

ABSTRACT

Marie Y. Roberts, RECLAIMING ALIENATING ENVIRONMENTS: AFRICAN AMERICAN FEMALE PRINCIPALS REFLECT TO BUILD MATH IDENTITY AND IMPLEMENT CULTURALLY RESPONSIVE COACHING. (Under the direction of Dr. Matthew Militello)
Department of Educational Leadership, May, 2024.

In this participatory action research (PAR), I investigated how African American female principals designed and implemented culturally responsive coaching practices to support teachers who work with the collective Black students in mathematics classrooms. Often perceived to be natural outsiders to math curriculum, mathematics classrooms can be alienating environments for Black students; leader and teacher identifying their math identity as students was critical to their ability to rethink leading and teaching practices. Secondly, coaching practices are typically culturally neutral and do not often take into consideration the identity and experiences of the coach or coachee. The goal of the study was to understand how school leaders can identify and act on their cultural identity as African American women school leaders to coach teachers to address inequities in instructional practices. In the participatory action and activist study, I used critical ethnographic methodology to investigate how two principals engaged, reflected on their personal math identities and leadership practices, and identified and implemented culturally responsive coaching practices. The findings of the study indicate that leader and teacher math identity is central to their understanding of their coaching and teaching practices. By focusing first on math identity, principals implemented culturally responsive coaching strategies and encouraged teacher implementation of culturally responsive practices in math classrooms. The study has implications for understanding how identity plays a central role in teacher change as they implement culturally responsive coaching practices to address instructional inequities.

RECLAIMING ALIENATING ENVIRONMENTS: AFRICAN AMERICAN FEMALE
PRINCIPALS REFLECT TO BUILD MATH IDENTITY AND IMPLEMENT CULTURALLY
RESPONSIVE COACHING

A Dissertation
Presented to the Faculty of the Department of Educational Leadership
East Carolina University

In Partial Fulfillment of the Requirements for the Degree
Doctor of Education in Educational Leadership

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May, 2024

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DEDICATION

For

Jayne and Samantha because you are my life

And

The collective Black, because you are my life's work.

ACKNOWLEDGEMENTS

To Project I⁴ and the angels who come with, Dr. Militello, Lynda Tredway, and Dr. Ken Simon, I am thankful for the give-up-itis vaccination and for believing even when I stopped. To say that the program was a blessing is not enough. Today, I am better educated, more empowered, and armed as an equity warrior and an advocate for continuous improvement. I am thankful for the generations of educators in my family whose steps I follow in – Poppa, Euna, Mabel, Jernice Marie, Hiawatha, and Jane – and to those who follow in ours – Alana and Aryn. It is in our blood. I thank the Queens- Carin and Zarina -for walking in regal-ness even when their heads were heavy and for their inspirational sisterhood which supported my soul. You are amazing leaders and advocates for the children and families you serve. To my other sisters whose shoes I walked in until I could find my own, I thank you for clearing a path. Last but not least, I am the product of great teaching (Virginia Johnson and Kitty Epstein in Oakland), great places to learn to teach (Emiliano Zapata Street Academy and Ozen High), and a proud graduate of Spelman College.

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CHAPTER 1: NAMING AND FRAMING THE FOCUS OF PRACTICE

They do not wish to damage children; indeed, they likely see themselves as wanting to help. Yet they are totally unable to perceive those different from themselves except through their own culturally clouded vision. Lisa Delpit (1995)

In education, underlying beliefs about that mathematical ability of Black students have contributed to the consistent failure to improve math achievement for youth who are historically underrepresented in American urban schools. Thus, the students find math classrooms an alienating environment in which their cultural ways of knowing are rarely a part of the instruction. According to Battey and Leyva (2016), whiteness impacts an educator's impression of a student's mathematic ability and the teacher's mathematical instruction; the expectations for students of color are to follow white norms. The concept of math as a practice in which success is attainable by white people and the historical racist beliefs of the low intellectual capacity of African Americans and other students of color have led to poor implementation and low expectations in urban school mathematics classrooms (Gholson & Wilkes, 2017). For all students to develop successfully in mathematics, the standard of success cannot reflect the practices and beliefs of one culture group; rather, a standard of culturally responsiveness to guarantee equitable learning is essential. The standard, defined by whiteness, has created a deficit model that continuously perpetuates the failure of students of color. Or, as Delpit (2012) stated, "[w]hen one 'we' gets to determine standards for all 'wes,' then some 'wes' are in trouble!" (p. xv).

In addition, the coaching practices of principals are typically culture and race neutral (Bloom, 2005; Knight, 2007). Revising that standard starts with the school principal and how the principal interacts with teachers. In this study, I analyzed how two African American principals developed and implemented culturally responsive coaching practices with teachers to ensure higher quality math instruction for Black students. I refer to the students in this study as the

collective Black, which includes “African American, Latin@, Indigenous... West Indian, African...social groups whose status has been racialized, Blackened, or, more pointedly, positioned as inferior”; often Black students are stereotypically identified as “not good at math”. (Gholson & Wilkes, 2017, p. 229).

Martin (2009) states the "dispositions and deeply held beliefs that individuals developed about their ability to participate and perform effectively in mathematical contexts" are defined as "mathematical identities" (p. 36). The mathematical identities of collective Black youth too often have developed negatively within hostile classroom environments that alienate them by subjecting them to poor instruction and low expectations (Delpit, 1995). The collective Black students often perform poorly in math and do not perceive themselves as mathematicians, or even as effective participants within the classroom because of their negatively developed mathematical identities (Gholson & Robinson, 2019; Gholson & Wilkes, 2017; Martin, 2009). The development of mathematics identities (Berry et al., 2011; Martin, 2009) and the implementation of culturally responsive pedagogy in the math classroom (Aguirre et al., 2013; Martin, 2009) are two sides of the same coin. However, altering the presentation of mathematics instruction from an area of study in which only whites and Asians succeed can counteract this perception, which leads to historical disadvantage for students of color (Battey & Leyva, 2016; Moses & Cobb, 2001). Reforming how we teach mathematics requires including diverse perspectives, rethinking instruction, and identifying culturally and linguistically responsive teaching practices. In this project and study, I posited that effective school leaders implementing culturally responsive coaching practices can support teachers to improve mathematics instruction. What was essential to the study was tackling leader and teacher math identity as a prerequisite to improving teachers' pedagogical practices.

Focus of Practice

Using participatory action research (PAR), I included activist forms of PAR and relied on critical ethnography as a methodology. In the PAR project and study, I engaged two African American female principals in co-designing and implementing a culturally responsive coaching model to support teachers who were in turn integrating culturally responsive pedagogy (CRP) in math classrooms. In the PAR project and study, I expected that leaders in schools recognized the biased experiences that students of underrepresented communities face, highlighted the inequities within the mathematics structure, and coached teachers in methods that supported the collective Black students to be successful in math classrooms. In addition, I expected that the two leaders, both steeped in African American culture, history, and dispositions, might uncover the strengths of crafting coaching from their cultural strengths and perspectives. Through their experiences, we collectively differentiated the culturally responsive coaching attributes. Some school leaders addressed similar inequities in the English Language Arts curriculum by implementing culturally responsive pedagogy into reading initiatives, improving literacy achievement for students of color, and extending to mathematics education (Muhammed et al., 2021).

Specifically, African American principals in one urban northern California city and two elementary schools, all diverse in population, worked with sets of teachers in each school to implement reform practices to address the inequities that existed within their schools. While literacy in reading had improved, the schools had not had similar growth patterns in math. This reality caused them to return to the drawing board and rethink their approaches while asking: How do we, as school leaders, coach teachers to implement culturally responsive practices

within mathematics? But first, how do we change our coaching practices to reflect who we are and who the students are – the students who are often least well-served by our current practices?

To prepare for the PAR project and study, I met with a group of six African American principals in Oakland, California in a Community Learning Exchange (CLE). CLEs are a gathering of a group of persons in a school, district, or geographical community who come together to exchange ideas about a topic or a collaborative goal (Guajardo et al., 2016). We collaboratively analyzed our personal experiences with math, our struggles to create initiatives that supported teachers in math curriculum implementation, and the lack of development of the underrepresented youth in our schools as mathematicians. A majority of students in each school were African American or Latinx. In addition, we identified ways that we had been successful with students of color while addressing literacy, including

- Increased cultural awareness for teachers.
- Implemented intervention.
- Established a culture that held the expectation that all students will learn.
- Promoted a philosophy in the school and the community that all students can be literate.

However, we are products of the system in which we work, and we had not fully considered that we might need to shift the ways we coached and communicated to reflect a stronger cultural identity that we felt, but often “kept under wraps” in our daily leadership. As we progressed, we recognized the importance of our cultural identity and math identity with the system and supported teachers to consider their math identities as a critical part of implementing more equitable and rigorous instruction.

During the CLE, we discussed our knowledge of the history of mathematics and the role that our cultural experiences played in developing our mathematical skills, each of us from different backgrounds. Three of us had experienced few African American teachers; one had experienced only African American teachers until attending college. Half of us had grown up in the American middle class while half of us experienced poverty during childhood. Five of the six of us were Californians by birth, and the sixth principal had been born and raised on the east coast. I will work with two principals, from this group, on the PAR project and study.

During the CLE, in my conversations with African American, female principals, we collectively researched "mathematicians" and found images of only white men and a few white women. However, we were in awe when we googled "African American mathematicians." We saw African American images on our screens, something we were not expecting. From where had they all come? We had not realized that so many African Americans were mathematicians and STEM experts; their names were mostly unknown to us. Thus, although African American role models in mathematics exist, if we, as educators, had little exposure to them, what exposure did students have? This activity drove our CLE process into a deep dialogue about math opportunities and expectations for people of color. The experience bonded us in a determined quest.

In the PAR rationale, I discuss the low achievement levels of students of color on assessments at state and local levels; the math experiences of African American school leaders and the development of their math identities; the impact of math identity on their leadership; the impact of a culturally biased curriculum on underrepresented students; and the importance of coaching teachers to recognize students from all cultures as mathematicians.

Rationale

The focus of practice (FoP) for the PAR project was: Engage two African American, female principals in co-designing and implementing a culturally responsive coaching model to support teachers in integrating culturally responsive pedagogy in math classrooms. As reported by the California Department of Education in 2019, 74% of Asian students and 54% of white students scored at or above grade level on the California state math assessment. In contrast, 21% of African American and 28% of Hispanic students scored at or above grade level (see Figure 1). The math achievement scores in the district participating in this study reflect similar percentages, with Asian and white students far out-performing African American and Hispanic students. The expectation on these African American female principals is to drive the initiatives that will change the mathematical practices and improve the low math achievement for youth who are historically disadvantaged in their schools.

This study seeks to contribute to a growing body of research on how school leaders can shift their coaching practices to better support teachers in their common quest to improve math outcomes for students. In this project and study, we examine specifically how African American elementary principals develop culturally responsive coaching practices in order to better support teachers.

Assets and Challenges of the FoP

To prepare for the PAR and better understand the FoP, I identified the assets and challenges that principals currently face in their work and were present during the study. The overarching issue is the reliance on state test results to determine student learning (see Figure 1) "Emerging from our understanding that relationships are central to our work through the CLE" (Guajardo et al., 2016, p. 27), I became aware of the assets and challenges faced regarding the

California students who met state test standards in 2019



Chart: Sonali Kohli • Source: California Department of Education

Figure 1. California Math Assessments by ethnicity.

support of collective Black students in math and analyze these assets and challenges on three levels -- micro, meso, and macro.

Micro Assets and Challenges

At the micro level, I included the assets of the two African American female principals. The principals were working from an urgent perspective to improve the mathematical experience for students of color, recognizing that change must happen now. Further, the assets included the principals' knowledge of academic discourse strategies. The relational trust was already in place between the two principals and some teachers. However, the principals believed that they had little support in their endeavor and were already overwhelmed by the lack of time to work with each other, the poor professional development opportunities, and the inconsistency in district messaging. However, principals acknowledged challenges as the teachers having little knowledge of the political aspects of math; some teachers had a personal fear of the subject; and most did not understand the cultural backgrounds of the majority of the students, all of which directly impacted the relational learning.

Meso Assets and Challenges

At the meso level, some district assessments were useful for identifying the student achievement levels as a support. However, the district created discontinuity in the curriculum implementation by buying new products annually, changing initiatives, and failing to provide teacher professional development on math instruction and culturally responsive pedagogy. The district did not provide professional support for principal affinity groups or acknowledge principal achievement. Substantial research on district support for instructional initiatives tended to promote discontinuity rather than cohesion (Honig, 2012; Wong et al., 2020). Often, school

leaders concentrated on the district message about improving test scores, which further exacerbated improving teacher practices (Rigby et al., 2020).

Macro Assets and Challenges

A macro asset to the study was the work of the National Council of Teachers of Mathematics and the attention that NCTM had given to rethinking mathematics instruction as conceptual and not procedural. However, there were significant challenges at the macro level. Included in the challenges was the failure of the state and national education departments to provide an equitable math curriculum inclusive of collective Black mathematicians and coaching to support teacher implementation of the curriculum.

In addition, the improved state standards were an asset because they had previously had a consistent focus on the answer over the depth of knowledge. However, the intervention strategies, based on a deficit solution process focused on remediation with little consideration for mathematics identity of the students, were still problematic. Kendi (2019) posits that "...it is racist power that creates the policies that cause racial inequities" (p. 94). Racists and biased policies normalize these inequities. When perceptions drive policies that provide solutions to students based on race, this is behavioral racism. Individuals cannot be responsible for the behavior of a racial group (see Figure 2) for fishbone analysis of the assets and challenges.

Significance

Historically, students of color, on local and national levels, have not been allowed to access mathematics instruction because of biased curriculum implementation (Battey, 2013; Bonilla-Silva, 1997). In the two schools, the collective Black student population performed at the lowest percentile levels on local and state assessments. As the two African American female

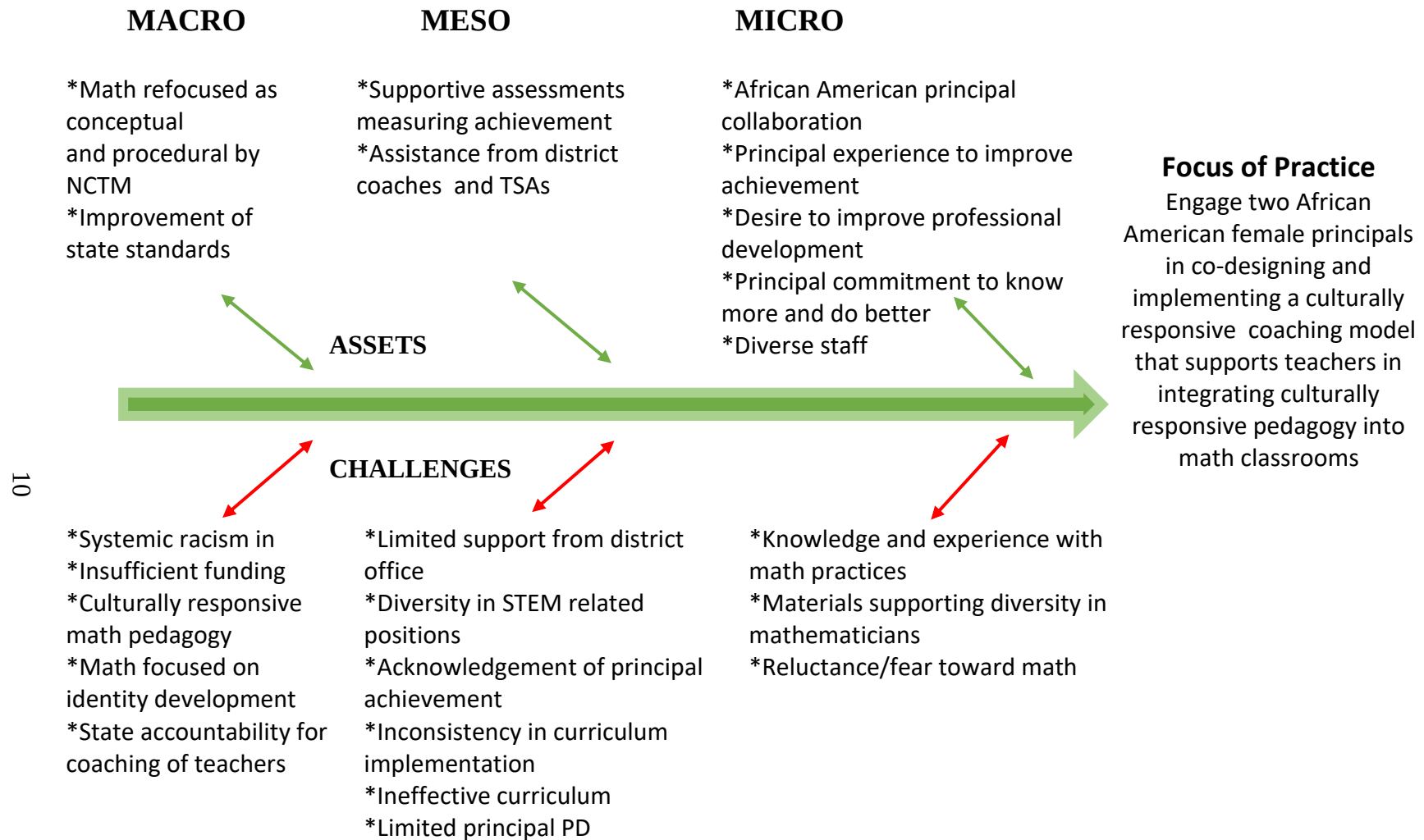


Figure 2. Assets and challenges of the Focus of Practice.

principals and I collaborated as a team, we identified problems, described math instruction and engaged in the inquiry process while co-creating action steps needed to shift the coaching practices to better support teachers in the delivery of the math curriculum. Our first step was important, however, as we focused on leader, teachers, and student math identity. Ultimately, my hope was that if I worked collaboratively with other African American female principals to develop and implement a culturally responsive coaching model that fostered culturally responsive classroom pedagogy, then school leaders would be able to coach teachers to implement culturally responsive instructional practices in mathematics classrooms.

