice: Create a project centering on racial injustice or inequity, given your chosen topic. Explain how your project is an example of social justice mathematics by including the following items and a two-paragraph explanation to illustrate any data you would like to inform your classmates about.

- Model graphs
- Include data tables
- Show functions
- Show how data in a table relates to graphic representation
- Decide which representation is an appropriate representation of your data

All of the students' project deliverables would also identify an understanding of the mathematics topics covered during the CRP implementation unit plan centered on algebraic functions. Students were to use websites outlined by Ms. Collier while data mining.

During the Final interview, which took place after Ms. Collier's implementation of the CRP unit, we discussed her experiences with implementing the *critical consciousness-centered* project. She first shared with me that she allowed students time in and out of class to complete their projects. Ms. Collier reflected that, while students were diligently working during a class session:

I never formally thought about using social justice topics as a means to teach mathematics, but now that my students are conducting their research on how functions can be used to model trends in various topics such as gun control,

immigration, and access to health care, I am starting to see that this teaching method can be quite powerful.

Once the project was underway, Ms. Collier said she started seeing the benefits of implementing social justice mathematics and its powerful, thought-provoking impact on her students thus far. Unfortunately, this excitement was soon diverged due to the way that (her pre-chosen) websites organized and displayed data. About this, Ms. Collier explained,

One of the things I realized most graphs do, which is really weird, [is that] with demographics and [when] related to race, is [that] they group Hispanics with white people, which is fascinating. I had to tell the kids. I was like, I'm really sorry. It was like every graph I found. [And] I didn't realize that [ahead of time when websites were chosen]. They were like "What? Really? That's crazy. I'm offended." And I was like, I'm offended for you.

Ms. Collier's Latinx, as well as her Black students, were offended because they were not able to initially get the data they desired. Ms. Collier shared with me that she was mortified and kept apologizing to her students because she realized they could not complete their project without additional research to find the correct data on their city's Latinx population. She stated that she responded to and challenged students by saying,

There's a misrepresentation of your people on a graph, what you going to do about it? What can we do about this? We could write a letter, we could do this. We could do that. So just getting them to think about it because I want

them to be active citizens and really understand that numbers have power. It's not always just about solving for X. It's not always just about graphing. It's really about understanding numbers, how they're working, and being able to apply them, and literally solve real problems, not just equations.

With this new and unfortunate discovery, Ms. Collier changed the project guidelines. She decided to create student groups for them to work in, and some of the topics were changed due to how easily online data could be ill-displayed and misinterpreted. As a result, Ms. Collier's students could not truly experience critical consciousness and social justice mathematics as we planned. Unfortunately, this was the reality of CRP implementation for Ms. Collier.

### **Conclusion of Part 2 Findings**

This chapter answered the second research question concerning the change in practice and change as a Black mathematics teacher of Black and Latinx students experienced by Ms. Collier. In particular, any change experienced while implementing CRP in her urban middle school mathematics classroom with her Black and Latinx students. These findings emerged during and after CRP implementation. Findings suggested that change for Ms. Collier occurred within each domain of the Change Environment (detailed in Chapter 2): Domain of Practice, Personal Domain, and Domain of Consequence. There was also evidence that Ms. Collier experienced a change in her perspective on implementing CRP. In the next chapter (Chapter 6), I discuss the implications of Ms. Collier's understanding of CRP and change in practice, report on the affordances and limitations of this study, and establish goals for future research.

## **Chapter 6: Discussion and Implications**

This final chapter begins with a summary of the two main parts of this dissertation study. For both parts, I provide an overview, discuss their research designs, and then present their results. I then consider how all results contribute to and connect with the literature on culturally relevant pedagogy (CRP), culturally responsive mathematics teaching (CRMT), CRP in online education, and Black mathematics teachers of Black and Latinx Students. The chapter then discusses the implications for educators, including pre-service teachers (PST), in-service teachers, and mathematics teacher educators (MTE). I conclude the implications section by discussing the implementations for researchers studying CRP implementation. Lastly, I end this chapter with some final conclusions and suggestions for directions for future research that impacts the mathematics teaching and learning experiences of Black and Latinx students.

### **Overview of the Study**

The purpose of this study was to examine how an experienced and highly regarded Black middle school mathematics teacher, Ms. Collier, understood the theoretical and empirical literature on CRP and any change in her practice experienced due to implementing CRP. Ms. Collier was identified as the main participant in the study due to her tacit knowledge of CRP that she demonstrated in practice. However, she had never formally studied CRP and thought about how to apply CRP principles to her mathematics teaching. As such, the project began with her and I jointly reading and reflecting on CRP and CRMT literature that I believed would allow her; to fine-tune, if not “remix,” her mathematics instruction to make it

even better aligned with the key tenets of CRP and CRMT in the existing literature. The Part 1 findings (see next section) uncovered Ms. Collier's understanding of CRP and revealed two new themes. Ms. Collier experienced changes in practice, understanding, and mindsets, having implemented CRP that were explained according to teacher change theory. As discussed in the Part 2 section below, she also experienced a change in perspective about implementing CRP in an urban school mathematics classroom with her Black and Latinx students.

### **Part 1**

As indicated, the dissertation findings were separated into two parts, each guided by a central research question. The first research question concerning Ms. Collier's developing understanding of CRP drove Part 1 of this study centered on a curated professional development (PD), where she and I studied theoretical and empirical literature on CRP. This PD gave Ms. Collier a knowledge base in which she could now name and critique her practice concerning CRP in her urban mathematics classroom. In particular, the analysis of transcripts from video-recorded conversations and interviews from Part 1 showed that Ms. Collier gained an understanding of Ladson-Billings' three foundation tenets of CRP: student learning (formally called academic achievement), cultural competence, and critical consciousness. In addition, Part 1 results also crystallized two themes of CRP, classroom domain and teacher mindset, that, although implicit in the literature, are not typically, if ever, named and emphasized.

With Ms. Collier's newfound knowledge of CRP, she and I co-created a unit plan (Linear Functions and Accompanying Models) that she implemented. The unit plan was remixed (from an Illustrative Mathematics unit plan) with her students' cultural attributes and planned for implementation over eight days. Her reflections on this implementation were the focus of Part 2 of this study.

## **Part 2**

Ms. Collier's experiences during the CRP unit implementation offered answers to the second research question concerning the changes in her practice and person (as a professional) resulting from CRP implementation. Utilizing the three domains of Clarke and Hollingsworth's Interconnected Model of Professional Growth (IMPG): The Change Environment, I organized her reflections on her experience and perspectives on changes to her practice and herself as a teacher into themes. Within the Domain of Practice, the themes of *realization*, *intentionality*, and *refinement* emerged as being particularly salient to Ms. Collier during the implementation stage. Within the Domain of Consequence, themes of *realization*, *refocus*, and *remix* resonated in her reflections on herself as a practitioner. Furthermore, the themes of *awareness*, *believing*, *knowing beyond*, and *humanization* emerged in the Personal Domain. Part 2 of the study concluded by reflecting on Ms. Collier's journey of Change in Perspective while implementing CRP in her urban mathematics classroom.

## **Connections and Contributions to Research Literature**

The results of this study offered multiple connections and contributions to the literature on culturally relevant pedagogy (CRP) and culturally responsive

mathematics teaching (CRMT), along with research on highly regarded Black teachers.

### **CRP and CRMT**

Effective mathematics teaching practice acknowledges the deep connection between theory and practice. In 2018, Brown et al. noted the need for scholars to engage in explicit theory-to-practice research about cultural relevance in STEM (inclusive of mathematics) classrooms. That is, the empirical documentation of the praxis of CRP in mathematics needed to be more extensive. For example, Rousseau Anderson (2021) asked, “Why do we not see more examples of culturally relevant pedagogy in mathematics?” (p. 378). Moreover, having conducted this research, my response is that because theory-to-practice implementations of CRP, particularly in the mathematics classroom, are complex, teachers’ use of CRP differs from teacher to teacher (Brown-Jeffy & Cooper, 2011). Particularly given that, as this dissertation shows, the implementing CRP is not limited to teaching practices but includes teachers’ reflections on their sense of being. So, how one teacher implements CRP in their mathematics classroom will unavoidably differ from another teacher’s implementation.