Context

The PAR project was significant because I supported two leaders in Bay Area schools in developing culturally responsive coaching practices, which, in turn, supported the principals as they coached teachers to implement culturally responsive teaching practices. While a small study, this in depth attention to two leaders and their stories of change could influence similar contexts. Ultimately, we intended to change the narrative for children and youth who were historically disadvantaged in schools performing at the lowest percentiles in mathematics classrooms.

Practice, Policy, and Research

The PAR process was rooted in a reflective process on which I focused to improve educational experiences and minimize inequities by engaging people who were involved in an issue or concern (Creswell & Guetterman, 2019). The PAR was significant to practice because principals as coaches examined their identities and used what they learned to encourage teachers to examine their math identities and support students to do the same. In addition, they used

culturally responsive coaching practices that influenced how teachers shifted classroom instruction by implementing culturally responsive math instruction.

The PAR could be significant to local and state policy by creating leadership practices and effective principal-facilitated coaching models that establish inclusive and equitable environments in mathematics classrooms. Although schools and districts implement culturally and linguistically responsive pedagogy into the classroom when teaching literacy, these practices are often omitted in other curricular areas, including mathematics. In particular, as I indicate in the findings, we miss a critical step – identifying how leaders and teachers recall their math experiences and how that influenced how they currently lead and teach.

Hale (2001) points out that action research leads to "deeper...thorough empirical knowledge of the problem" (p. 13). The PAR with an activist frame supports social change, deviating from the conventional and more neutral participatory action research methods (Hunter et al., 2013). The PAR project research, primed in activism, served as a guide to support principals in developing strategies to coach teachers who in turn implemented culturally responsive pedagogy in mathematics instruction. Additionally, the research may encourage districts to support affinity groups that empower African American female principals to lead equitable initiatives in other curricular areas.

Connection to Equity

School leaders who have led major initiatives in literacy addressing issues in urban education -- including culture awareness, self-advocacy, and racial diversity for students of color -- have been unsuccessful in leading similar campaigns within mathematics (Muhammad et al., 2021). Why is the implementation of mathematics approached differently than the implementation of literacy?

Historically, the collective Black students had not experienced high academic achievement in mathematics (Gholson, 2013). In addressing this concern, I focused on how African American leaders led mathematics initiatives that supported students who had historically been disadvantaged. By concentrating the focus of practice (FoP) specifically on African American female principals in two urban elementary schools, I analyzed their reflections of personal experiences with mathematics and how they coached teachers to implement mathematics instruction that supported the academic needs of students of color.

The influence of historical, cultural bias and the stereotypical beliefs embedded in mathematics instruction validate the investigation of mathematics from political and psychological frames. Politically, mathematics is too often framed as a content area intended for an elite group and shares a privileged platform that often excludes marginalized students (Gutiérrez, 2013). Psychologically, the field of mathematics fails to reflect a future for all students, supporting stereotypical bias and destroying identity (Delpit, 2012; Gholson, 2013; Gholson & Wilkes, 2017).

Political Frame of the Focus of Practice

This country's established political beliefs about math have contributed to the consistent failure to improve math achievement for historically disadvantaged youth (Gutiérrez, 2013). Often, people are considered more intellectual if they can maneuver through mathematics applications. We look upon them with awe; they are privileged because mathematics is privileged. According to Gutiérrez (2013), "[i]n much of the West and the colonized world, mathematical proficiency is used as a proxy for intelligence" (p. 10). Battey and Leyva (2016) present a framework for understanding how whiteness emerges in math education as a mechanism for subjugating historically marginalized students and making visible how whiteness

impacts white students who reproduce privilege; "whiteness oppresses Blackness through deficit ideas, poor treatment, and lower quality of instruction" (p. 55). Low expectations and poorly developed math identities of collective Black students is one result of the belief that math is to be attainable only by some. Although we had seen recent initiatives to address the development of math identities in students of color at high school and some middle school levels (Gholson, 2013; Gholson & Wilkes, 2017), this is too late a stage to begin development of math awareness that supported self-advocacy and academic success. If we begin educational experiences believing that only some people can do the math, we are essentially affecting our ability to support students in forming positive math identities (Gutiérrez, 2013).

Psychological Frame of the Focus of Practice

Partnering the political ideology with a psychological perspective, we can better understand how negative cultural stereotypes further influence the failure of math development for the collective Black students. According to Gholson (2013), "general self-perceptions and beliefs about others' perceptions of one's own racial group carry over into mathematics" (p. 69).

Steele (2010) refers to this as stereotype threat. The implication is that if students of color believe that as an accepted rule, students of color do not do well in math, it negatively impacts their ability to achieve. With the echo of 'Black people do not do math' as a common response in and outside of the African American culture (Gholson, 2013), we essentially destroy the ability of African American youth to believe that they are, or can be, mathematicians. In addition, the inability of instructors to see the collective Black students as mathematicians exacerbates the effect. Delpit (2012) notes that this "unintended bias" is harmful and recommends a counter:

When we educators look at a classroom of black faces, we must understand that we are looking at children at least as brilliant as any of those from any well-to-do white

community. Without having any intention of discriminating, we can do harm to children who are viewed within a stereotype of 'less than'. (p. 5)

However, this is not an isolated bias. According to Delpit (2012), "[w]e have all been affected by our society's deeply ingrained bias of equating blackness with inferiority" (p. 9). Thus, the need for African American principals to reflect upon their own mathematic experiences before coaching teachers. This opportunity to reflect in an affinity group while working together to develop a coaching model that supported the delivery of equitable math instruction led us to the design of the study. In the next section, I discuss the research design, including the study's goal and activities.

Participatory Action Research Design

The recognition of mathematics as inequitable and culturally biased (Gholson & Wilkes, 2017) called for a change in the implementation of mathematics curriculum and instruction in urban California schools. I addressed this call by engaging two African American, female principals in co-designing and implementing a culturally responsive coaching model to support teachers in integrating culturally responsive pedagogy in math classrooms. The change I proposed required principals to collaborate and reflect upon their experiences, recognize and discuss the impact of historical math practices on marginalized populations, analyze present teacher practices, and then coach teachers to implement equitable math practices. Specifically, I worked in collaboration with two African American female principals in the Bay Area as a co-practitioner researcher (CPR) group. A CPR is a collaborative research group of participants who work together to increase the researcher's ability to understand and maintain the data's original meaning (Foulger, 2010) throughout the participatory action research (PAR)/activist study joined by critical ethnography.

In this study, I aimed to engage principals in developing a coaching model to support teachers in improving culturally responsive practices in the mathematics classroom. The goal required school leaders to address inequities in instruction by first focusing on their math identities, coaching teachers to do similar reflection and examination of math identity, and then changing biased practices used in math curriculum implementation. In this way, by focusing on root causes of inequity, working with a collective, and seeking to create transformation, the study became activist research (Hale, 2001). Activist research allows the comprehension of inequity and oppression from its origin. The framing of change in this research was activated through the collaboration of the researchers and the individuals subject to the problems (Cohen-Chen & Van Zomeren, 2018) and required in-depth exploration and reflection as encouraged by critical ethnography.

Critical ethnography is a qualitative approach to research that explicitly seeks to implement transformation and free individuals from repression (Anderson, 1989). In defining critical ethnography, we must pay attention to the consequences of the research as well as the goal of diminishing injustice (Allen, 2017).

Conducting critical ethnography means committing to addressing social injustice and inequality through the research process...doing critical ethnography requires the researcher to recognize that methodological choices have political consequences [which include] active reflection on their choice of theories and methods, accountability for any potential consequences of their research, researcher positionality, deconstructing taken-for-granted assumptions to uncover the workings of power and control, and advocating for social change. (p. 297)

By combining activist research with critical ethnography in the study, I examined cultural practices, rituals, and structures that protect privilege and limit access while enabling and maintaining systems of oppression within mathematics. To summarize the PAR intent, I identified the theory of action, the focus of practice, the research questions, and the proposed project activities for this study.

Purpose Statement and Research Questions

The purpose of the participatory action research (PAR) project was to develop a culturally responsive principal coaching model that focused on supporting teachers to implement culturally responsive practices in math instruction. The study focused on how two African American female principals support each other, discuss their identities as learners of math and support teachers to analyze their math identities, co-design coaching processes, and develop their strengths as coaches. The overarching research question is: *How do African American female principals develop and implement culturally responsive coaching practices that support coaching in math classrooms?* In addition, there were three sub-questions.

1. How does personal reflection on identity as African American female principals influence culturally responsive leadership practices?
2. How do school leaders use culturally responsive practices to coach?
3. How does the process of collaborating with African American principals support my leadership development?

Theory of Action

I proposed the following theory of action in response to the research questions and motivation to work with principals to create change for the collective Black students in mathematics classrooms: *IF* I work collaboratively with other African American female

principals to develop and implement a culturally responsive coaching model to support teachers, *THEN* principals will be able to coach teachers to implement culturally responsive instructional practices in mathematics classrooms. What we found, of course, is that in order to develop a culturally responsive coaching model, we needed to have teachers – many who were Black teachers – to examine their early math experiences as a critical step to implement culturally responsive practices.

PAR Activities and Cycles of Inquiry

We engaged two cycles of inquiry and activities for the PAR (see Table 1). In Chapter 3, I describe these cycles and the proposed data in detail. Three types of data collection in qualitative research include qualitative observations, interviews, and documents (Creswell & Guetterman, 2019). Observations included field notes to record site activities. Interviews, whether semi-structured or open-ended questions, reflect the participants' views. Documents included emails, journals, reflective memos, and field notes. I collected and analyzed data from these sources in the two cycles of inquiry. I implemented protocols during our meetings using community learning exchange protocol and collected artifacts. I wrote reflective memos, documenting my experiences and thoughts. I coded all data using qualitative methods (Saldaña, 2016).

In summary, the PAR study design focused on how principals engage in developing and implementing a culturally responsive coaching model to support teachers in improving instructional practices in the mathematics classroom for the collective Black students. Within the design are two iterative inquiry cycles that include co-practitioner researcher meetings, observations, interviews, and data collection that I analyzed. The framing of change in this research design was dependent upon the collective participation of African American elementary

Table 1

Project Activities

Research Cycle	Activities
PAR Cycle One Summer 2022 May – Jul 2022	• Convene monthly CPR meeting using CLE protocols • Interview CPR members – 2 principals • Observe principals coaching teachers • Read anchor texts • Write reflective memos and field notes
PAR Cycle Two Fall/Spring2023 Aug 2022 – May 2023	• Convene monthly CPR meeting using CLE protocols • Observe principals coaching teachers • Interview CPR members – 2 principals • Write reflective memos and field notes • Conduct member checks

school principals seeking to transform the educational experiences of the collective Black students. During the study, I attended to several considerations.

Study Considerations

Limitations exist within all research studies. In addition, the collection, compilation, and coding of research data takes time. Forming a thorough understanding of participants' responses is time-consuming. I conducted this study over a period of two cycles of inquiry. Though there were two principals included in this study, the sample remained relatively small. I used a convenience sampling method to identify these school sites and the outcomes of the research may not be replicable. I maintained the security of the data and protected the confidentiality of the participants. I utilized pseudonyms for the schools, and the two participants in the study. The two participants signed informed consent forms (see Appendix C). Anyone deciding at any time not to participate could do so without reprimand.

Ensuring validity is key in qualitative research. During this study, I focused specific efforts on the use of content validity and triangulated data with field notes, member checks, and memos (Creswell & Creswell, 2018). The generalization of the study's findings to address outside settings or individuals was the greatest external threat to the validity of qualitative research (Creswell & Creswell, 2018). In addition, I will keep the transcription of interviews and tapes, field notes, and documents in a secure, locked location. Finally, none of the material collected from district personnel was be replicated or disseminated in any way. As previously mentioned, the district was privy to an executive summary report and member checking of the initial findings.

Summary

Khalifa (2018) asks, "[h]ow can we reform education without understanding the realities of the people we serve?" (p. 169). In agreement with Khalifa, I have collaboratively focused with other principals on the implementation of a coaching process that would support teachers with addressing equity in math instruction (Khalifa, 2018). In addition, I focused on a next level question: How can we, as school leaders, reform mathematics instruction for the collective Black students without understanding our own math identities? By supporting principals in understanding how their math experiences have impacted their math identities and assisting them in analyzing how this has affected their leadership regarding math instruction, we improved their ability to coach teachers on the development of positive math identities and improved the math achievement of historically marginalized elementary school students.

There is no silver bullet, no easy fix, no coaching for teachers that can identify one specific way to teach all African American, or all Latinx students, or all boys, or all girls. There is great complexity in the system we are asked to implement and maintain (Bryk et al., 2015). However, by creating a culturally responsive coaching model for principals that supports principals in ascertaining teacher capacity and math knowledge, acknowledging and improving math identities, and developing tools that support teachers in understanding cultural pedagogy, we can improve the academic progress of the collective Black students in two Bay Area schools.

In Chapter 2 of this research study, I include a literature review of normative, theoretical, and empirical research regarding the focus of practice, including mathematics as a civil right, the concept of an inclusive culture in the mathematics classroom, the historical leadership of the African American, female principal. In Chapter 3, I examine the methodology of the action research study, including the research design, overview, an outline of the research cycles,

investigative questions, and elements of data collection and analysis. In Chapter 4, I detail the contextual aspects of the research describing the participants and the school settings and the PAR Cycle One. In Chapters 5, I discuss the themes from PAR Cycle Two and identify the study findings. In Chapter 6, I summarize the entire study, discuss and implications of the findings and conclusions and analyze my leadership journey.

CHAPTER 2: LITERATURE REVIEW

In order for poor and oppressed people to become part of a society that is meaningful, the system under which we now exist has to be radically changed. I am saying you must say, too, that in order to see where we are going, we not only must remember where we have been, but we must understand where we have been. Ella Baker (1969)

This research study sought to understand the relationship between two African American female principals and the teachers they coach. The principals wanted to positively affect the instruction for the collective Black students in mathematics classrooms. Gholson and Wilkes (2017) identify the collective Black as students who are subject to stereotypical racial scripts even though they may be individually quite different from each other. Molina (2014) adds to this definition by discussing how the Black collective term exemplifies “the ways in which the lives of racialized groups are linked across time and space and thereby affect one another, even when they do not directly cross paths” (p. 6). Thus, in my review of the literature, I framed the experience of Black or African American students using the rationale of Gholson and Wilkes (2017): The U.S. racial conversation of Blackness is the fulcrum of all other racial conversations; large numbers of studies on identity center on Black identity, and counter scripts are more common in the racial conversations of African Americans.

To explore the role of the Black collective in mathematics, first, I examined the historical context of the origins of math in relation to Black students and mathematics as a gatekeeper to higher mathematics and even college entrance. Then I analyzed the work of Moses and Cobb (2001) to explore the implications of mathematics instruction as a civil rights issue for Black students and the analysis of Boykin and Noguera (2011) as a necessary part of the conditions of.... for students of color. Secondly, I examined the leadership profile and historical background of the African American female principal in the American education system. Being

an effective coach of teachers is fundamental to the school leader's role. Thus, I sought to build an understanding of how African American women principals' identity, race, and culture affects coaching teachers to implement culturally responsive teaching in mathematics instruction. The purpose of the study was to support the co-design of a coaching model by African American elementary school principals as they worked with teachers in meeting the cultural and cognitive needs of the collective Black students in math classes.

Math: Gatekeeper or Civil Right

Mathematics education enables people to employ critical skills that allow them to “learn and think logically in any field of endeavor” (Lefkowitz, 2014). In this way, the field of mathematics has enjoyed a social status that is highly valued (Gutiérrez, 2013). However, the American mathematics system segregates society forcing economic, political, and ideological divisions that impact students in schools, increase racial hierarchies (Battey, 2013; Bonilla-Silva, 1997) and violates the civil rights of the collective Black students.

Society upholds this segregation by acknowledging the status of math and by rewarding the achievers in the mathematics field with social recognition including access to college and higher paying positions (Battey, 2013). In schools, the status of math is sustained within structures that support instructional tracking, including segregated high level math courses and Advanced Placement programs, however limiting access to collective Black students (Boaler 2002, 2008; Gutiérrez 2013). This lack of access to quality mathematics education can directly impact an individual's ability to obtain and sustain an opportunity to improve their social status or economic wealth. The Diversity in Mathematics Education Center for Learning and Teaching (DiME, 2007) describes mathematics as a “gatekeeper” and posits “mathematical literacy... is the key to citizenship; it becomes a civil rights issue and a necessary component in promoting

economic and civic equality” (p. 417). The key to this gate for students depends on the school’s ability to facilitate the development of strong math identities in all students.

Mathematics education was established as an elite curriculum; it was originally intended as a study for only White males. Since 1920, it has remained a gatekeeper for access to college and higher paying positions in America. Ultimately, without change, math education will continue to violate the rights of the collective Black students, alienating them from the promises of Brown vs. the Board of Education, and for equitable practices in the classroom.

The Origin

The Commission on the Reorganization of Secondary Education (CRSE) report (Cardinal Principles of Secondary Education, 1918) acknowledged algebra as a high school graduation requirement but supported the continued segregation of specific groups learning math based on “the fact of marked individual differences (being) scientifically established” (p. 9). At the height of the eugenics movement and the advent of IQ testing (Stoskopf, 2002; Terman, 1916; Thorndike, 1940), the report recommended restricting the teaching of advanced math, reserving it for white “boys intending to study in engineering schools” (Cardinal Principles of Secondary Education, 1918, p. 18). As Thorndike reiterated over his career: power should go to those who are genetically more able (Beatty, 1998). This perspective remained static for more than three decades and established an ideology of mathematics being reachable by only the naturally gifted. African American, Latino, and Native American students were considered culturally and biologically deficient with respect to these practices in mathematics education (Battey, 2013).

A change occurred in American mathematics and science with the emergence of Sputnik in 1957 (Barlage, 1982). The Soviet Union’s technological advancement, deemed a threat to national security, was humiliating to the United States and spotlighted the low quality of math

and science instruction in American schools (Klein, 2003). In 1958, Congress passed the National Defense Education Act to support the increase of science and math majors who could fill highly technical jobs. No longer simply about making intelligent citizens, mathematics education was related to “the development of life (or survival) skills— that is, competencies needed for personal growth and for successful existence as a citizen, consumer, jobholder, taxpayer, and member of a family” (Brodinsky, 1977, p. 524). Mathematics had a new significance, but the focus of who could participate remained largely the same.