### ***Connections and Contributions to CRP and CRMT Literature***

This study has multiple connections to research literature involving CRP and CRMT and offers meaningful contributions to both. The two most commonly used implementation models for CRP, specifically in the mathematics classroom with students of color, have been Culturally Relevant Mathematics Pedagogy (CureMap;

Rubel & Chu, 2012) and Culturally Responsive Mathematics Teaching (CRMT; Bonner & Adams, 2012). One connection to research is that this study utilized Bonner and Adams' (2012) CRMT framework because it was the framework that most closely aligned with Ladson Billings' foundational CRP framework offering a remix for mathematics classrooms. Ms. Collier's practice connected to the literature because it illustrated elements of CRMT's four cornerstones (discussed in Chapter 2). In the cornerstone of knowledge, Ms. Collier displayed MKT and had vast knowledge of her students, their cultural attributes, and their families. This knowledge favored Ms. Collier with the next cornerstone of CRMT, relationships. Ms. Collier's knowledge of her students was extremely beneficial in helping her build trust and strong relationships with her students. Based on Ms. Collier's self-reflections and my observations of her teaching, she supported their growth inside and outside the classroom as students and citizens, just as CRMT literature suggested, which forged trust between them (Ms. Collier and her students). She explained that the trusting relationships they built and maintained made way for Ms. Collier to communicate with her students, the next CRMT cornerstone. Ms. Collier utilized everyday language while teaching and communicated mathematics through students' cultural (and generational) referents by incorporating music artists, football players, and a youth credit card. The last cornerstone of CRMT was reflection and revision. Not only did Ms. Collier rely on reflection and revision throughout her instructional practice with implementing a CRP unit, but she also applied a critical lens to reflect on and remix curricular content to make it more accessible for students' learning and to give her Black and Latinx

students status and power in the mathematics classroom as suggested by Howard (2003) and Bonner (2021).

Another connection to the literature was in McKinney et al.'s (2009) study that examined the mathematics teaching practices of mathematics teachers of exclusively Black and Latinx students. Although this research intended to examine mathematics-specific teaching practices while implementing CRP in the mathematics classroom, it was inevitable that it also indirectly examined teaching practices. McKinney et al.'s study showed that practices reminiscent of the pedagogy of poverty remained prevalent in urban mathematics classrooms, with teachers implementing traditional mathematics methodology instead of student-centered approaches more consistent with CRMT. Teachers surveyed in their study strictly adhered to the mathematics curriculum and pacing guides mandated by their district (or school) without adding personal creativity to the curriculum. Studying Ms. Collier's practice was unique because she did not entirely share these practice attributes. Her practice was student-centered, as one who implemented CRP's practice should be. Her pedagogy was literally remixed with her students in mind. Even though Ms. Collier used the prescribed curriculum (Illustrative Mathematics), she added her personal creativity when she remixed the curriculum to include her students' cultural traits. Ms. Collier intentionally created an environment conducive to students learning from her and learning from each other.

Ms. Collier's practice was actually in opposition to the pedagogy of poverty. It utilized (students') culture in the instructional process, which does not

reflect the pedagogy of poverty. Ortiz (2018) and Tate (1995) both argued the vast differences between CRP (Ladson Billings, 1995) and the pedagogy of poverty (POP) (Haberman, 1991). Ortiz described POP as saturated in monotonous lecture, practice, and assessment forms, while CRP was an equity pedagogy. Tate described the POP as not being a practice that centered the needs and experiences of [African American] students. Another way that Ms. Collier's practice was oppositional to the pedagogy of poverty was that she invited her students to share/have power in her classroom. During the final interview, she reflected:

I think one of the things that teachers need to also do, and what I've learned in this process is ...The greatest teachers walk with their students [in their process of learning mathematics]. You walk with them, you don't walk in front of them, you don't walk behind them; you walk side by side with them. Until they don't need you anymore, then you let them lead. But you ain't really ever in front. If you think you're in front, you're doing the wrong type of teaching. And so one of the things that I'm trying to do less or do more of is lead from the back. I want to be in the back. I want them in the front. That's my overall goal, is that they're in the front. And I'm just watching and smiling.

Ms. Collier believed that positioning her students as facilitators of their learning both empowered and humanized them. She solicited them to teach and to assess while teaching, and while they were teaching (via the Zoom online platform), Ms. Collier directly messaged them and suggested techniques to use while they

taught. Implementing CRP allowed her to build trust in her students at a greater level in a way that comforted her in positioning them for power.