Math as a Gatekeeper

The skewing of math along racial and class lines had the effect of sending the message to students of color little was expected of them.
(Moses & Cobb, 2001, p. 96).

As a gatekeeper, mathematics reifies symbolic racism in terms of mathematics aptitude. Mathematics supports an ideology that attempts to filter the students by intelligence, legitimating a racial ideology of who is intelligent, can access elite universities, and obtain high-paying jobs (Battey, 2013). The perception of Asians and whites at the top of a biological hierarchy in mathematics furthers the segregation in mathematics, allowing some students through the gate while denying others (Martin, 2009). Without access to high-level mathematics, collective Black students will be unprepared for college and careers.

In his efforts to reveal the advantages that the American math curriculum offers whites over collective Black students, Battey (2013) “analyzes the wage-earning differential related to stratified mathematics coursework by ethnic/racial groups” (p. 332). Battey’s research, along with the research of other math researchers (Aguirre et al., 2013; Gholson & Robinson, 2019; Moses & Cobb, 2001), identifies ways in which the American mathematics system segregates, negatively impacting economic choice and sustaining racial hierarchies (Battey, 2013; Bonilla-

Silva 1997). “Those at the top of the racial hierarchy receive economic compensation, better jobs, and higher social respect... based on who is mathematically able” (Battey, 2013, p. 350). In what Battey refers to as a color-conscious framing, he posits that the curriculum acts as a “racialized social system investing more in Whites than Blacks, Hispanics, and American Indians” (p. 350). Boaler (2002), Gutiérrez (2013), and Oakes (1985) note the impact mathematics has on the identities and life transitions of children, including economic, educational, and career access.

Gatekeeping begins early in the schooling experiences of students because different access and opportunities are available to the collective Black students than those offered to white students. When teachers believe students lack the intellectual ability to think abstractly, these deficit ideologies can result in hostile environments for students (Perry et al., 1993). Early in their educational experiences, the collective Black students are subjected to low expectations, beliefs that math requires intrinsic ability, and biased “calling on” procedures. As early as fifth grade students are positioned in pathways “making them vulnerable and less likely to take risks” (Boaler, 2015, p. 94). In middle and high school, collective Black students often do not have access to advanced classes, are tracked into lower mathematics course work, and referred by counselors to sub level career paths (Noguera, 2004; Oakes & Rogers, 2007). All of these processes serve to reduce mathematics literacy, college opportunities, and earning potential for the collective Black students. Aguirre et al.’s (2013) argument for change in the instructional process is that “responsive accommodations be made as needed to promote equitable access, attainment, and advancement in mathematics education for each student” (p. 9).

This reformation of math education altered the focus of math but maintained the mythology of mathematics attainability being accessible to only a few as a universal truth. The

reform focused on high school students who were college bound. The intent was to “identify bright young potential mathematicians and steer them into math programs based on university campuses” (Moses & Cobb, 2001, p. 9). They point out the “tragic inadequacy” of this early mathematics education movement, which excluded ethnically diverse populations and focused solely on white male, “to train an elite, create a priesthood” (Moses & Cobb, 2001, p. 16); in doing so, limited access for students of color and women persisted. Economic access allowing full citizenship depended on math and science literacy (Moses & Cobb, 2001). Thus, the civil rights and SNCC (Southern Nonviolent Coordinating Committee) Bob Moses, who had been a leader in the 1960s freedom struggles in the south and Freedom Schools, raised the civil rights issue for the collective Black students who had limited access to mathematical literacy “making them the designated serfs of the information age just as the people...in the 1960s on the plantations” (Moses & Cobb, 2001, p. 11).

Math as a Civil Right

Court decisions established through the outcomes of the Civil Rights Movement (CRM) determined that equal educational opportunities and legal protections were to be afforded to all citizens regardless of race, religion, or other characteristics (Pub. L. 88-352, 78 Stat. 241). These opportunities included the right to vote, to be seated in restaurants and on transportation, and to have equal access to public facilities and employment. The CRM, which propagated the *Brown vs. Board of Education* landmark case, led to the expectation of equality in public education for all students. Prior to the technological shift, the access to equal educational opportunities was associated with traditional literacy, the ability to read and write, arguing that all Americans should have the right to access (*Gary B. v. Whitmer*, 957 F.3d 616, 6th Cir. 2020). However, today, the great equalizer has changed.

Robert Moses viewed math literacy and algebra as foundational for access to first class citizenship as early as 1986 (Moses & Cobb, 2001). Moses began a movement focused on equity in mathematics to combat the existing oppression in what he viewed as an elitist curriculum locking African American students out of the incoming technological revolution. Inspired by his experience as a civil rights leader, Moses' goal was systemic change. Moses wanted to create an environment in which every student was prepared for and would do algebra by the eighth grade. These skills would then allow students to participate in advanced math classes in high school. He called his program the Algebra Project (AP), a non-profit organization dedicated to African American students learning algebra in a student-centered environment that tapped into their personal experiences (Moses & Cobb, 2001).

The Algebra Project was rooted in developing algebraic thinking in economically disadvantaged middle schools with African American students. In 1995, AP began developing instructional materials for high school students and received a National Science Foundation grant in 1997 to develop professional development and community development materials. The NSF grant launched research targeting low performing students in six high schools. The cohorts were made up of twenty students each from ninth – twelfth grade. Five of these were demographically different, nearly all students were performing below proficient in math on the eighth grade state assessment. AP programs for middle school and high school students incorporated the inclusion of site members in the program design and implementation; the development of a local board, professional development for teachers; change in teachers' beliefs about the students and the curriculum; increased integration of AP practices with other materials. The research findings from AP vary as each program is dependent upon the sites members and resources. However, AP research reports the following increased measures of impact:

- interest of students in algebra, math, and learning in general;
- enrollment (and passing rates) in higher level mathematics courses in high school;
- student performance on math tests (Algebra Project classroom tests, state mandated tests, college admission tests, college math placement tests);
- student deep understanding of mathematics concepts as indicated by in-depth performance assessments and interviews on mathematics problems.

The success of the collective Black in AP programs in states and schools across the country helped to focus attention on the transformation of mathematics from a curricular issue into a national question of equitable access: Should the math curriculum be accessible to everyone?

The importance of mastery of numeracy can now be identified as the pursuit for equity and considered as essential to the economic freedom of all American citizens. Numeracy, sometimes synonymous with mathematical literacy, is defined by the OECD (2019) as:

an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments, and to engage in mathematics in ways that meet the needs of that individual's current and future life as a constructive, concerned, and reflective citizen. (p. 12)

During the last two decades of the 20th century, a math-for-all movement placed an emphasis on raising the expectations for all students to learn and excel in mathematics (Diaz, 2017). As part of the math-for-all reform in schools, focus was placed on granting equal access and opportunity to all students—“regardless of personal characteristics, backgrounds, or physical challenges” (National Council of Teachers of Mathematics, 2012, p. 12). However, in order to reach equity in a math-for all movement, what had been a struggle to obtain access to reading and writing skills, must now include a movement to gain access to numeracy, the newly

recognized gatekeeper. While we can proclaim math as a civil right, enacting our belief has been more problematic.

African American Women as Principals

The only way to undo racism is to consistently identify and describe it – and then dismantle it. Kendi (2019)

The crisis in the American STEM education system impacts collective Black students, endangering their futures and threatening their access to an equitable, meaningful mathematics education (Martin, 2000). A reform focusing on equity and the success of historically underserved students at its core could change the narrative of mathematics instruction for all students in this country (Anderson, 2016). The African American principal is not only significant, but crucial to the necessary shift in mathematical practice and the implementation of a cultural structure that will support collective Black students authentically (Anderson, 2016). The democratic concept of a free public education for children kindergarten through twelfth grade is only beneficial if educators recognize that all children must be provided with the best education possible (Moses & Cobb, 2001).

The Civil Rights Movement, Brown vs. Board of Education, Black Lives Matter, and like initiatives increased attention to equity in the American educational system. With a transition in reform effort – in this case the call for more higher cognitive demand in math and more opportunities for student representation of their thinking -- certainly the influence of the principal as a leader of equity is more than ever central to the culture of the school and the future of students of color (Anderson, 2016; Grissom et al., 2021). The African American female principal has struggled with and for historically underserved students since before integration (Cain, 2016; Tillman, 2004). She knows these students and has helped them “develop positive self-concepts and generally to feel good about themselves and their people” (Tillman, 2004, p. 123),

prerequisites for assuring that historically underserved students receive the mathematics education they deserve. Specifically, African American female principals (1) recognize the biased experiences of their students who come from underrepresented communities; (2) are aware of the inequities within the present mathematics structure; (3) can coach teachers in methods that will effectively develop positive math identities in all students because the students engage in academic; and (4) can determine how to ensure access and rigor for students using culturally responsive practices.

Recognition of Biased Experiences

African American female principals began spilling into educational academia between 1973 and 2008. Lomotey's (2019) extensive study of the leaders notes a significant increase in the flow of research after 2000, almost exclusively through dissertations and journals. These works address historical aspects of African American female principal leadership, her characteristics, and her experiences in feminism, transformational schools, with racism and sexism. The research explores the African American female principal, her place in education and her struggle to be promoted. The collection of this research creating a social construct of the African American principal as a warrior of the people and a spiritual leader (Carson, 2017; Lomotey, 2019). However, these principals are the least likely to receive district support in their endeavors and are often overwhelmed by the lack of time to collaborate with peers, the poor professional development opportunities, and the inconsistency in district messaging (Cain, 2016). In addition, they are faced with a teaching force that is unaware of or struggling with the political aspects of math. Some have a personal fear of the subject, and most do not reflect the cultural backgrounds of the student population (Kelley, 2012; Lomotey, 2019). The majority of

these leaders are in inner-city and transformational schools with populations that are often impoverished (Cain, 2016; Carson, 2017; Loder, 2005; Tillman, 2004).

Educated African Americans, prior to the Supreme Court's decision in *Brown vs. Board of Education*, though highly qualified, cultured and cultivated, were restricted in career options and found themselves thriving in educational roles. Siddle Walker (Long, 2020), in schools, said that they “developed rigorous curriculum that challenged and inspired...(teaching their students) that they had the same inner resources and potential as any human being” (p. 1). Committed to their communities, these educators were recognized as leaders and role models; they were relied on and revered by students and their families. However, the empirical studies explain the impact that occurs after *Brown* forces the integration of schools in the United States (Cain, 2016; Kelley, 2012; Lomotey, 2019). The loss of segregated schools caused a deficit of African Americans in the educational system, at both the teaching and administrative levels (Siddle Walker & Byas, 2009). What followed was “the dismissal, demotion, or forced resignation of many experienced, highly credentialed black educators who staffed black-only schools” (Long, 2020, p. 1). These African American educators were not welcomed into the newly integrated programs (Siddle Walker & Byas, 2009). Thus, the elimination of thousands of qualified educators, advocates, and role models from the American education system.

The unexpected blow struck by integration contributed to the racial division in the American teaching force, shifting the construct of public-school teachers. Today, the teaching force remains overwhelmingly white by 80%, contradicting the now majority minority student population (Kelley, 2012; Lomotey, 2019). This shift into integrated schools with the majority white teaching force bussed children into integrated classrooms, while separating them from cultural role models, and much of their community support, isolating them in foreign

environments and depleting their self-esteem. Essentially, the shift equated to a loss of a sense of community (Kelley, 2012). In addition, even the white school staff members were shifted, “when black children arrived, some of the best teachers left” (Delpit, 2012, p. 16). As a result, gone were “the teachers who showed black children that they could believe in themselves...who taught civics curriculum where they participated in democracy...who, in the midst of oppression, taught children to aspire,” explains Siddle Walker (as quoted in Long, 2020, p. 1).

With the fading of educational leadership that promoted cultural advocacy for the collective Black students came the birth of negativity. Implemented without “regard for the stigmatizing effect that it can have on students” (Toldson, 2019), terminology was instilled into “equity-intervention” that highlighted the failure of collective Black students. “Lower quartiles,” “achievement gaps,” “low performers,” “at-risk,” “Title 1” became labels by which these students were readily recognized, grouped together as one entity. In Long (2020), Siddle Walker, author of *Hello Professor*, referred to the transition from segregated all Black schools to the integration into white schools as a trading of “*aspiration and advocacy for access to the resources white schools had*” (p. 1). Siddle Walker and Byas (2009) wrote that all that sustained Black children was forfeited for a “second-class integration” (p. 271).

The loss of African American teachers and administrators in the name of civil rights created a new civil rights phenomenon for the collective Black students in the classroom. Without advocates and school leaders to protect them, these students were subjected to the policies, practices, perspectives, and beliefs of educators outside of their communities and culture. In her research Kelley (2012) notes that the denial of rights is not always visible nor defended:

...although the turbulent integration of African American students into predominantly white schools was problematic in the past with gaining peaceful desegregation, today, children from diverse cultures differing than their teachers still may face challenges that are much less aggressive, but sometimes hidden and often unchallenged. (p. 69)

The civil rights danger to the collective Black students in mathematics classrooms was specifically identified in a study of identity in mathematics (Aguirre et al., 2013). They are being “denied the opportunity to engage with mathematics in rich and meaningful ways that emphasize critical thinking and problem solving” (p. 5), interfering with mastery of numeracy. Empowering students of color in the mathematics classroom is dependent upon the early identification of ways to “strengthen student learning and cultivate positive mathematics identi[ties]” (Aguirre et al., 2013, p. 10). “We define mathematics identity as the dispositions and deeply held beliefs that students develop about their ability to participate and perform effectively in mathematical contexts and to use mathematics in powerful ways across the contexts of their lives” (Aguirre et al., 2013, p. 14). Educators must establish strong, healthy math identities that encourage and sustain students’ desire and belief to achieve in mathematics in the elementary stages of education. Thus, we needed to understand the development of positive identity as it related to the power and status of mathematics and establishing equity in the math classroom.

Culture in the Classroom

Collectively, Black students are identified as possessing inferior skills and branded as underachieving, unmotivated learners when compared to hierarchical white and Asian peers (Noble & Morton, 2013). This positioning of the collective Black students fostered the image that failure was both predictable and to be expected (Martin, 2009).

In *Multiplication is for White People*, Lisa Delpit (2012) documents the propensity for teachers to “teach down” to students of color, to “teach less,” (p. 6) and to engage in deficit corrections as opposed to in-depth instruction. In many cases, students of color are simply not being taught. Delpit reminds us that we are all susceptible to the existing cultural bias that has deeply saturated the institutions in which we educate our children, directly impacting our ability to support the collective Black students in excelling in mathematics. “Without having any intention of discriminating, we can do harm to children who are viewed within a stereotype of ‘less than’” (Delpit, 2012, p. 6). What is needed is a new perspective.

If teachers are going to teach in diverse classrooms, they “must understand that (they) are looking at children at least as brilliant as those from any well-to-do white community” (Delpit, 2012, p. 8). Instruction in all classrooms must include, “teaching in ways responsive to the cultures of our students (as it) is vital to enhance equity of access to achievement” (Browne, 2012, p. 65). In a conscious effort to address this impact and assure significant academic achievement for students of color, Moses and Cobb (2001) identified

a minimum intervention...to maximize its effects...we began to define what we’re calling the “floor”—an acceptable goal or standard for mathematics component of math-science literacy...The floor is this: you have all the...students ready to do the college prep math sequence when they get to high school. (p. 15)

Thus, the significance of the development of a student’s mathematics identity is critical to their success within the curriculum (Battey & Leyva, 2016; Martin, 2000). Yet, the majority of the literature on mathematics identity addresses it at the middle or high school level (Gholson & Robinson, 2019). This, however, is too late. There is a need for leadership that will return support structures of advocacy and culture to the elementary schools for the collective Black

students, identifying them as key factors of a successful education. Of the five practices significant to effective schools, Kelley (2012) posits that principals must provide:

professional development that address(es) cultural competency issues, develop(s) a sense of community and promote(s) awareness and knowledge about cultural proficiency practices...For principals to change both, their own and their teacher's attitudes, beliefs, assumptions, and behaviors as they work with students of color, the principal must be able to identify and understand barriers to equity. (p. 628)

Kelley's practices echo what Oakes and Rogers (2007) substantiates in *Radical Change Through Radical Means*, that principals developing equity consciousness is not enough. "Creating equitable schools requires challenging and disrupting social norms" (Oakes & Rogers, 2007, p. 196). Principals must lead initiatives that support teachers with learning culturally responsive teaching (CRT) practices and implementing them into the math classroom to support identity development.

Culturally responsive teaching is defined by Gay (2000) as, "using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them" (p. 29). These pedagogical practices were studied by several researchers. Starker et al. (2011) "suggest that effective teachers of African American students were proficient in infusing their students' culture throughout the teaching and learning process" (p. 211). Browne (2012) argue that culturally responsive teaching is required if "equity of access to achievement" (Averill et al., 2015, p. 65) is to be reached for the collective Black students. Averill et al. contend that:

One's identity has a major influence on how they perceive others, their self-esteem, self-confidence, aspirations, motivation, and effort expended in various aspects of their life.

When schools don't aggressively try to facilitate positive identities by all their students, including their racial identity, there are consequences. [The students are]...subject to stereotypes and low teacher expectation. (p. 13)

Racial identity for the collective Black students is formed through experiences, both in society and in the schools. "Schools have an enormous influence on how we come to see ourselves, the hopes and dreams we acquire, and our achievement motivation" (Browne, 2012, p. 12). The development of equitable schools to promote strong, positive identities, racial and math, requires the disruption of established norms that act as barriers for collective Black students seeking academic achievement (Browne, 2012; Martin, 2009; Oakes & Rogers, 2007). The implementation of culturally responsive teaching contributes to the increased engagement and academic success of these students (Marshall & Khalifa, 2018; Starker et al., 2011).

Oakes and Rogers (2007) identify the principal as "a leader who promotes the success of all students by advocating, nurturing, and sustaining a school culture and instructional program conducive to student learning and staff professional growth" (pp. 197-198). If there is evidence of inhibiting racial identity either intentionally or subconsciously, cultural courageousness is required, though the implementation of culturally responsive teaching practices is difficult (Browne, 2012). Averill et al. (2015) posit that the challenges to CRT include teachers "lacking deep understanding of culturally-linked behaviors, inter-personal communication, and experiences" (p. 65). Boerst et al. (2011) extend these challenges by identifying curricular challenges specific to teachers implementing mathematics instruction:

[T]hey are likely to emerge from professional preparation with a relatively small tool kit.

This can cause anxiety because they know from their own experience in schooling, from

observations of teachers, and from their own trials of techniques that there is much more to teaching than can be managed by any set of techniques. (p. 2,852)

The lack of cultural knowledge specific to the culture of the students in class, along with the lack of knowledge of the curriculum, contribute to the challenges and increased anxiety of the teacher. Developing “cultural competencies...is therefore particularly important for enhancing equity of access to achievement” (Averill & Drake, 2015, p. 65). However, principals may support teachers by addressing these challenges within an effective professional development program.

The position of principal is traditionally responsible for management, but more recently principals are identified as the school’s instructional lead. As the leader of instruction, principals are expected to support the development of teacher capacity to improve achievement for all students (Khalifa, 2018). In doing so, principals must also develop culturally responsive instruction and an awareness of equitable practices in teachers. McKenzie et al. (2006) posits that being conscious of equity is essential to teaching all students well and a critical quality for teachers in diverse schools. Her research establishes four central beliefs associated with equity consciousness:

that all children...are capable of high levels of academic success; that this academic success equitably includes all student groups, regardless of race, social class, gender, sexual orientation, learning differences, culture, language, religion, and so forth; that the adults in schools are primarily responsible for seeing that all children reach this success; and that traditional school practices result in inequity for individual students and groups of students and that these must be changed to ensure success for every child. (p. 160)

Teachers must acquire the skills they need to implement equitable practices that address CRT (Delpit, 2012; Hammond, 2015). Principals must help teachers develop this consciousness. Recognition of equity develops individually in each teacher; thus, school leaders need to provide intentional, differentiated professional development to achieve this goal (McKenzie et al., 2006). Coaching provides a frame to deliver individually differentiated professional development.

Coaching Culture

Elementary schools must be places where learning occurs for students and teachers if the needs of all students are to be met in mathematics (Aguilar, 2013). Equity in the mathematics classroom requires a shift in instructional practices and principals are key to facilitating the shift in their schools. Principals can implement coaching practices that will support teachers in learning how to implement equity-based math instruction. Conversations regarding emotional intelligence and implicit bias that are required for this implementation cannot happen without school leaders. Hammond (2015) posits that culturally responsive teaching requires personal presence, a key component in coaching models.

Being responsive to diverse students' needs asks teachers to be mindful and present. That requires reflection. Engaging in reflection helps culturally responsive teachers recognize the beliefs, behaviors, and practices that get in the way of their ability to respond constructively and positively to students. (p. 53)

Traditionally, teacher professional development has not proven effective in supporting teachers with improving instructional capacity (Aguilar, 2013; Knight, 2007). These trainings happen out of the context of the classroom, are often one-time events, and are not aimed at addressing specific teacher needs. However, to develop the conditions for effective adult learning that improve student outcomes, research is leaning into coaching (Knight, 2007). "Coaching can

build will, skill, knowledge, and capacity because it can go where no other professional development has gone before: into the intellect, behaviors, practices, beliefs, values, and feelings of an educator” (Aguilar, 2013, p. 8).

According to an Annenberg Institute for School Reform (2004) study on instructional coaching, coaching can address inequities by providing specifically targeted differentiated supports and facilitate teacher learning of system wide initiatives. “An essential feature of coaching is that it uses the relationships between...principals and teachers to create the conversation that leads to behavioral, pedagogical, and content knowledge change” (Annenberg Institute for School Reform, 2004, p. 4). As quoted by Knight (2007) once coached, teachers are more “likely than non-coached peers to transfer newly acquired teaching practices into classroom use” (Knight, 2009, p. 198).

Teachers who support students in developing strong identities need to examine their identities; all educators should be supported in identity development that facilitates high achievement for students (Price, 2020). Coaching involves “developing the instructional capacity of teachers in ways that improve student achievement...” (Khalifa, 2018, p. 536). Principals can support culturally responsive mathematics classrooms in which all students can learn by providing trusting environments for teachers where they can implement inquiry, take risks, solve problems, and reflect; all aspects of a strong coaching model (Boaler, 2015; Hammond, 2020). This process must begin with teachers critically investigating themselves. Leveraging diversity requires self-analysis "a critical first step for teachers is to understand how their own cultural values shape their expectations in the classroom—from how they expect children to behave socially, take turns during discussions, or even pass out classroom materials” (Hammond, 2015, pp. 55-56). McKenzie et al. (2006) describes equity conscious teachers as believing that all

students “are capable of high levels of academic success” (p. 160), but that this is not always reflected in their teaching practice.

Maher and Muir (2013) posit that all elementary teachers are not confident in their mastery or comprehension of mathematics. Many primary teachers lack conceptual understanding of mathematics even though they “have a command of the facts and algorithms that comprise school mathematics” (p. 73). According to Averill and Drake (2015) teachers’ learning experiences may vary from their original mathematical education programs, creating a lack of confidence in their ability to deliver the content. In addition, Averill and Drake (2015) argues that:

challenges arise for those teachers who lack knowledge of the cultures of their students and who have not experienced culturally responsive practices in their own formal learning experiences or, if they have, have not noticed them or identified how they can be integrated within mathematics instruction. (p. 65)

Principals have the responsibility of leading and in doing so establishing direction. As coaches, principals partner with teachers. Kee et al. (2010) defines a coach leader as “one who will challenge his or her educators to break away from the norm, to be creative, to use their imagination, to initiate something new, to act in new ways” (p. 11). Knight (2007) identifies coaching as key to the implementation of professional development that is required for the needed growth in schools. Knight (2009) identifies three aspects of coach-teacher partnerships:

establish a clear picture of reality; set emotionally compelling, student focused goals; and learn, adapt, and integrate teaching practices that help teachers and students hit goals.

That kind of comprehensive learning is next to impossible for busy educators to achieve without a coach. (p. 7)

As coaches, principals must enter into respectful and encouraging relationships with their teachers.

Principals must become listeners who seek to understand, “ask questions that provide clarity, and stimulate great thinking” (Kee et al., 2010, p. 11). Coaching requires difficult discussions and decision making, but it can lead to transformation. “A coach points out things you can’t see, motivates you to be your absolute best, and challenges you to go beyond where you normally stop” (Miedaner, 2000, p. xvii). The coaching process should be beneficial for the coach as well as the teacher (Aguilar, 2019; Kee et al., 2010; Knight, 2009). However, Aguilar (2019) reminds us that principals serving as instructional coaches cannot be neutral about racial equity or academic achievement for all students. Systemic oppression is prevalent in our society, though often undetected or not acknowledged. “It isn’t an option for coaches to be neutral on issue of justice... Systems of oppression (including racism, patriarchy, and classism) are embedded in our mindsets, behaviors, and institutions” (Aguilar, 2019, p. 40).

Principals acting as instructional coaches must build trust and attend to emotion through partnerships with teachers. Partnerships include the establishment of equal state and power, listening, making decisions, and thinking together. Principals must recognize that teachers are professionals and trust that teachers can and will make good decisions (Aguilar, 2019; Campbell & van Nieuwerburgh, 2017; Kee et al., 2010). The art of coaching focuses on learning, asking powerful questions, and growing self-awareness. Principals cannot take this on lightly. In order to support teachers in reaching their own potential, principals have to be able to recognize equity and inequity themselves. “...Before and during any work around educational equity, you need to

reflect on and cultivate deep awareness of your sociopolitical identity markers, including your own racial identity. This is meaningful work in and of itself” (Aguilar, 2019, p. 11).

Conclusion

In this chapter, I focused on a review of literature that supports my efforts to address the following research question: *How do African American female principals develop and implement culturally responsive coaching practices that support coaching in math classrooms?* I explored the leadership profile and historical development of the African American female principal, identifying her as an advocate for collective Black students from her roots in all Black schools to her transition through the Civil Rights Movement into multicultural institutions. Then, I analyzed how mathematics instruction as a critical skill vital to economic and civil equality while investigating it as both an inequitable gatekeeper and as a violator of civil rights. Finally, I reviewed the concept of culture in the classroom and the need for all students to have authentic cultural representation. The concept of the cultural representation of students in the classroom is extended to building an understanding of how principals can coach teachers to implement culturally responsive teaching into the mathematics classroom. This literature review served as a support for the collaborative work with other African American female principals in seeking a process for co-developing a coaching model to support the teacher implementation of math instruction.

CHAPTER 3: RESEARCH DESIGN

In the participatory action research (PAR) project and study, I worked with two African American female principals to develop a culturally responsive coaching model for working with teachers. We worked collaboratively to design a coaching model that was equity-based and culturally responsive. The school leaders recognized the biased experiences of underrepresented communities and the ways those inequities are presented within the current mathematics structure. They wanted to learn how to use culturally responsive practices to coach teachers. I established the model based upon foundational principles identified in the following theory of action (ToA): *IF* I work collaboratively with other African American female principals to develop and implement a culturally responsive coaching model to support teachers, *THEN* principals will coach teachers to implement culturally responsive instructional practices in mathematics classrooms.

In this chapter, I include the methodological approach to this study, a research design overview, an outline of the research cycles, investigative questions, elements of data collection and analysis, and dormant constraints of the research. I explored this study by implementing participatory action research (PAR) primed by activist research methodology (Herr & Anderson, 2014; hunter et al., 2013) and combined with critical ethnography. As a critical step in the process, I also included community learning exchange (CLE) protocols in designing and implementing the research methodology. During the 14-month PAR research period, I engaged in two iterative cycles from Spring 2022 to Spring 2023. I began by providing an overview of the qualitative research process. Then I discuss the study participants, data collection, and data analysis. Finally, I conclude the chapter with limitations, validity, confidentiality, and ethics.

Qualitative Research Process

In this qualitative study, I conducted in-depth research seeking “the meaning individuals or groups ascribe to a social or human problem” (Creswell & Guetterman, 2019, p. 4). I employed participatory action research (PAR), activist research, and critical ethnography as the primary research methodologies. I tested the theory of action in data cycles conducted in a collaborative and participatory process by investigating responses to the research question. I implemented two cycles of inquiry and collected data in a collaborative and participatory manner to examine the research question and test the theory of action.

Participatory Action Research and Activist Research

I selected activist participatory action research (PAR) for this study because of its collaborative and participatory educational principle allowing the inclusion of stakeholders in the research process with the purpose of contributing to change (Hale, 2001; Jacobs, 2016). Rooted in the PAR process of reflecting, collecting data, acting, and then reflecting again (Creswell & Guetterman, 2019), I focused on improving education and minimizing inequities by engaging people who were immediately involved in an issue or concern and transforming to solution. This activist PAR process supported the focus of practice (FoP): Engaging two African American, female principals in co-designing and implementing a culturally responsive coaching model to support teachers in integrating culturally responsive pedagogy in math classrooms.

The research design included two iterative cycles of inquiry that addressed the PAR overarching research question: *How do African American female principals develop and implement culturally responsive coaching practices that support coaching in math classrooms?*

Why Activist Research?

This question called for a social change to address the exclusivity of educational practices by focusing on inclusivity and addressing marginalized populations (hunter et al., 2013).

According to hunter et al. (2013), activist research is a method utilized to influence change as a form of social justice. Freire's (1970) activism in education supported methodologies for social change; knowledge "emerges" through cycles of "continuing inquiry human beings pursue in the world" (p. 45) individually and collectively. This support of the individual and/or group analysis of practices that systematically impact stakeholders enables a "self-help" approach that can empower and lead to change in practice (Hale, 2001; Herr & Anderson, 2014). Activist research allows comprehension of inequity and oppression from its origin and the framing of change through the collaboration of the researchers and the individuals subject to the problems (Cohen-Chen & Van Zomeren, 2018). According to Hale (2001), this type of research leads to "deeper...thorough empirical knowledge of the problem" (p. 13). PAR deviates from the conventional qualitative methods by facilitating social change through research and can act as a support in addressing oppressive and inequitable practices within by encouraging the participation of group members.

For action to be meaningful, enduring, and connected to those who are oppressed, there need to be multiple opportunities for reflection. I designed activities that encourage praxis -- reflections leading to actions (Freire, 1970). During meetings and interviews I planned to introduce reflection exercises on personal experiences, successes, challenges, and observation data. I intended for these reflective exercises to guide the CPR group and steer improvements.

Critical Ethnography

In order to obtain an extensive understanding of the more significant issues, I included critical ethnography as a qualitative methodology. Based on “procedures for describing, analyzing, and interpreting a culture-sharing group’s shared patterns” (Creswell & Poth, 2018, p. 474), ethnography allows the researcher to delve deeply into behaviors and beliefs. Specifically, critical ethnography, defined by Creswell and Creswell (2018) as “a study of the shared patterns of a marginalized group with the aim of advocacy about issues of power and authority” (p. 476), encourages not only an in-depth exploration by the stakeholders but a reflexive and collaborative effort from the researcher. Critical ethnography contrasts general ethnography in that it seeks to disrupt inequalities by first uncovering and then working against the dominant discourse; thus, participants need to engage in analysis and some rethinking in order to build anew (Anderson, 1989). In this case, while they knew about culturally responsive practices for the classroom and have promoted them, coaching remained race-neutral with generic practices for all school leaders, regardless of their race, ethnicity, or culture. The methodological approach of critical ethnography supported the deeper process of fully understanding the identity and cultural backgrounds of the principals and supporting them to translate that to their coaching practices. Activist PAR process complements the critical ethnography process in the use of reflecting, collecting data, and acting while extending and empowering a politically minded researcher to also advocate against inequality. Through this process, I studied the common interactions, behavior, beliefs, and language practiced the principals used in the study group group and in their coaching practices.

Community Learning Exchange

Using the concept of collectivity in this PAR project and study, I included community learning exchange (CLE) methodology as a process for engaging participants in a “deep dive” into the research questions. The CLE axioms support the learning process within the PAR project. The five axioms are:

- Learning and leadership are dynamic social processes;
- Conversations are vital and central to pedagogical strategies;
- The people closest to the issues are best situated to discover answers to local concerns;
- Crossing boundaries enriches the development and educational process; and
- Hope and change are the building blocks of the assets and dreams of locals and their communities (Guajardo et al., 2016, pp. 29-34).

Through this participatory practice, I invited us to work toward building trusting relationships, maximizing “the opportunity for conversation, reflection, and exploration” (Guajardo et al., 2016, p. 21) with those closest to the issue of concern. These concerns, often deriving from neglect and marginalized voice, require the substantial involvement and collaborative methods employed through both the PAR and CLE processes (Creswell & Guetterman, 2019; Guajardo et al., 2016). Therefore, my collaboration began with a co-practitioner researcher group (CPR), a team of two female principals who engaged in daily leadership practices with teachers affecting marginalized populations of inner-city students. I use the data collected to develop a culturally responsive coaching model with a focus on coaching teachers in elementary math.

Research Questions

The overarching question governing this study was: *How do African American female principals co-develop and implement a culturally responsive coaching model that supports teachers in integrating culturally responsive pedagogy into math classrooms?* I collected and analyzed data to answer three sub questions:

1. How does personal reflection on identity as African American female principals influence culturally responsive leadership practices?
2. How do school leaders use culturally responsive practices to coach?
3. How does the process of collaborating with African American principals support my leadership development?

I designed activities to support a systematic and methodological approach to PAR and ethnography. While there are numerous studies about African American principals, this study looked deeply at the experience of African American female principals as leaders of math initiatives within elementary school.

Action Research Cycles

For this study, the PAR approach placed African American female principals at the center of a process that supports changing how teachers design and implement learning experiences. PAR allowed me to "engage a diverse community in productive, collective efforts to improve" (Bryk et al., 2015, p. 140). Action research is iterative, an ongoing cycle "proceeding in a spiral of steps, each of which is composed of the planning, action and the evaluation of the result of action" (Kemmis & McTaggart, 1998, p. 8). The research process included two improvement cycles, and the implementation of reflect, plan, and act (Hunter et al., 2013). I describe the activities and timeline of the two improvement cycles as displayed in Table 2. The co-

practitioner researcher group met during the Cycle One to support the planning process. After PAR Cycle One, we organized one action cycle that followed improvement cycle steps.

Participants, Data Collection, and Analysis

In the PAR project and study, I supported principals to cultivate culturally relevant coaching practices. Critical ethnography requires that the researcher participates and observes while seeking to change inequalities (Anderson, 1989). Thus, in the project, I engaged the participants in the design and implementation of the research and the collection and review of data. As the lead researcher, I worked with two principals as co-practitioner researchers (CPR). I used interviews, member checks, reflective memos, and artifacts from the CPR and CLE meetings as the key qualitative data instruments collected from multiple sources. I collected data throughout the PAR research window and analyzed it in each data cycle as to make decisions informing the following cycle. I engaged participants in dialogue during each cycle by implementing the four staged cycle from experiential learning theory (Kolb, 1984): experience, reflect, conceptualize, and apply to reflect. I documented participant responses, stories, questions, and next steps. I coded all evidence using both pre-established codes and open coding (Creswell & Creswell, 2018; Saldaña, 2016). I further discuss the participants, data collection, and analytic methodology in this section.