The theme of *trust* sets this study apart from others and contributes to the literature on CRP. I studied literature that discussed how when teachers implemented CRP, the typical result thereof was that students trusted each other (Borrero et al., 2018) and that students built mutual trust with the teacher (Carter & Bradfor, 2019; Howard, 2001; Hubert, 2014; Watson et al., 2016). However, this study contributes to the literature that when CRP is implemented, the implementing teacher builds trust in oneself. The quote in the previous paragraph described Ms. Collier's change in practice but also provided that, as Ms. Collier implemented CRP, she gained trust in herself to change from the role of teacher to the role of facilitator. She trusted herself to situate her students in power roles in her classroom. She trusted herself in her level of knowing her students, to know that they would be engaged with the lessons she created with them in mind. Moreover, having implemented CRP, Ms. Collier trusted that her practice and cultural relevance improved.

Rousseau Anderson (2021) noted that it was easier to find examples of teachers who experienced challenges enacting CRP in mathematics than to find exemplars. Nevertheless, this study contributes a theory-to-practice empirical exemplar of CRP in an urban mathematics classroom with Black and Latinx students. Teachers failed to understand what it meant to enact CRP in mathematics and were unsure how to connect students' lived experiences with mathematics content. Even though teachers embody beliefs and commitments aligned with CRP,

they may still fail to enact CRP in practice (Rousseau Anderson, 2021). Ms. Collier's experiences implementing CRP and her changes in her practice offer the field an experiential map of what could be involved with implementing CRP, an exemplar of the steps involved. Through a PD on CRP's empirical and theoretical underpinnings, she gained the background knowledge necessary to understand what it meant to enact CRP in her mathematics classroom. Although the studies we reviewed did not include a how-to-guide for connecting students' lived experiences with mathematics content, Ms. Collier used her creativity and knowledge of students to embed her students' cultural attributes into the curriculum. She had some of the same students for the past three years, so she knew them and their families, and yet she still had her students complete a "Mathography" so that she would be confident that her curriculum reflected her students' cultures, identities, and interests.

### ***Connections and Contributions to CRP Literature and Online Education***

As mentioned in Chapter 1, due to the pandemic, Ms. Collier switched from teaching in person to teaching online just prior to the planned study. With this change, she could not physically interact with her students as she had grown accustomed to in her 16 years of teaching. Although I had not originally planned to focus on Ms. Collier's practice from the standpoint of online education, I would be remiss not to highlight the connections and contributions to the literature on CRP in an online context that Ms. Collier exhibited. Ms. Collier's practice connects and contributes to the literature on creating culturally responsive classroom spaces online. Terrell Shockley et al. (2018) suggested that, in an online context, teachers

must critically consider students' culture and funds of knowledge to create engaging learning opportunities for their students. When this is prioritized, it contributes to a culturally responsive learning environment (Terrell Shockley et al., 2018).

There needs to be more literature on teacher-to-student and student-to-student communication within an online context when teachers also enact CRP. Lawrence (2020) created a grounded theory for *Culturally Responsive Online Pedagogy* (CROP) that specifically contributed to an emerging model showcasing CR modes of communication within an online context. This study contributes to the small body of literature in this area because Ms. Collier provided an exemplar for each mode of communication that Lawrence outlined. The first mode was *Communication is Personal*. Ms. Collier exhibited this by knowing her students' individual interests and backgrounds, cultivating strong teacher-student relationships, and situating student feedback as time for individual personal dialogue that benefitted the class as a whole. Ultimately, Ms. Collier knew her students individually and maintained caring relationships with them throughout implementing the CRP unit. Lawrence's (2020) second mode of communication was *Communication is Communal*. Ms. Collier exemplified this because she facilitated a positive classroom environment and created community by facilitating whole-class instruction. The third mode was *Communication is Instructive*. Ms. Collier epitomized this through her continuous reflection and revision of her practice. She reflected on her instructional approach and varied her practice and classroom activities to meet the needs of her students. The fourth and final mode of Lawrence's (2020) CRP communication framework was *Communication is Authentic*. Lawrence (2020) noted that "engaging

students in authentic learning experience did emerge as a part of these teachers' praxis; however, the ways in which instructional activities were relevant to student culture did not surface" (p. 20). However, since Ms. Collier's students completed a Mathography with which she compiled unique aspects of her students' culture and interests, it was evident in what ways she made instructional activities relevant to her students' culture.