Participants

The participants for this study included school leaders from two inner-city elementary schools in Oakland, California. These female African American principals had an interest in

Table 2

Action Research Cycles

Research Cycles	Activities
PAR Cycle One May, 2022 – July 2022 CPR: Two African American female principals.	PAR Cycle One: • Monthly Co-Practitioner Researcher Group (CPR) meetings using CLE protocols were be held. • One individual interview of each CPR member. • Read anchor texts. • Use PDSA to reflect on actions.
PAR Cycle Two August 2022– May 2023 CPR: Two African American female principals.	PAR Cycle Two: • Convene monthly as a CPR using CLE protocols • Observations of principals coaching teachers using the developed model • Interview 2 CPR principals • Collect and analyze artifacts from CPR meetings and coaching observations. • Conduct member checks to analyze and reflect on evidence. • Final CRP Meeting

improving mathematical instruction for students of color in elementary school and a willingness to use their experiences and stories to develop their leadership. In addition, other participants included teachers and other principals. I used purposeful sampling to select CPR participants. This process recognized participants who can “identify issues of central importance to the purpose of the research” (Patton, 2015, p. 170). The participants I selected were able to assist me in cultivating an in-depth understanding of both the problem and the research questions (Creswell & Creswell, 2018). They were qualified educators with a desire to improve the implementation of culturally responsive practices into mathematical instruction at the elementary school level. This study focuses on the work of the principals as coaches of math instruction. The two principals worked with teachers at their sites to address improving the implementation of math practices.

The two African American elementary school principals leading urban schools and myself, the researcher constituted the core group of practitioner-researchers. According to Foulger (2010), “collaborative reflection is an influential factor in developing and sustaining a culture or inquiry...” (p. 139). Foulger points out that a researcher is at a disadvantage by working in isolation. Thus, we worked together to identify problems, describe, and understand math instruction, and engage in the inquiry process. At the same time, we co-created action steps to improve the changes needed to support teachers in the delivery of the math curriculum.

I gained permission of teachers (n=9) who the principals coached so that we could record and transcribe the coaching sessions. They were useful in helping us understand the coaching process and how the principals used culturally responsive coaching practices. All participants signed release forms (see Appendix C).

Data Collection

A qualitative study involves the investigation of a research question and the collection of data. According to Creswell and Creswell (2018), four types of data are typical in qualitative studies: Observations, interviews, documents, and audio-visual materials. Specifically, I used interviews, observations, reflective memos, artifacts, and field notes from meetings as the key qualitative data instruments collected from multiple sources (see Table 3).

Observations

I worked with the CPR to co-design an observation tool for coaching conversations that was focused on culturally responsive coaching. Observations of principals coaching teachers were included as part of the data collection method to record the behavior and activities of the research participants. Observations allowed me to have a first-hand experience of the occurring event, recording it as it occurred. In addition, observations allowed me to investigate subject matter that participants may have been uncomfortable discussing (Creswell & Creswell, 2018). The observations included information from one-on-one and group sessions with principals and recorded coaching sessions the principals hold with teachers.

Interviews

During each cycle, I met with participants individually and as a group as part of the data collection process. I designed the interview questions and activities to elicit perceptions, predictions, and the participants' personal views. These data support critical ethnography and learning about principal practices and rituals in coaching teachers regarding mathematics instruction. Interviews allowed the participants to provide an historical context and they allowed me, as the researcher, to direct the line of questioning (Creswell & Creswell, 2018). I recorded, transcribed, and coded the data (Saldaña, 2016).

Table 3

Research Questions

Research question (sub-questions)	Data Source	Triangulated with
How does personal reflection on identity as African American female principals influence culturally responsive leadership practices?	Interviews CPR/CLE artifacts CPR Meeting Notes Coaching Observations	Reflective Memos Member Checks
How do school leaders use culturally responsive practices to coach?	CPR meeting artifacts and notes Coaching Observations Coaching Notes Reflections from CPR members	Reflective Memos Members Checks
How does the process of collaborating with other African American principals support my leadership development?	CPR/CLE artifacts Coaching Observations Coaching Notes Interviews	Reflective Memos Member Checks

Artifacts

As the key qualitative data instruments, I focused on CPR and CLE artifacts from meetings, interviews, member checks, and reflective memos, which included the participants' words and voice. These artifacts include items used in routines and rituals, including but not limited to symbolic cultural items, books, decorations, posters, and photos.

Member Checks

I implemented member checks as a method to reduce bias in the research. Member checking increases the validity of the research as it reduces the personal beliefs and interests of the researcher and acts as a triangulation technique (Lincoln & Guba, 2000). By establishing this process, the participants had the opportunity to engage in discussion about the data collected and confirm the results, increasing trustworthiness (Creswell & Guetterman, 2019).

Reflective Memos

Reflective memos are essential to both the PAR and ethnographic research. These memos supported me to generate meaning when analyzing data as a researcher. As noted in Kolb's (1984) experiential learning process, reflection is necessary for effective learning and to drive change. I wrote reflective memos regularly and collected the other principals' memos. These memos are a part of the triangulation process; they helped me reflect on the research process and the conclusions verifying the findings (Gerdes & Conn, 2001).

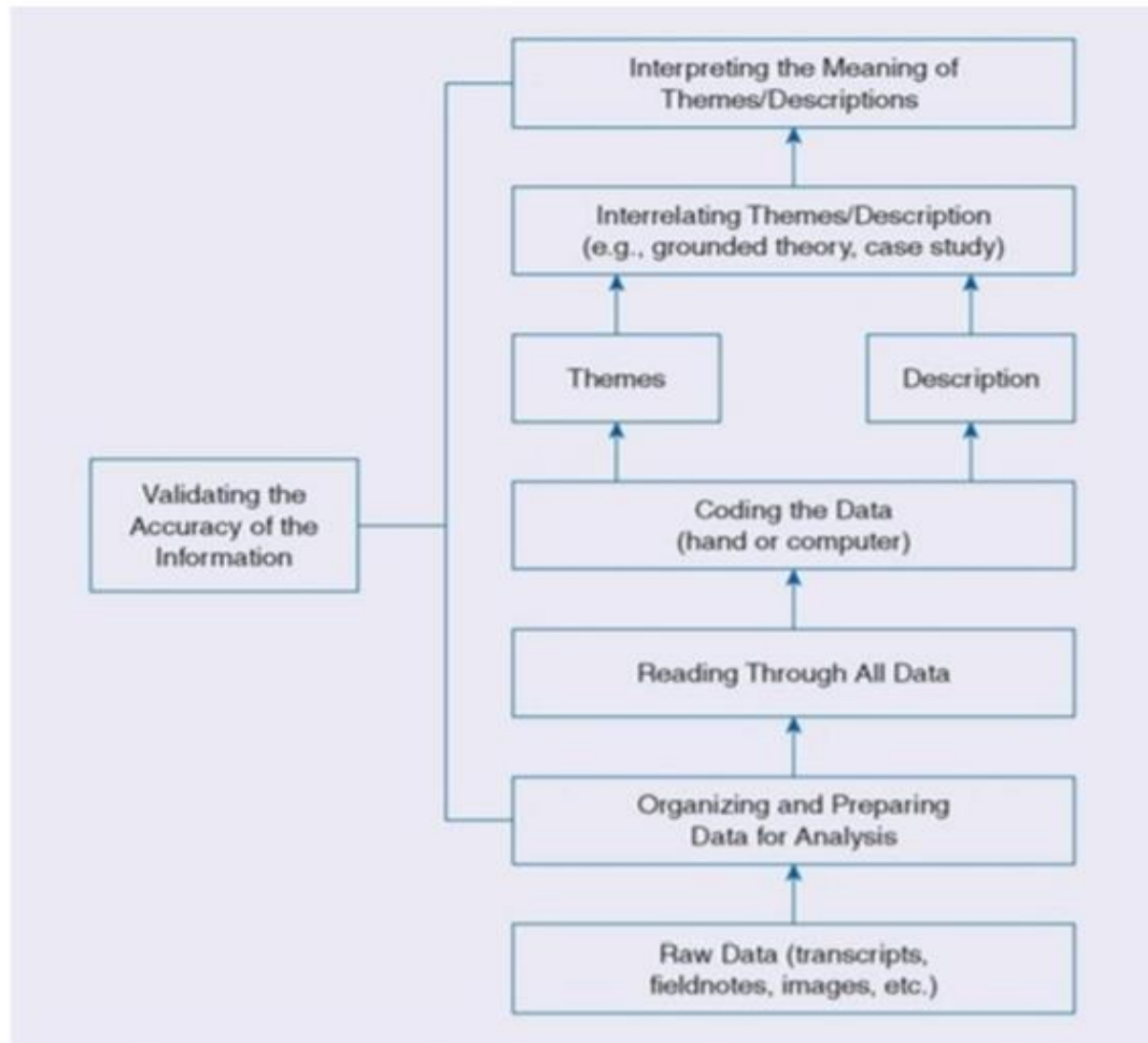
Other Documents

Other documents included in the collection of data is Flipgrid (a video tool used for individual reflection with transcript), and written responses, agendas, written reflections, meeting transcripts, and agendas. I analyzed documents produced through protocols such as journey lines, poetry, and artwork.

Data Analysis

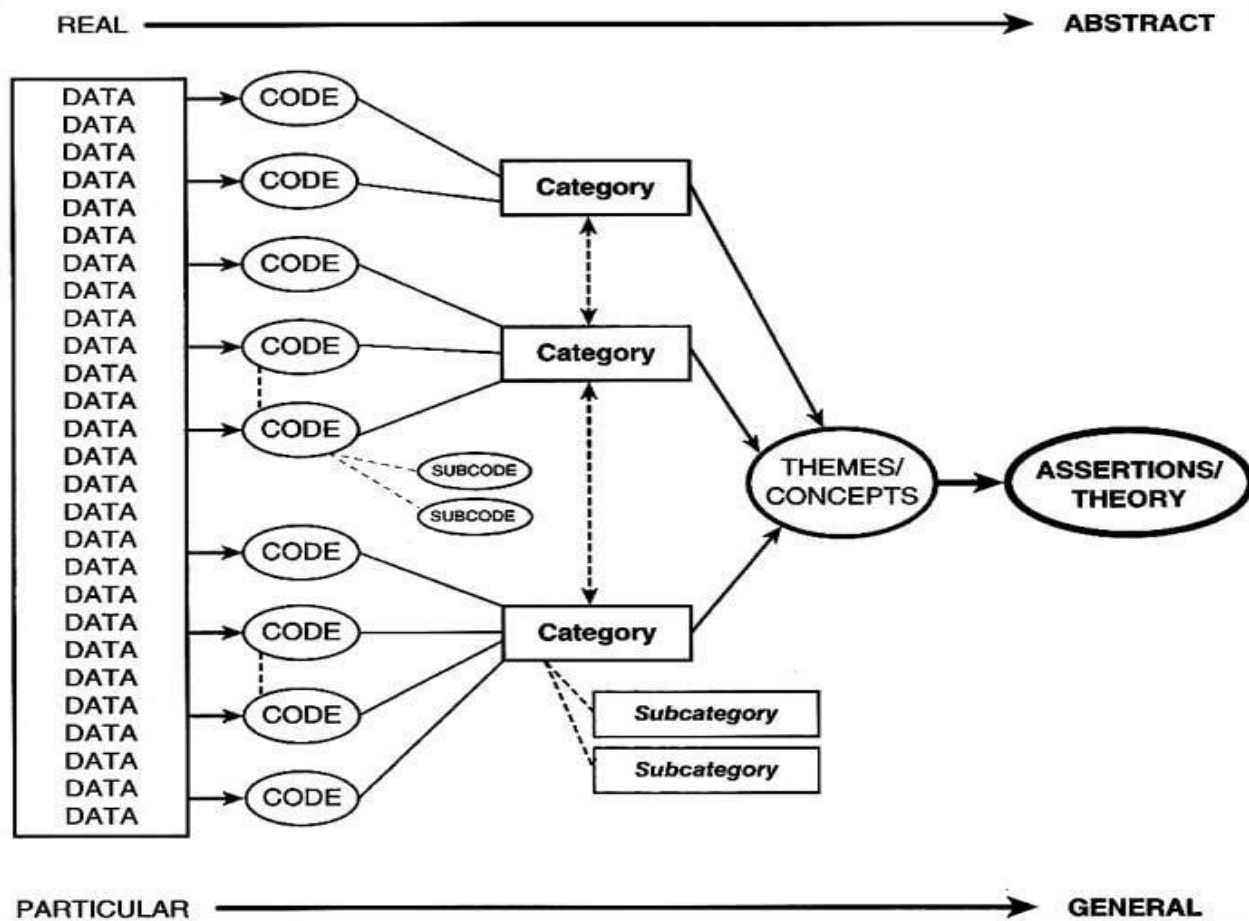
I collected data throughout the PAR research cycles and analyzed those data from each data cycle to make decisions that informed the subsequent cycle (see Figure 3). I then triangulated data from each cycle to study the same phenomenon. I triangulated by collecting data from multiple sources and then identifying coherent themes, which added validity to the research (Creswell & Creswell, 2018). I used a five-step process from Creswell and Creswell (2018) to analyze the data collected during each cycle. I organized, reviewed, coded, generated descriptions, and represented the description and themes as identified.

I used the method from Saldaña (2016) to complete the coding process. I began with the initial coding (open coding) in the first cycle of the arranged raw data from the coaching conversations, observations, interviews, and reflective memos. Saldaña (2016) identifies this as the breaking down of the data into discrete sections so that they may be carefully studied. “It is an opportunity for...a researcher to reflect deeply on the contents and nuances of...data and begin to take ownership” (p. 115). Next, I used open coding for all documents and predetermined codes for the coaching conversations. I organized these codes into categories and subcategories (see Figure 4). Once I identified the themes, I presented findings for the study. At the end of each cycle, the collected evidence was subjected to member checks ensuring validity as defined in limitations (Creswell & Guetterman, 2019). Collecting, triangulating, and coding the data, then identifying themes was significant to qualitative inquiry and an essential part of this PAR. In the next section, I discuss the study considerations, focusing on limitations, validity, confidentiality, and ethical considerations.



Note. (Creswell & Creswell, 2018).

Figure 3. Steps to analyzing data.



Note. (Saldaña, 2016).

Figure 4. Coding process.

Study Considerations: Limitations, Validity, Confidentiality, and Ethics

Qualitative researchers "need to demonstrate that their studies are credible" (Creswell & Creswell, 2018, p. 124.). Identifying study considerations is imperative to this credibility. As a qualitative researcher conducting a study including PAR and critical ethnography, I discuss the study's strengths and limitations, validity, confidentiality, and ethics below. I also completed the International Review Board Collaborative Institutional Training Initiative (IRB CITI) certification in compliance with ethical requirements governing human research (see Appendix A). Next, I address the limitations as established by Quierós et al. (2017). Then, I discuss the concerns of both internal and external validity. Finally, I consider the significance of confidentiality and ethics.

Limitations

Though a qualitative PAR focused on ethnographic research offers real life experience from individual and group participants that include depth and perception, there are limitations that exist (Quierós et al., 2017). Among the limitations included in this PAR project are time, generalization, and bias that I may bring as the researcher.

The collection, compilation, and coding of research data takes time. Forming a thorough understanding of participants' responses is also time consuming (Gerdes & Conn, 2001). I conducted this study within twelve months, a relatively short time period and the process was labor-intensive. In addition, with only two school sites from one school district in the Bay Area in this study, the sample was small. I used a selective and convenient process to identify these school sites, and the research outcomes may not be replicable. Finally, as the prime analyst of the research in this study on African American female principals, I am an African American female

principal and my identity was an influence on the study. In addition, the two other CPR team members were African American female principals.

Internal Validity

Ensuring internal validity is a key factor of qualitative research. During this study, I focused specific efforts on the use of content validity and the employment of established survey instruments (Creswell & Creswell, 2018). Three African American, female, principals make up the CPR, the core team of the study. The three CPR members have a prior, long-term, relationship as colleagues in the same school district for many years. The implementation of the clarification of researcher bias strategy helped us address the concerns of the research regarding this matter. Creswell and Creswell (2018) identifies the following strategies to support validity: triangulation, member checking, research-site observations, and participatory modes of research. Specifically, triangulation allowed "pooled judgement" (Merriam, 1988, p. 413) as we identified multiple sources of data to analyze.

The worthiness of any study depends on the trustworthiness of data collection and the analysis of the data. Lincoln and Guba (2000) identify specific indicators of trustworthiness as credibility, dependability, and confirmability. Each of these indicators establishes a criterion regarding the study's protocols and findings. The selection of the participants in this study was focused on diversity and a commitment to the academic success of students and life-long learning of adults. I further cultivated a relationship with each CPR member through relational trust and around honest, in-depth conversations about the research data.

External Validity

The generalization of the study's findings to address outside settings or individuals is the greatest external threat to the validity of qualitative research (Creswell & Guetterman, 2019).

The forms and instruments I used can be used in other contexts and are well-known methods of collecting data in a qualitative study. The findings will be applicable to other school principals around the country.

Confidentiality and Ethics

Each participant signed a consent form (see Appendix C). I met with potential participants individually and privately to determine their interest in participating in the research. Each participant was a site-based practitioner with a desire to apply culturally responsive coaching practices in support of improving mathematics instruction. The research in this study was designed to answer the primary research question: *How do African American female principals co-develop and implement a culturally responsive coaching model that supports teachers in implementing culturally responsive pedagogy math instruction?*

The use of pseudonyms protected both schools and each participant. Prior to the initiation of the study, all appropriate consent was in place. Participants signed the required consent forms required by East Carolina University Institutional Review Board (ECU IRB).

As data security and confidentiality are priorities for the study, the following measures were maintained (Creswell & Guetterman, 2019):

1. Data files including important personal papers will be stored in a locked cabinet in the administrator's office;
2. All electronic forms for data collection will be kept in a password-protected file, and;
3. I will share data and copies of reports with all members of the CPR group for purposes of transparency, improvement, and reflection.

Conclusion

Throughout this chapter, I detailed the research design and methodology for the PAR study. In the study I sought to answer how do African American female principals co-developed and implemented a culturally responsive coaching model that supported teachers in implementing culturally responsive math instruction. Through the process of two inquiry cycles and the implementation of PAR methodology, the CPR team engaged in a Community Learning Exchange (CLE), collecting and analyzing data leading to identifiable patterns. In the next chapter I describe the PAR context, data from the PAR Cycle One.

CHAPTER 4: PAR CYCLE ONE

The purpose of the qualitative study was to observe and analyze how principals use culturally responsive practices to coach teachers to improve math instruction. Through using participatory action research and critical ethnography, I focused the study on two African American female principals (AAFP) who designed a coaching process to develop their strengths as coaches in working with elementary teachers in math classrooms. The overarching research question is: *How do African American female principals develop and implement culturally responsive coaching practices that support teachers in math classrooms?*

The sub-research questions support the overarching question:

1. How does personal reflection on identity as African American female principals influence culturally responsive leadership practices?
2. How do school leaders use culturally responsive practices to coach?
3. How does the process of collaborating with African American principals support my leadership development?

In the participatory action research (PAR) process, I identified a particular practice – how school leaders act as coaches – to identify their views on math identity and strengths and assets of their coaching practices (Kindon et al., 2007). In tandem with the PAR inquiry process, I used a critical ethnographical approach to unearth cultural assumptions, hidden agendas, patterns, and rules that influence the participants. I incorporated both methodologies to examine the values and practices of two African American female principals as they developed and implemented culturally responsive coaching strategies that supported teachers in improving math instruction. In this chapter, I discuss the PAR Cycle One of the study, including the study context the Cycle One process, timeline of the events, evidence, analysis, and reflection on leadership.

PAR Context

In providing an overview of the PAR context, I describe the school district, the city, and the principals and teachers who participated. I describe the two principals who worked collaboratively to use personal reflection to explore math identities of self and others and develop and implement coaching strategies to support teachers in meeting the cultural, social-emotional, and cognitive needs of the collective Black students. In this study, the collective Black includes cultural student groups experiencing marginalization in school (Bonilla-Silva, 1997; Gholson & Wilkes, 2017), often referred to as a minoritized population (Khalifa, 2018).

The project and study took place in two elementary schools in the Oakland Unified School District, in Oakland, California. Oakland is the state's 8th largest city, located in a California in a region known as the Bay Area. East of the San Francisco Bay, the port of Oakland acts as a major gateway for cargo coming into the northern part of the state. The city's demographic population reflects cultural and economic diversity. Of the 440,000 residents, 28.6% are White, 21.6% are Black or African American, 17.3% are Hispanic or Latino, and 15.6% are Asian (Data USA, 2021). Oakland is often considered to be divided by what residents term the "hills" and the "flatlands." The hills area is recognized as affluent and mostly White, while the large sections of the flatlands are referred to as economically disadvantaged areas and populated by minoritized populations. Next, I discuss details of the district and schools in which the study takes place.

Two Elementary Schools

The Oakland Unified School District is a public education district that operates 87 district schools and 31 county and district-authorized charter schools. The district reports a student population of 36,154 students in district schools and 16,495 in their county and district-

authorized charters with 47 elementary schools in the district. The district's enrollment based on race and ethnicity is 90% students who are minoritized. Almost one-third (10,771) of the students are English language learners (EL), with the largest of the EL population being Spanish speakers. The free and reduced lunch population makes up 71% of the district enrollment. Specifically, the two principals involved in the study were veteran school leaders in elementary schools with transitional kindergarten through the fifth grade and in different areas of the district.

The first school in east Oakland is in a residential neighborhood divided by two major highways, just below the Oakland hills. The school has a student population of about 225 students. Demographically, the school reports a 98% minority population with the enrollment makeup being 66% African American, 3.2% Asian and 2.3% White. There is an 8.8% English learner population and the special education students make up 15.3% of the student population; 84% of the students receive free and reduced lunch, identifying them as economically disadvantaged. The recent data state that 32% of the students between third and fifth grade are at or above proficiency in math.

The second school is in north Oakland, above a major highway at the base of the Oakland hills, in a neighborhood that is residential and commercial. The school is situated amid locally owned businesses -- coffee houses, restaurants, and boutiques. The student population is 340 students with a 91% minoritized population with the enrollment makeup being 50% African American, 18% Latino, 10% White, and 10% Asian; 72% of the students receive free and reduced lunch, identifying them as economically disadvantaged. About 17% of the students between third and fifth grade are at or above proficiency in math

Study Participants

The primary participants for the project included two leaders from elementary schools in the Oakland Unified School District, both African American female leaders in TK – 5th grade elementary schools. Each principal has served at her school site for many years and established deep relationships and instituted pedagogical practices. Both principals and I are in the same EdD program, and they focused their dissertation studies on observing and understanding how teachers incorporate culturally responsive practices in math classrooms. The two principals acted as co-practitioner researchers (CPR) for this study of analyzing the school leaders' coaching practices with teachers. Because I observed coaching practices with teachers, the other participants included teachers from the principals' school sites.

Principals

Principal A has been at the school for 15 years. The student population of her school is majority African American. Although college educated in the Bay Area, Principal A is an East Coast native who relocated to the Bay Area while earning her BA and remained here to earn an MA in 2005 and administrative license at UC Berkeley Principal Leadership Institute. All but one year of her thirty-three years of experience in education were in the same school district. In her youth, from kindergarten through twelfth grade, she was educated in a community in which all but one of her teachers were African American, served as role models, and advocated for excellence from their students.

Principal A was born on the east coast and raised in a single parent family led by a strong matriarch. Her mother did not complete high school, however years later, while working to support her family, her mother earned a high school equivalency. Principal A was one of three children, two girls, and a boy. Raised in generational poverty, she lived in public housing

throughout most of her childhood. All three children attended college: two earned degrees. She was part of the Gifted and Talented Education (GATE) program in elementary school. In reference to her GATE experience, Principal A said, “I was a product of educational experimentation.” She explained that she was in one classroom, kindergarten through second grade, with the same teacher for three years. She repeated the process from grades 3-6 with a different teacher, giving her a total of two teachers for her entire elementary educational experience. Between kindergarten and tenth grade, all her teachers except one were African American; she was Puerto Rican. She described her early educational experience as an immersion into nurturing and high expectations. Principal A said that she always felt her teachers cared about her.

When you are walking through snow with your feet wet and you arrive at school and have to put your shoes up on the heater, then get your hot chocolate that someone made for you because they cared, that made us feel nurtured. They were strict, but it was okay because we knew they believed we could do it. It was not a question if you could; you did.

(Interview, July 6, 2022)

Principal A later attended a primarily White women’s college in the San Francisco Bay area and majored in psychology. After college graduation, she became a substitute teacher in public schools. She reflected on this experience: “The first principal I substituted for said, ‘Oh, you ain’t scared of the kids, do you want to come back?’” She later returned to school to earn a teaching certificate. She has a primary imperative about teachers: “Kids will not work for you if they think you don’t like them and certainly not if they don’t like you. And the only reason they don’t like you is because they think you don’t like them” (Principal A, interview, July 6, 2022).

Principal B, the leader of the second elementary school, was born and raised in Oakland. Principal B focused on ensuring that all students experience the richness of the African and African American cultures through classroom instruction, artistic experiences, and role model interaction. Devoting more than 35 years of her educational experience to the city's children, she has a 15-year tenure at the same elementary school. She attended public schools in Oakland for her K-12 experience. She received a BS degree in political science from the University in California, teaching credentials from Cal State East Bay, UC Berkeley, and University of San Diego; her administrative credential preparation was with New Leaders for New Schools through Cal State East Bay and Boston University.

Principal B was one of two girls and was raised in a two-parent lower middle-class family. She attended schools that had majority White students and teachers. She had two African American teachers in elementary school, second and fourth grades. Her seventh-grade English teacher was African American, but she lost that teacher midway through the year when she was moved to a GATE program at a different school with all White teachers. At the end of middle school, her mother entered a lottery to change her from the neighborhood high school to the "better" school. She had no African American teachers in her academic classes in high school. A GATE English teacher in ninth grade inspired her. According to her, he was a good teacher. "He engaged us in dialogue something like Socratic Seminars and he helped me with an essay contest," she said. Principal B reported that this teacher was important to her because he took time to build a caring, student-centered environment for his students. He was one of two adults she recalled nurturing her, the other one was her counselor. Principal B attended a primarily White college in California.

As a pre-law student, Principal B earned a political science degree. During one semester, she studied abroad at the University of the West Indies in Jamaica: “It was there that I found the right people; I felt nurtured. I was a rebel rouser. I marched for divestment in South African and for the freedom of Nelson Mandela.” She returned home and started law school but did not like it. She needed a job, interviewed, and was hired at the Xerox Corporation. She explained that she excelled but felt like a hypocrite because they were invested in South Africa. She returned to Jamaica and became immersed in the culture. “When I came home, I started studying African dance and started volunteering at a private school with an African philosophy” (Principal B, interview, July 6, 2022). She became a substitute teacher and earned a credential. She then became a founding teacher for a private school with a Yoruba cultural foundation where she taught until she began working in public schools.

Other Participants

Additionally, I included teachers from the two participating schools. Each principal participating in the study was conducting research with a small group of teachers. In both cases, the principals observed classrooms and conducted post observation conversations. As the principals coached teachers in the post observation conversations, I observed the coaching sessions with the teachers. The teachers agreed to be recorded. The focus of the project remained on the principals -- their relationship building and their coaching practices and procedures. However, because they were working with teachers, the teachers were study participants. The first elementary school included 3rd – 5th grade teachers (n=4), averaging from one to 13 years of experience. The teachers of the second school (n=5) included two third grade teachers, one fourth grade teacher, one fourth-fifth grade combination class teacher, and one fifth grade teacher.

PAR Cycle One Process

In Cycle One, as the beginning stage of the study, I conducted background research that supported the focus of practice. I built an understanding of how two African American female principals used personal reflection on math identity to coach teachers in integrating CRP in math classrooms. I describe the activities implemented during Cycle One and review the process I used to develop the codes and codebook.

Activities

During the PAR - Cycle One (May 23 - July 8, 2022,) I met with the two African American principals, the co-practitioner researchers (CPR) for this study, to build initial understanding of their life experiences and the process. As colleagues, we were familiar with each other. Each of us had a desire to improve mathematical instruction for students of color in elementary schools. However, I wanted to develop deep relational trust as well as core understandings and foundational practices of math and CRP. This cycle afforded an opportunity to create a common understanding of identities as African American female school leaders, their mathematics identities, and initial knowledge and beliefs about coaching the math curriculum and culturally responsive pedagogy (CRP; see Table 4 for the dates and activities during the Cycle One).

In May, I met with the two principals who I identified as meeting the qualifications for the study. Both veteran African American female principals were engaged in leading their elementary schools through math initiatives. Both embraced a deep desire to create the intentional implementation of culturally responsive practices at their elementary schools. I interviewed the principals in person at their school campuses and online. In the interview, each principal shared her core beliefs and experiences regarding math and culturally responsive

Table 4

PAR Cycle One Activities and Data

Activity	Date	Evidence
CRP Meetings	May 30, 2022	Meeting Agenda, Notes, and Video
CRP Meeting	June 1, 2022	Meeting Agenda, Notes, and Video
CPR Meeting	June 9, 2022	Meeting Agenda, Notes
Individual Interviews	July 6, 2022	Meeting Notes

practices, as learners and as educators. In addition, they explored the role of instructional math coach focused on culturally responsive practice. I conducted interviews using formal and informal structures, one-on-one and in a group with the three of us. The principals discussed why their participation in the study was important and how their participation would support them in the work they were leading at their school sites. Although their educational experiences were different, the two African American female leaders shared early experiences and examples of strong math instruction in which they had participated. They shared what they felt were best practices and influences in their learning and teaching of mathematics.

The PAR Cycle One conversations supported the principals' reflection on core beliefs, experiences, and common understandings of CRP and mathematics. The hope was to build a foundation based on what was already in place, important, and what was needed. We explored culturally responsive practices and use of CRP in the two schools. The sessions included individual video recordings about identities, one-on-one interviews, and a CPR meeting. During the first virtual asynchronous session with the principal participant, I used an electronic whiteboard to capture the principals' responses to three specific questions:

- How have your experiences influenced you as an instructional leader of math?
- How do you see yourself as a math coach?
- What is your understanding of culturally responsive practice?

During the first in-person CPR meeting, we discussed the components of effective math instruction, principals as instructional coaches, and culturally responsive practices.

Coding

I began the coding process for the Cycle One data collection incrementally. I employed Saldaña's (2016) steps in coding the data. First, I transcribed the initial response and organized

and reviewed the meeting agendas, interviews, video transcripts, notes, and memos. Once I had prepared the data, I read each document and began a precoding process by “circling, highlighting, bolding, and underlining...significant participant quotes” (Saldaña, 2016, p. 20). I read their initial codes and helped them to identify commonalities that could lead to a second round of coding. Then, we discussed the information regarding possible categories. This exercise supported me in learning the coding process; as we spent time reviewing, discussing, and then re-analyzing the data, we gained a deeper understanding of the coding process steps as well as the data content.

The interviews and the conversations among us in our meetings were rich with concepts, ideas, emotions, beliefs, values, and history; as we talked about our prior and current experiences, I found that we could lose track of the purpose. As I completed each research activity, I read the data and returned to the research questions to ensure that we stay on track. According to Saldaña (2016), “It is from the patterned minutiae of daily, mundane life that we might generate significant social insight” (p. 17). Then, I began hand coding documents and entered quotes into the code book and created the first level of codes. I re-read the quotes (*in vivo*) and first codes in search of patterns and repetition and then did a second coding round. I began to question our understanding of CRP and returned to articles regarding culturally responsive practices to reread and clarify. My task, as identified in Chapter 3, was to work with the participants to “identify issues of central importance to the purpose of the research” (Patton, 2015, p. 170). To do this, I had to create a culture of inquiry. As the methodology is activist PAR and ethnographic research, I was careful to understand the role as researcher Saldaña (2016) describes the researcher’s role, “if the interactions are significant, bidirectional dialogic exchanges of issues jointly constructed meaning – then the researcher’s contributions could be

appropriately coded alongside the participant's: the researcher's participant observation field notes, authored from first-person perspective..." (p. 17).

I reviewed the emerging categories with CPR members through a member check process. These categories are not specific to each activity, but a culmination of the information arising from the activities. I conclude the chapter with a description of the categories from the PAR Cycle One and reflections and planning for PAR Cycle Two.

PAR Cycle One Categories

In PAR Cycle One activities, the two African American female principals revealed the central aspects of personal reflections on their math identities and their coaching development. The principals identified early educational learning experiences as value-rich and discussed the connection of these values to coaching. They noted that an essential aspect of culturally responsive coaching would be to ensure a belief in the assets of the collective Black students. Additionally, they wanted to support teachers by coaching to center their practices on culturally responsive pedagogy, but the actual practices of coaching for CRP were not described in the literature and seemed, at times, to be generic. Based on codes, I identified the categories as coaching values, belief in the collective Black students, and coaching for CRP in math. Clearly, the principals' values and their belief in the possibility of students influenced their coaching. Table 5 represents the early emergent categories aligned to the data sources. As I discuss how principals envisioned the early development of coaching to support the implementation of CRP in the math classroom and develop a coaching identity, we became clearer about what CPR coaching meant and how principal actions aligned with their values and beliefs. These initial stories, which I am italicizing for emphasis, tell of their experiences as students and what most influenced their educational trajectories.

Table 5

Categories and Codes from PAR Cycle One

Category	Codes and Frequency	Percentage
Coaching Values (n=85)	Values (32) Early Educational Experiences (19) Supporting Teachers (19) Responsibility (15)	56%
Belief in the Assets of the Collective Black (n=4)	Recognizing Assets (18) Access to the Curriculum (18) Standards Mastery (4)	22%
Coaching for CRP in Math (n=41 instances)	Cultural Knowledge (15) Equity (15) Engaging Student Interests (7) Culture Keeper (4)	22%

I grew up with the belief that you do what they tell you from home and school. I did not know anything about college or know anyone that had been to college, but I knew my mother said I would go and that my teachers were preparing me for it. We did not have money, but I had love and support and people who believed in me all of her life. They nurtured and targeted me for success. There was no question. I was immersed in the Black community and supported though surrounded by poverty. We didn't know we were poor. We were like everyone else. Someone set an expectation for us to be great and so we did. (Principal A, CPR meeting, June 9, 2022)

I had support from home; both of my parents completed high school and my father attended college. My mother chose to work instead of going to college because she did not want to put pressure on her foster mom. I remember going over blueprints my father brought home from work. We would sit around the dining room table engaged in architectural measurements. I loved math until the school change. Then I became one of a few African Americans unlike my other school and felt lost and I lost my confidence.

(Principal B, CPR meeting, June 9, 2022)

These stories indicate their predisposition to developing values about coaching others. They were supported in their families and, in certain cases, in their schools. Thus, they had strong commitments to supporting others.

Coaching Values

As the principals reflected on aspects of their early educational experiences and leadership practices, their coaching values emerged. I describe their coaching values as value-rich because the principals' early experiences in math and their values as educators heavily influenced how they thought about supporting teachers; their values (56% of the PAR Cycle One

data) provided strong foundations that guided their work as instructional leaders in coaching teachers. I categorized these aspects as coaching values as they are essential to their coaching identities. The principals reflected on the importance of their early experiences and responsibilities as instructional leaders as crucial to supporting teachers.

Early Educational Experiences

Principal A shared aspects of her primary education identifying knowledgeable teachers, mixed grade level classrooms, and experiential practices as key to her development as a leader. She reflected upon her development:

As an instructional leader for adults, I harken back to what made learning fun and memorable as a student, and then I try to infuse that...learning how to count resulted in things like jumping jacks and jump rope on the yard, but also, as I got older, being able to measure rooms, being able to do math projects that called for dimensions, and to use geometric shapes. (CPR artifact, May 30, 2022)

Principal B shared that she exposed her teachers to these developed values during professional development, staff meetings, and in professional learning community meetings.

As a student I know sometimes being asked questions, you usually like the right answer, and if the answer is wrong, you hear 'no, next.' Well no, I don't want that for my students. I want my students to be pushed, I want the teachers to believe that all students can answer the questions and that they give students wait-time to think. That is a big thing for me as an educational leader, making sure that that happens. (CPR artifact, May 30, 2022)

The principals anchored coaching values in their educational experiences. Their reflections highlighted moments of success that they attached value to in their coaching.