### **Literature Connections to Black Mathematics Teachers of Black and Latinx Students**

Ms. Collier's practice gives a nod to researchers who have highlighted the lived experiences of Black mathematics teachers (Buli, 2022; Frank et al., 2018; Frank et al., 2019). Buli (2022) actually conducted previous research with Ms. Collier, studying the impact that her teaching practices had on positioning Black and Latinx students in the mathematics classroom. Implementing CRP magnified similar teaching perspectives, noted by Buli (2022), that Ms. Collier had to that of Black teachers in the pre-Brown era. These past teachers maintained high expectations for their students and truly believed they were capable learners and doers of mathematics (Buli, 2022; Frank et al., 2018; Frank et al., 2019). Likewise, Ms. Collier expected and insisted that her Black and Latinx students learn and master the content. Through her use of warm-demander pedagogy and tough love, she often illustrated a sense of kinship with her students, another researched attribute of Black mathematics teachers (Buli, 2022; Frank et al., 2018). She felt a strong sense of mutual obligation (Buli,

2022) to her students and took their academics as seriously as she took building relationships with them.

Ms. Collier exhibited care for her students that translated into her teaching practice and manifested in her classroom domain (described in Chapter 4 as the inter-relationship between her classroom environment and classroom community). She purposefully cultivated a classroom domain focused on learning for her students while positioning them as humans (Buli, 2022; Frank et al., 2019). Ms. Collier valued her students intrinsically (Buli, 2022) and mentioned that she taught her students other things outside of mathematics so that she could be a change agent for them and pour into their lives. To Ms. Collier, she was the intervention for her students that would change their lives for their survival in mathematics and their survival as Black and Latinx people in a world where they were/are often dehumanized.

## **Implications**

### **Implications about Educators**

When considering the implications of this study, I believe that Ms. Collier's practice offers wisdom to in-service mathematics teachers and university mathematics teacher educators. For in-service mathematics teachers, Ms. Collier's practice suggests that CRP and CRMT are more than just a set of teaching practices. Ms. Collier reflected that she experienced a change in her mathematics teaching practices and her practices of teaching and interacting with her Black and Latinx students. However, she also experienced change on a personal level. Although she

set out to discover the benefits of a CRP-integrated curriculum for her students (and she saw those), she also discovered that the approach benefitted her as a teacher, specifically in areas including trust, power, and high expectations in the mathematics classroom.

For mathematics teacher educators (MTE), Ms. Collier offered that exposure to the research literature on CRP and CRMT is vital. Suggested ways of exposure include reading and discussing articles authored by those who showcased empirical research. MTEs could also present CRP and CRMT through videos that showcased the teaching practices and mindsets of Dreamkeepers working in the mathematics classroom. After the videos were viewed, MTEs could hold discussions with their pre-service teachers (PST) and coordinate Socratic Seminars in which PSTs would discuss and name tenets of CRP and cornerstones of CRMT that they noticed in the viewed practice. Another layer of exposure could be visiting a Dreamkeeper's mathematics classroom so that PST could observe the lived experiences, just as I benefited from observing Ms. Collier.

### **Implications about Researchers**

Ms. Collier's practice implied that meaningful professional development (PD) benefited understanding CRP. As the Researcher, I situated myself to work alongside Ms. Collier during every aspect of the PD. We read every empirical and theoretical article together, reflected on the knowledge of CRP imparted, and co-created a CRP unit plan based on how Ms. Collier understood CRP. Meaningful PD can be situated with a participatory action research style in mind and rally the engagement of the

study participant. Therefore, a researcher must learn from my experiences working with Ms. Collier that researcher positionality is vital. When researchers position themselves in such a way that contradicts the negative authoritarian stereotypes that sometimes are built between the university and the K-12 school system, it could create silos of schools that have experienced fragmented university partnerships.

### **Conclusion**

At the onset of this dissertation study, I was skeptical that you could *teach* an educator how to be culturally relevant. It was something that I questioned for at least eight years after discovering CRP and Ladson-Billings while in my master's program. I believe my conclusion was why I chose Ms. Collier as this study's participant. Having observed her at the beginning of her 16-year career, I knew Ms. Collier's practice was unique. However, I had not yet learned the vocabulary to name aspects of her pedagogy or practice as culturally relevant.

Having conducted this study, I conclude that you can *walk alongside* educators in their discovery of culturally relevant pedagogy as they fine-tune their cultural relevance. Likewise, walking *alongside* can occur for PST and in-service teachers as they fine-tune their understanding and mathematics teaching practice. In closing this study, it is crucial to revisit the stance that CRP is more than a set of practices but a way of *being*. This idea repeatedly emerged during this study. Moving forward in research, it will ultimately vary for each culturally relevant mathematics teacher of Black and Latinx students based on how they see and position themselves as change agents in urban schools.