Principals' Values toward Coaching Teachers

The principals' educational values drove their responsibility to coaching teachers. As those values derived from early experiences, they extended to their current perceptions of their responsibilities to support teachers by using processes and protocols. The overlap between CRP coaching practices and coaching for CRP instructional practices in math classrooms were intertwined. Principal B discussed her coaching values in terms of supporting teacher instructional academic discourse strategies. She identified student engagement, questioning strategies, critical thinking, and problem solving as essential knowledge and skills she needed to engage in effective coaching practice when coaching teachers.

I want to make sure that I am coaching them to be aware of the students they are calling on. I want them to be aware of the types of questions that they are answering or asking. As a math coach, the thing ...is just to make sure that I bring awareness to the teachers in supporting their growth and development... In addition, making sure that they have the content knowledge, that they are modeling, that they are checking the understanding, and that they are equitably engaging all. (Interview, July 6, 2022)

Principal A said:

...my teachers and I reflect often on the use of different techniques... doing entry tickets as well as exit tickets prior to teaching units of study so that you have a gauge on what students already know about a particular topic...also, making sure the students are not dependent learners, but independent learners. Not being afraid of leaning into rigor, but

not just the procedural side of rigor, but also the conceptual side of rigor, and really given a balance, really trying to teach math so that students can apply it. (Principal A, interview, July 6, 2022)

Both principals expressed the value of ongoing teacher professional development, equitable student access to curriculum, improved mathematics curriculum, and strong conceptual understanding of math. Their responses appeared to reflect personal and professional responsibility they felt for the development of the teachers and the achievement of the students. Specifically, principals noted that content knowledge and access to grade level curriculum were essential aspects of the professional development that teachers needed to improve in their math instruction. Culturally responsive practices, student awareness, and building strong relationships among teachers and students were main topics in the three Cycle One activities. Ultimately, principals wanted to coach teachers to develop practices that they could use to support students with a particular focus on supporting the collective Black, and they believed that this coaching could be positive for all students.

Belief in the Assets of the Collective Black

The interchange between the two principals in a meeting demonstrates how they rely on the assets of the collective Black as foundational to their work with teachers. Through their discussion, the collective Black means that deep belief in the students' abilities to learn and setting up the processes that encourage collective expectations of the class for individuals and for supporting each other in the learning process.

Principal B: Teachers experiences in practice and their beliefs about the students also lead to whether or not I feel they are going to probe and get those kids to find the right answer. You, they, have to have the belief that students can (get to the right answer).

Principal A: *Yes the expectation that students will, not the high expectation, but the confidence that they (the students) know, (so that the teacher will) even offer them the challenge.*

Principal B: *I believe that they have gotten to the belief, not that they completely believe yet.*

Principal A: *But, over time though because they didn't start that way.*

Principal B: *No, I don't think they started that way, but I think they value that process. I think they more so just valued calling on the kid who they thought had the right answer. Or they called on the kid who had the wrong answer, then they would ask that kid to call on a friend for help instead of probing and questioning that kid to have that productive struggle.* (CPR Meeting, June 9, 2022)

Acknowledging that all students arrive in classrooms with diverse assets is essential to obtaining academic achievement for all students. The principals agreed that teachers needed to implement strategies supporting the belief in the assets of the collective Black students (24% of the PAR Cycle One data). However, teachers often overlook student assets as they concentrate on student deficits. In addition, the belief in the collective Black means that students experience a system of discrimination in mathematics instruction; the marginalized groups share similar struggles while learning mathematics though they may differ in experience (Martin, 2019).

Deficit focused teaching prevents the recognition of student assets that could be leveraged to increase motivation and learning (Ladson Billings, 2000; Martin, 2009; Muñiz, 2020). Principal A and Principal B said that some teachers did not believe in the abilities of the collective Black students. They offered evidence of some teachers' failures to support student access to the curriculum. Additionally, even when teachers had strong relationships necessary for

teaching, they were often hesitant to engage the collective Black students in experiencing academic struggle during math instruction. The principals initially attributed this to how teachers did not believe in the abilities of all students. Although they agreed that teachers in their schools cared about their students, even loved them, both principals discussed “love” as a possible enabling factor rather than a supportive one to push students’ cognitive levels. As a result, the principals shared their desires to coach teachers to implement equitable practices using a CRP frame that would focus on student strengths. Without a surmountable change in practice, the academic scores of the collective Black students in these schools would likely remain in the lowest quartiles of math assessments. To do so, the principals had to provide opportunities in their meetings with teachers to experience equitable discourse and to feel that the principals felt change was possible for the teachers. While lack of belief in the abilities of the collective Black students impedes their academic experiences, the principals realized that teachers – many of them Black men and women – had similar diminishing experiences in their math education and experienced de-professionalizing in their teaching years. These experiences contribute to their instructional decisions and routines, which often appeared to protect students in ways that did not include pushing students. During the CRP activity, Principal A and Principal B noted their feelings that access to grade level curriculum and to the academic struggle were limited for the collective Black students during math instruction (CPR meeting, May 30, 2022).

The principals identified the lack of belief as the reason that a variety of effective instructional strategies were not implemented in all classrooms. I noted that many strategies that they identified in the Flipgrid activity and then reiterated in the other PAR Cycle One activities were best practices that could be found in many classrooms but were often not found in classrooms with the collective Black students. These strategies included asking probing

questions, teaching critical thinking skills, urging students to problem solve, ensuring access to grade level curriculum, using manipulatives, allowing wait-time, and changing the focus from the right answer to conceptual thinking. Principal A recognized that similar activities were implemented in English language arts activities for English language learners, but that they did not translate to the math lessons (CPR meeting, May 30, 2022). *I told the teachers [to] lean on what you learned in EL [because] what is changing is not the curriculum, the content, but the questions themselves, how you do them, and what you hope to gain don't change.* (Interview, July 6, 2022)

Finally, the principals discussed how the teachers' lack of belief in student abilities led to assumptions about deeper academic engagement in math. Instead, teachers often cultivated a type of protection that compounded the students' ability to push through and enter academic struggle (CPR meeting, June 9, 2022). Thus, the teachers struggled with caring for students, which sometimes translated to protection, instead of pushing the cognitive level of classroom instruction and becoming warm demanders of students (Ware, 2006).

The principals agreed that their teachers often discussed how much they loved the students, but that love did not translate to high expectations. Principal A explained that she did not feel that students had the opportunity to explain their thinking. She said that teachers did not build trust between the teacher and the students regarding their abilities. Principal B added that teachers seemed afraid to allow students to experience productive struggle. According to Principal A, "They (teachers) are uncomfortable with the productive struggle part. They are uncomfortable with leaving lessons open so that there is no closure, you know, for them, they need to have closure" (CPR meeting, June 9, 2022). The principals felt that some teachers failed to recognize the assets that students bring with them, their lived experiences, their beliefs and are

unable to facilitate a connection between these lived experiences and the skills needed in the math curriculum. This showed up in the evidence as lack of attention to standards mastery.

In conclusion, access to the math curriculum, the principals identified academic struggle, and the implementation of equitable practice as issues for their coaching and for teacher instructional practices. The principals believed that if teachers used particular practices in all classrooms with all students, they could shift how teachers could shift their beliefs to students meeting the standards at grade level. A culturally responsive leader and teachers must hold to a belief in the collective Black potential as an essential component of academic success.

Coaching for Culturally Responsive Pedagogy (CRP) in Math

Advocacy – by principals and with teachers -- for culturally responsive pedagogy (CRP) is paramount to the implementation of equitable practices for coaching teachers and for teachers' instructional practices (24% of the PAR Cycle One data). Students arrive in the classroom with their cultures (beliefs, language, religion, etc.), and they should expect to see themselves reflected in the curriculum (Lomotey, 2022). A focus of the June 9 CPR meeting was engaging the principals in defining and reflecting upon what they mean by CRP knowledge. Principal A and Principal B suggested that the inclusion of CRP would encourage equitable practices and promote student engagement in mathematics instruction. Both principals said they wanted to support teachers in developing a consciousness of CRP in math lessons.

During the June 9 CPR meeting, I invited the principals to reflect on their understanding of culturally responsive practices. Initially, the discussion focused on CRP and race, excluding other areas like gender, kinship ethnicity, religion, etc. The definition broadened throughout the discussion incorporating cultural ways of learning, inclusive strategies shared with staff in professional development, and research principals were reading (see Figure 5). The principals

Culturally Responsive Practice

What practices are in place?



Student

Students are given the opportunity for their teachers, classmates and school community to know them as they complete posters about their hopes and dreams and when they are highlighted as the "student of the Week."

Student: Recognize students bring assets into the classroom-Entry tickets to assess what students already know

Staff

Staff: Socioemotional learning happens in ALL classrooms-Morning Meetings-Student led

Staff: Staff use CRP's during class "Ago-Ame", music that is aligned with student's cultural background, Readings from Zaretta Hammond CRT and The Brain to anchor staff meetings and math instruction

Teachers get to know their students and include cultural aspects when possible in their lessons. In addition, they use Call and response, visuals, art, small group work and project based learning.

Community

Community: Afterschool Program staff use call and response "Ago-Ame" to center students, enrichment activities that are student selected based upon interests (e.g. Capoeira, dancing)

through enrichment programs such as African dance, African drumming, capoeira, choral music, and computer coding. We have family engagement events that celebrate culture through family reading nights, family math nights, African

Admin

Admin: Staff, PD and PLC meetings include CRP information (e.g. videos, readings), "Culture Keeper" supports students and families by modeling appropriate cultural discourse

and read every report card so I know my students. At my site, I use the school budget to have the African American Female Excellence Program (AAFE) and the African American Male Achievement Program (AAMA). These programs as for

Leading book review with staff. Kendi X, How to be an Anti Racist, and Ghodly Muhammed's book, Cultivating Genius.

Figure 5. Principals identify elements of culturally responsive pedagogy (CRP).

individually defined CRP and then identified evidence of CRP in their schools. They recorded the evidence in Jamboard, an electronic whiteboard application. The responses indicate that the practices must be vertical from principal to teacher to students and horizontal across all students in a classroom. While the attributes apply to students, principals must imbue their work with teachers as an asset approach to their experiences and knowledge.

- Students arrive with assets including their lived experiences, their beliefs, and feelings about themselves and others.
- Students are not empty vessels to be filled with “things,” but full people who use what they have experienced to expand their knowledge of things and help others gain deep(er) understanding of themselves.
- CRP is about teaching students based on who they are and what they need to succeed.
- Teachers need to get to know the hopes and dreams of their students and families.
- Teachers must learn how students learn best and use practices that engage student interest (June 9, 2022).

The principals noted specific aspects of CRP that they had been studying with the staff in Hammond’s (2015) *Culturally Responsive Teaching and the Brain*. The responses reflected strong advocacy for an asset-based approach to instruction, honoring student strengths and reflecting teacher expectations.

The principals recalled that past district efforts had not focused on equity in math. They said equitable practices that existed in language arts instruction were not visible in mathematics. For example, Principal A shared that “research suggests that the collective Black students are not doing well. The only reason it could be is we have not found a way to address their needs. The district has invested in reading literacy and not math literacy” (Meeting notes, June 1, 2022).

Emphasizing the point, Principal A relayed a story about a White teacher; in a recent district meeting, she stated that she was not sure why the district was having talks about equity in math because it was not an issue. Principal A said that although not completely surprised, she was taken aback that anyone would think that equity should not be a staple standard in all instruction. Principal A responded, “I said of course equity is an issue and grade level materials are an issue” (Meeting notes, June 1, 2022). She added, “The good news is that it was said respectfully and not to blame, but pretty strongly.” I attributed this final sentence in her statement to the principal hinting in a “tiptoe” process that African American educators feel and act on in meetings addressing topics relating to race when they are in the minority. Principal A later explained she was trying to be direct regarding the need to continue struggling for equity but not offend the teacher.

The reflection on CRP surfaced practices on each school campus. Principal A said that teachers, classmates, and school community knew about each student through posters they made about their hopes and dreams. She said that the student of the month supported student recognition. Principal B said that the after-school program used call and response and student enrichment based on cultural interests. She identified Capoeira, African American dance, drumming, choral music, and computer coding as examples. Both principals said that morning meetings, cultural lessons in classrooms, call and response, art, and small group work were common practices in their schools. The principals added they made intentional efforts to gain knowledge of student culture by engaging with families and caregivers in all special education IEPs, SSTs, and parent meetings.

However, the principals noted that intention behind the implementation of CRP mattered. Principal B said when implementing call and response strategies that had cultural roots (i.e., Ago

– Ame), a class call and response protocol that derived from African culture, teachers needed to understand the significance of the cultural history behind the practice. Principal A explained that her site had a position that incorporated what she identified as a culture keeper. One of the culture keeper's duties was to maintain the integrity of how teachers or other adults spoke to or about children. The culture keeper could be heard saying, "We don't speak to children that way here," to adults who were working with children outside of the school's expected agreements. The principals noted that these examples of CRP on their sites were practices in place, but often the practices were not consistent; they did not show up in all classrooms, and they were rarely implemented into math instruction. Thus, identifying, building, and maintaining a CRP culture is essential schoolwide, but its place in math instruction is limited.

In conclusion, the PAR Cycle One of the study engaged the principals in a process of reflecting on their math identities. In the reflections, they identified personal early educational leadership experiences, belief in the collective Black students, and culturally responsive teaching practices as essential aspects of their coaching and identity development. Perhaps at this point, we were not entirely clear about the necessary relationship between CRP in the classroom and CRP coaching practices, but the principals used these data as an information source for how they needed to engage in coaching teachers. Next, I reflect on how the PAR Cycle One of this study impacted my leadership and outline the plan for PAR Cycle Two of the research.

Reflection and Planning for PAR Cycle Two

In the PAR project, I focused on understanding how African American female principals collaboratively used personal reflection on math identity to co-develop and implement coaching strategies to support teachers in delivering math curriculum equitably. According to Merriam and Tisdale (2009), researchers do not discover knowledge; rather, we construct knowledge. I used

the PAR Cycle One of this study to specifically open a dialogue with principals during which we began to create a common understanding about equitable math instruction, culturally responsive practices, instructional coaching, and aspects of our leadership identities that support these practices. Through this process, we highlighted three categories from the data: Creating a coaching identity by reflecting on coaching values, believing in the collective Black students, and building culturally sustaining practices in math. In addition, student engagement, student awareness, and building strong relationships between and among teachers and students were main topics in all three PAR Cycle One activities.

Reflection on Leadership

Qualitative research offers an opportunity for a participant to become more knowledgeable about the phenomenon of interest and to achieve a deep understanding of the phenomenon. For this reason, Merriam and Tisdale (2009) described “qualitative researchers [as] interested in understanding how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences” (p. 5). I chose PAR and ethnography because of my interest in gaining a greater understanding of the role of the African American female as principal and the possible impact she might have in changing the alienating environments in the math classrooms for the collective Black students. As school leaders, school principals have few opportunities to work together to address the day-to-day issues we face. There are even fewer opportunities for African American women who are principals to work cooperatively with each other and address inequities, to reflect and share experiences, cultural practices, or math. This study allowed us a rare moment to collaborate and more deeply understand the dilemmas of practice that we can articulate but often not change.

As the ethnographer of this study, I sought a deeper understanding of African American female principals and how we can work as instructional coaches to support teachers in building positive math identities in the collective Black students. The interplay between how principals coach teachers and how teachers teach children is clear. Historically, classrooms have been alienating, unsupportive spaces for some students, and often professional learning spaces for the adults who teach them do not foster supportive learning. In addition, the historical damage that the African American community has experienced while learning mathematics directly impacts not just our students, but the teachers and school leaders. The data suggest how the principals have become who they are and that directly influences how principals lead. While I am studying two principals, I find these characteristics in my leadership.

Reflection upon this process allowed us to acknowledge and address the how our instructional experiences impacted our leadership; in many cases, we had been unaware of how those experiences affected who we are and how we lead. Being more intentional about surfacing the connection of early experience to current leadership offered the two participants and myself new lenses for understanding our roles. More importantly, the process of reflection substantiated our values, underscored our beliefs, and reinforced the need for us to ensure that all students can have strong math identities if they are to be successful mathematicians.

Our daily direct contact is with our teachers, and the procedures we put in place to support them greatly impact the learning experiences of our students. A coaching process that is intended to build strong math identities for the collective Black students must include culturally responsive practices and self-reflection, and we, as principals, must model those experiences. As the principal teacher in the building, systemically, principals typically address these circumstances in isolation. Because of our parallel experiences as African American women

leaders, I strengthened and enhanced my ability to leader. In the CPR meetings, we developed a trusting partnership among three African American principals and addressed issues and feelings that are not usually recognized in larger principal meetings where we are the minority. We had an ease and trust that supported our thinking, questioning, and co-construction of meaning. The work in PAR Cycle One compelled us to dive deeper into culturally responsive practices, the development of math identity, and equitable math practices. In addition, we were interested in continuing our individual and collective understanding and implementation of CRP practices.

Conclusion

In PAR Cycle One, I used dual methodologies, participatory action research and critical ethnography to review the values and practices of two African American principals serving in Bay Area elementary schools. During this cycle, the principals identified coaching values and examined personal math identity by reflecting on their experiences as math students, teachers, and leaders. The school leaders identified lack of belief in the abilities all students as a critical barrier to equitable practices in math instruction and suggested the implementation of culturally responsive pedagogy as a method to address the concerns. In the next cycle, I identify processes and activities of the PAR Cycle Two, analyze the data to develop emergent themes and, finally, determine the project findings.

CHAPTER 5: PAR CYCLE TWO AND FINDINGS

Many African American female principals are positioned in schools that have high poverty and low academic achievement levels (Bailes & Guthery, 2020; Jang & Alexander, 2022). The African American female principals participating in the study represent this reality. As school leaders in impoverished areas with low achievement, the principals have traditionally focused on reading instruction per district mandate. With a new academic focus to improve math instruction, the principals are shifting their attention to ensure that students who have historically been unsuccessful in math become successful. The study focuses on how the two participating principals use culturally responsive practices to support their coaching of teachers and improve mathematics instruction.