## Limitations

There were multiple limitations that I experienced with conducting this body of research. The first limitation was conducting this study during the Covid-19 pandemic and collecting all data virtually. When Ms. Collier and I first planned the CRP unit on Functions, it intended to have her students physically active within her classroom domain. Implementing CRP virtually not only lessened the previously planned student interactions but also stifled Ms. Collier's practice and added a layer of classroom management that Ms. Collier had not experienced before. Schools closed, and once they reopened, Ms. Collier and I had to reimagine and redesign what implementing CRP would now look like for her and her students in a virtual environment.

At the time of this study, I did not feel as such; however, I wonder if having the added positionality of knowing Ms. Collier personally and having attended undergraduate studies together made me *too much* of an insider on the study. I considered that our prior friendship positioned me in a unique way to be able to know and name Ms. Collier as a Dreamkeeper. I knew that Ms. Collier would not hesitate to give her all in fine-tuning her cultural relevance due to having previously observed and worked in the same classroom with Ms. Collier. I wonder if, because I was a true insider, I had a blind eye to themes that could have emerged if I had more of an outsider's lens.

Lastly, I had difficulties using Teacher Change Theory to code data. Choosing whether to code within or between each of the three domains of this

theory was a struggle, and codes often lived within multiple domains, yet I chose to only present them within one. Additionally, coding for enactment and reflection was an added layer of coding that could have been dismissed because most items had already illustrated a specific theme(s).

### **Future Research**

Based on the findings from this study, I propose implications for future research that I would like to conduct and future research for the field. With Ms. Collier's recent completion of her Master's Thesis, focusing on how her use of CRP impacted her students' mathematics academic achievement, I would like to delve into continued research focused on her with a new additional focus on her students. One study would involve Ms. Collier's student's perspectives on her implementation of CRP. Daily after Ms. Collier's implementation, her students completed surveys where they shared their perspectives on that day's remixed curriculum and their perspectives on Ms. Collier's teaching practices. I would like to compare student themes to teacher themes and examine their daily and overall variance. Furthermore, I would like to study how Ms. Collier's use of CRP impacted her students' mathematics self-efficacy.

Ms. Collier is currently positioned as a mentor and trainer for an alternative teacher certification program; this unique positioning draws my interest. I would like to conduct research surrounding the urban school mathematics teacher as the trainer. So far, Ms. Collier has mentored two future mathematics teachers. I want to study how she translates CRP to her mentees and their experiences observing and

practicing in her urban mathematics classroom. I also believe that, with Ms. Collier working with mentees, it would be an ideal time for us to address some of the issues she encountered with the Social Justice Mathematics project [mentioned in Chapter 5] aimed at attending to the development of students' critical consciousness. For example, Ms. Collier and I could revisit decisions about creating a separate project compared to incorporating critical consciousness in the remixed lesson plan and other ways that she may want to impart social justice mathematics to her mentees in route to her students.

Lastly, I suggest further study of the themes surrounding teacher mindset that emerged from Ms. Collier's practice. I believe these themes strongly relate to emerging themes from Buli's (2022) and Frank et al.'s., (2018), Frank et al.'s., (2019) research on Black mathematics teachers. Frank studied an overwhelming number of retired teachers. I believe that Ms. Collier's practice in this study and Buli's (2022) study as a millennial teacher is reflective of such Black mathematics teachers who were Dreamkeepers prior to the birth of Ms. Collier's practice. I believe themes from this potential research would benefit students in urban school mathematics classrooms and future teachers.

## Appendices

### Appendix A

#### CRP Unit Plan on Linear Functions

<b>BEGINNING of Implementation</b>		
DAY(S)	$\frac{1}{2}$	<b>3/4</b>
Degree of CRP Implementation	NONE	MINIMAL
Lesson(s) & Topic(s)	Lesson 1: Inputs & Outputs Lesson 2: Introduction to Functions	Lesson 3: Equations for Functions Lesson 4: Tables, Equations, & Graphs for Functions
Implementation Description	NA	Incorporated students' names
CRP Implementation Focus	NONE	Student Learning & Cultural Competence
<b>MIDDLE of Implementation</b>		
DAY	<b>5</b>	<b>6</b>
Degree of CRP Implementation	COMPLETE	NONE
Lesson(s) & Topic(s)	Lesson 5: More Graphs of Functions	Lesson 7: Connecting Representations of Function-s
Implementation Description	Incorporated data of music streams from students' favorite artists; incorporated student data: birth year, breakdown of number of babies born that year by race; incorporated football and number of running yards of students' favorite players	NA
CRP Implementation Focus	Student Learning & Cultural Competence	NA
<b>END of Implementation</b>		
DAY	<b>7</b>	<b>8</b>
Degree of CRP Implementation	COMPLETE	COMPLETE
Lesson(s) & Topic(s)	Lessons 8: Linear Functions	Lesson 9: Linear Models
Implementation Description	Incorporated students favorite video games; incorporated football;	Incorporated video of an artist drawing using charcoal sticks; artist is

	incorporate students' name and usage of Greenlight child credit cards.	outside wearing a face mask; Incorporation of student data: birth year, breakdown of number of babies born that year by race; Incorporation of past pictures of each 8 <sup>th</sup> grade student from when they were in 6 <sup>th</sup> grade.
CRP Implementation Focus	Student Learning & Cultural Competence	Student Learning & Cultural Competence

## Appendix B

### Pre-CRP Professional Development

#### Teacher Interview Protocol

Participant Pseudo Name: \_\_\_\_\_ Date: \_\_\_\_\_

Start Time: \_\_\_\_\_ End Time: \_\_\_\_\_

Thank you for agreeing to meet with me and for participating in my research study. I really appreciate your time. I am Kelly Ivy from the University of Maryland, and the goal of my study is to examine culturally relevant mathematics teaching in urban schools. Today I will interview you on your experiences with culturally relevant mathematics teaching. Please let me know if you need me to repeat or clarify any of the questions.

If you do not feel comfortable answering any question that I ask, please respond by saying, “skip,” and I will move on to the next question. If you need to take a break at any time, please let me know. Also, we can end the interview at any time at your request, and you will not be penalized.

[Turn on audio (and video recording if participant agrees upon) device and test it.]

Before we begin, I would like to revisit your informed consent for this study and verbally acknowledge your consent for participating in this current interview. I would also like to acknowledge your consent for audio recording in this interview. Do you also consent to video recording this interview? Yes or No. I would like to remind you that your responses are confidential and that I will not share your recording with anyone from the school. Please feel free to be open and honest.

1. Please tell me the story behind why you wanted to become a mathematics teacher.
2. Tell me about your approach to teaching mathematics: anything from planning lessons, teaching lessons, assessment, fostering learning, to building relationships with your students, etc...
  1. Possible follow-up with a why question for further explanations.
3. How would you say that your approach or style of teaching differs from other mathematics teachers?
4. One definition of culture that I have discovered is “the sum of all human experiences.” Do you see culture based on this definition as something you incorporate or want to incorporate more of in your classroom?
5. Have you ever incorporated aspects of your students’ cultures or experiences into your mathematics teaching? Please explain.
6. Do you feel like culture has a place in the mathematics classroom? Why or why not?
7. Do you believe that teaching mathematics is cultural?
8. What are some of the ways you communicate mathematics to your students?
9. What does culturally relevant teaching mean to you?
  1. What would you say causes a teacher to be culturally relevant?
  2. What would you say are the outcomes of a teacher being culturally relevant in teaching mathematics?
10. Have you ever had any training or professional development in CRT? Please explain.

11. Do you feel like your current mathematics curriculum is culturally relevant? Why or why not?
12. Has teaching in urban schools impacted how you teach mathematics to Black and Latinx students? How so?

## **Appendix C**

### **Written Reflection Prompts**

#### **During-CRP Professional Development**

1. Overall reflection and thoughts about the article?
2. How does this article reflect your current teaching practice (what did you see in this article that you are actively enacting in your classroom)?
3. What did you see that you are NOT enacting in your classroom?

#### **Post - CRP Professional Development**

At the conclusion of the professional development, the teacher will reflect, guided by the questions:

1. After diving into research on the theory of culturally relevant pedagogy, how do you now describe/define culturally relevant pedagogy/teaching?
2. What did you learn today about culturally relevant teaching that is the most interesting?
3. What did you learn today about culturally relevant teaching that was the most difficult to understand/process?
4. Based on the readings, what culturally relevant teaching practices are you not currently enacting?

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