Upon initial meeting, the principals may appear to have few commonalities beyond the similarities in their ethnic background and their age. The principals were raised on opposite ends of the country and differed in the time of their exposures to all White and all Black educational environments. Principal A and Principal B grew up in dissimilar family structures and practiced different religions. However, within the course of the project, in reflective conversations, and in identity development, several commonalities stood out; they thrived while being nurtured in educational environments that were predominately African American and changed their original career choices to become educators to support the collective Black students. Additionally, the principals practiced what Lomotey (2022) established as “role identity of successful Black principals” (p. xxi). Lomotey titled Black principals’ role identity as ethno-humanism: commitment, confidence, and compassion.

The principals in the study live by philosophies that are grounded in their experiences; throughout the research project, we identified and reflected on those experiences. In this chapter,

I focus on reviewing the activities the principals engaged in during the research project that supported them in identifying and reflecting on the implementation of CRP strategies and practices as they sought to better their coaching craft and support teachers to improve math instruction.

Before the study began, I asked principals to identify the names of the African American mathematicians they knew. After some thought, they named the movie *Hidden Figures* without the names of the African American women mathematicians that it represented. I then asked them to Google the images of mathematicians. The search surfaced a plethora of White men from vast historical ages and one White woman. The next searches were for the greatest mathematicians and the 10 most famous mathematicians. Again, the searches surfaced White men. When we were more specific with the search, typing in African American mathematicians, without fail Katherine Johnson (one of the mathematicians recognized in *Hidden Figures*) surfaced and then many African American men and women. Most interesting was that the search for Black mathematicians surfaced scholars back through the early history of the US, but no later than the end of slavery. Yet, the history of mathematics dates to 400 B.C. The principals, African American women seeking to acknowledge the mathematical ability and brilliance of the collective Black students through a compassionate, caring, and asset-aligned approach, were startled. More determined than ever, the principals began focusing on how coaching practices as school leaders could not just teach math but develop mathematicians.

The previous chapter focused on PAR Cycle One in which I engaged African American female principals in a process of reflection on the development of their personal math and coaching identities. Throughout the PAR, I used a critical ethnographic lens, and the research centers on two principals working with myself as the researcher to co-design a coaching process

in which personal reflection on math identity could support teachers to integrate culturally responsive practices in math classrooms. During PAR Cycle One, the principals reflected on their personal coaching values. The principals identified belief in the collective Black students and knowledge of culturally responsive practices as significant to developing the desired coaching strategies. The categories from the initial work in the PAR Cycle One guided me to the development of the activities in PAR Cycle Two.

In PAR Cycle Two, the principals and I drilled down on the essential aspects identified in PAR Cycle One and reviewed the identification of the values, belief in the collective Black students, and CRP leadership practices. We focused on the processes and activities that the CPR members engaged in during the cycle. The research in PAR Cycle Two included observation of principal collaboration, site visits, professional development planning, coaching, and the review of supporting documents. The activities led to principal reflection, identity development, and data collection. In addition, the activities revealed the themes, which responded to the research questions.

As Creswell and Poth (2018) identified in their guide to ethnographic research, “An ethnographer typically spends time ‘in the field’ interviewing, observing, and gathering documents about the group to understand the culture-sharing behaviors, beliefs, and language” (p. 474). Therefore, in the first section, I identify the processes and activities implemented during the study that supported the data collection. In the second section I discuss research themes. In the third section, I analyze the data and form conclusions then relate the themes back to the overall research question. Finally, in the last section, I relate the findings to the leadership.

PAR Cycle Two Process

In this section, I identify the activities related to PAR Cycle Two. I collected the data during CPR meetings, school site visits, coaching observations (in person and recorded), and from a variety of documents including professional development plans, reflective memos, newsletters, bulletin boards, etc. Then, I discuss the collection of evidence and data analysis.

Key Activities

Interviews and observations are favored methods among ethnographers (Creswell & Creswell, 2018). The methods of acquiring data were essential to the data collection. To collect data for PAR Cycle Two, the principals and I met as a co-practitioner researcher (CPR) group, a collaborative research group working to increase the researcher's comprehension and maintenance of the data's meaning (Foulger, 2010). The meeting focused on the principals' reflection of the previous year and the planning for CRP implementation in their coaching for the upcoming year. In addition, I conducted two other CPR meetings during the cycle. At their school sites, I completed coaching observations both in person and recorded, conducted interviews, and reviewed a variety of school documents. Finally, the CPR team and I conducted member checks (see Table 6).

Co-Practitioner Researcher Meetings

I met with the CPR team three times in PAR Cycle Two. Each of the “Queen” meetings, as titled by the principals, included an agenda that allotted a principal “exhale,” “table clearing,” connection making, and then the work – reflecting, discussing, planning.

The meetings routinely started with “Hey Queens, what’s going on” as a greeting, a signal of decompression from the stress of the day-to-day work. The process, practiced by the group, allowed the principals to unload burdens that would keep them from fully participating in

Table 6

PAR Cycle Two Activities and Data

Activity	Date	Evidence
CPR Meetings	August 9, 2022	Meeting Agenda Notes, and Video
CPR Meeting	August 22, 2022	Meeting Agenda, Notes, and Video
Site Visit	September 12, 2022	Meeting Agenda and Notes
Individual Interviews	April 9, 2023	Meeting Notes
Coaching Observation	April 14, 2023	Notes and Video
CPR Meeting	April 15, 2023	Meeting Agenda, Notes, and Video
Coaching Observation	May 28, 2023	Notes

the meetings. We “exhaled” by discussing those issues and concerns that were immediately on the minds, usually the day’s events. We “cleared the table” by talking about large burdens that required knowledgeable input or support from the team. The “connection making” focused on families, children, or personal accomplishments. We then focused on the task. The process was not formally structured, and the activities varied in order but occurred in each meeting. In these spaces, we were free and safe to talk about issues and concerns -- including those of biases and racism, lack of resources for our students, etc. The meetings ended with a blessing/well-wishing and a promise of support and an agreement on the next meeting. The rituals and routines were critical to our conversations, and I recorded each meeting. As each of the members were engaged in doctoral research regarding math instruction, the meetings were reflective of collaborative talks and data gathering. During the first meeting, the principals reflected on the success and failures of the previous year. They were eager to collaborate about the beginning of the school year and to plan. We discussed strategies employed in professional development sessions and research the principals felt would impact changes in math procedures. The meeting offered opportunity for the principals to reflect upon their ideas, review professional development plans, identify research to be shared with the staff, discuss coaching strategies that could be implemented, and address possible barriers. The principals presented their professional development plans. We reviewed the plans and discussed coaching strategies. The principals introduced what they believed the district’s instructional direction for mathematics would be. We discussed the curriculum changes and the important components teachers were expected to teach. The principals noted the discrepancy between the principals’ math professional development plans and the district’s plans. Both principals expressed frustration with the fact that the district was planning but had not yet revealed the completed information for the plan. The principals

recognized that the professional development plans would possibly have to be adapted once the district instructional direction was released.

During the second meeting, we focused on changes that were needed based on the district's revealed professional development agenda. During the meeting, I facilitated a discussion about coaching strategies and activities to strengthen math instruction and we focused on the development of math identity. According to Knight (2007), coached teachers implement new strategies and practices more often than teachers who are not coached. In preparation for coaching, I had the principals review CRP strategies. The discussion unearthed the need for the principals to develop a deeper understanding of the newly implemented math curriculum, the math standards, and the essential components of the content area to coach teachers to support the collective Black students and develop positive math identities. The principals built observation schedules and we agreed on dates for site visits.

School Site Visits

I observed each principal at their school sites. The intention was to see them in their leadership role and observe them interacting with students, teachers, parents/caregivers, and other staff. I observed their leadership styles and cultural interactions in the context of the school environment. The visits lasted from two to three hours on each site. While there I listened to interactions, observed their offices, and walked through the hallways. I observed bulletin boards and postings inside and outside of the classrooms. Outside, I observed playgrounds, neighboring homes, and traffic areas. In both observations I saw each principal interact with clerical staff, teachers, students, and parents. During the interactions, I remained at a distance, so as not to engage in the conversations, but to observe and hear them.

Both principals had offices seated in the front of the school that allowed them to view who was coming in and out of their schools. The principals were easily accessible and prepared to play their required roles, changing hats from principal, to teacher, to security, to mediator, as needed. Each principal had a time during the visit when they were monitoring and/or teaching either one, or a group of students in their office. Both met with parents as needed, often without appointments, at the door, in the hallways, and in their offices. The visits were insightful. Both African American principals wielded the power of their positions in collaborative and caring manners.

Coaching Observations

I observed the principals coaching teachers during in-person professional development sessions and through recorded coaching sessions. “Coaching creates a relationship in which a (teacher) feels cared for and is therefore able to access and implement new knowledge” (Aguilar, 2013, p. 1). In addition, I talked with the principals in preparation for teacher coaching sessions. They identified their coaching approaches while watching recorded teaching lessons and in pre-meetings. The coaching sessions focused on directing teachers in the implementation of promoting positive math identity in students and in the implementation of culturally responsive practices. The principals reflected on their coaching methods and then created ways for the teachers to reflect on teaching methods.

Interviews

I developed an interview guide (see Appendix D) to support the questioning process before conducting the interviews. The guide included open-ended questions that addressed those concerns I felt were important to ask the principals. Though I had the guide, the interviews were semi-structured, giving me the opportunity to adjust the questions based on the principal’s

responses. I took field notes during the interviews, and later I wrote reflection notes. I offered to interview each principals at the site of her choice. The principals chose to meet at their school sites for the initial interviews. Later I conducted an interview at the home of Principal A and on the phone with Principal B. The interviews ranged from 30 minutes to 2 hours. In the notes I recorded things of importance including words, phrases, and quotes.

Evidence Collection and Analysis

I collected data from interviews, CPR meetings, observations, and documents. Once gathered, I transcribed the data and then coded in several cycles, using the Saldaña (2016) coding process. As I reviewed the raw data, particular descriptors were repetitive. As I noted the frequency of occurrence, I organized the data thematically (see Table 7).

The process of transitioning from categories in PAR Cycle One to themes included first identifying categories, collecting additional data, reviewing the codes, reflecting, and rereading before determining the themes identified in PAR Cycle Two. Creswell and Poth (2018) explain that transitioning from codes to themes can require the broadening of shortened codes. I revisited the categories identified in PAR Cycle One of the research and then returned to the code book. As I reviewed the code book for themes, I searched for areas that I may have truncated important information, eliminated critical data, or overlooked important patterns. The patterns reflected in the coding process through frequency revealed categories that led to themes. The identified themes are developing identity, culturally responsive practices, and developing coaching strategies. I provide evidence of the themes in this section.

Emergent Themes

The principals were in search of culturally responsive coaching methods that engaged the teachers in strategies to improve academic achievement in mathematics for all students,

Table 7

PAR Cycle Two Emergent Themes with Categories and Code Frequency

Emergent Themes	Categories	Codes and Frequency	Percentage
Developing Identity	Reflection (n=177)	Principal Values (n=44) Supporting Teachers (n=41) Coaching Responsibility (n=37) Early Experiences (n=33) Principal Knowledge (n=22)	57%
Culturally Responsive Pedagogy	(n=80)	Cultural Knowledge (n=33) Recognizing Assets (n=24) Belief in the Collective Black (n=23)	26%
Developing Coaching Strategies	(n=54)	Supporting Math Wounds (n=28) Implementing Strategies (n=26)	17%

including the collective Black students who historically had not been academically successful. To address the need, the principals implemented coaching strategies to support their teachers in developing CRP for the math classroom. The study focused on the principals' work in reflecting upon personal practices to build a model with the researcher that would assist them in coaching teachers. The principals offered a nested approach in which they, as coaches, modeled culturally responsive coaching and simultaneously supported teachers to adopt more culturally responsive practices in their classrooms.

In PAR Cycle One, the principals noted evidence of a teachers' lack of belief in all students, a lack of access to grade level curriculum, and little opportunity for academic struggle in some math classrooms. The principals viewed the areas as barriers to all students effectively engaging in math instruction. The principals planned changes in practice by using an asset-aligned approach on CRP during PAR Cycle Two. Principal A and Principal B reflected on practices related to coaching and reviewed coaching values that served as the foundational beliefs of the coaching practices, including belief in the collective Black students and CRP. In discussing key themes of PAR Cycle Two, I focus on identity development, culturally responsive pedagogy, and developing coaching practices.

Developing Identity

During the August CPR meeting, I facilitated a discussion with principals about developing strong math identities as teachers (57% of the PAR Cycle Two data) and researched the meaning. Aguirre et al.'s (2013) definition of math identity addresses the dispositions and beliefs of students as they develop. In this study, I explored the question of adult math identity and encouraged the comprehension of the principals' math knowledge.

Identity includes values, beliefs, and practices that determine actions (Muhammad, 2023); values can direct feelings toward learning and teacher interactions with students (Lomotey, 2022). As identity is not static but exists fluidly, growing and developing constantly is a key part of understanding self. Muhammad (2023) posits that self-reflection must be a constant practice for educators if they are to unearth the joy of learning for their students. Educators are obligated:

to cultivate knowledge, reflect upon our lives, and be able to name our purpose for and approach to teaching and learning...Developing identity requires consistent reflection.

Building confidence in the understanding of not just what to do and when to do it, but why it should be done, is rooted in the comprehension of purpose. (Muhammad, 2023, p. 94)

In the study, the process of reflection assisted the two African American principals in examining their value development as leaders and learners of mathematics. The reflective process supported them in making connections between early educational experiences and how the experiences supported the development of leadership values and math identities (n=44/14%).

While identity developed from a variety of factors – family, school, friends, experience (Lomotey, 2022; Muhammad, 2023), the principals initially viewed the development of math identity as an experience that occurred because of the interaction between the math teacher and the student (see Figure 6). However, in PAR Cycle One, the principals and I looked critically at the development of their leadership values and math identity by reflecting upon personal educational experiences, and practices, and then participating in discourse as administrators in the CPR meetings. During PAR Cycle Two, the principals explored the importance of developing strong math identities for others – teachers and teachers with students.

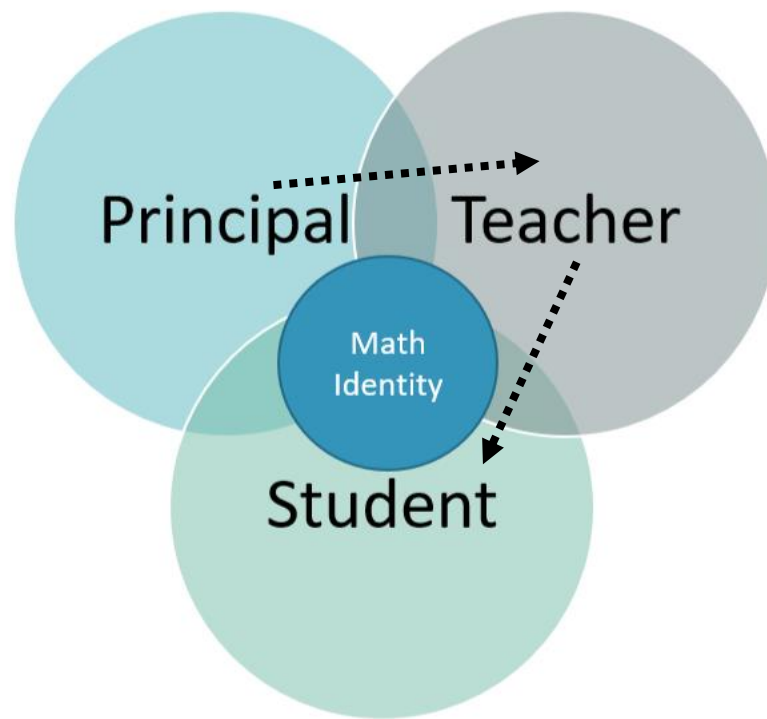


Figure 6. Teachers' math identities shifted as they explored identity with principal support.

In middle and high school, principals work with specific groups of educators who are teachers of math and are specifically trained to do so. However, unique to elementary school, most teachers, from transitional kindergarten through fifth grade, and in some cases sixth grade, have to teach math, even if they do not feel strong as math teachers. The principals recognized that coaching the elementary teachers meant including math identity development that would assist in ensuring teachers were confident and knowledgeable. This step was necessary if all students were to develop with positive math identities. Thus, the principals and I focused on a different coaching approach, a collective development of math identity that included the teachers in each of the schools processing and reflecting on their understanding of their math identities and then intentionally developing positive math identity for students. To begin the process, Principal A and Principal B reflected on personal math identity by journaling about early experiences as students in the math classroom. Next, they had teachers write about early personal math identity development using a process similar to the one we used as we discussed their math identities. In the August CPR meeting, the principals reported that reflecting upon their early learning experiences and identifying personal beliefs created a foundation reminding them of the practices that encouraged strong math skill development (n=33 or 11%). Principal B noted that her leadership practices set the tone for the teachers and wanted to ensure that what was constructed focused on an asset aligned approach to instruction and relationship building.

Engaging in a reflective practice and writing about their experiences acted as a catalyst to support the principals in developing their math identities and the same was true for the teachers. In addition, according to the principals, the teacher reflections on personal math identity revealed information about each teacher that was significant to deeply understanding how teachers'

individually internalized mathematics. For this reason, the principals found the review of each teacher reflection essential. Principal A said,

Teachers' experiences revealed how teachers taught and what we had in common and what was different. It was a starting place for us to share our own experiences. And for me as the leader to see how their experiences as students influenced them as teachers. We used them [the personal reflections] to first talk about observations. Additionally, the [reflections] showed experiences and some places where [their instruction in] math became negative, either middle school, high school; one talked about in college. (CPR meeting notes, April 15, 2023)

Principal B utilized the personal math reflections from the teachers to help her understand the teachers' math identity development and the possible impact on their teaching. "It was so sad that, in their journey lines, just about every teacher reflected that they liked math and then learned to dislike it" (Principal B, CPR meeting, August 22, 2023). However, Principal B wondered how she could use the knowledge in her practice and asked, "If we are going back to their reflection of their math journey lines, how will I take them back through that process?" (Principal B, CPR meeting, August 22, 2023). The question led the CPR team to explore the process and reexamine "math wounded" in relation to their educational development. The discussion and the reflection led to a planning outcome that inspired the principal's design of a math professional development session.

The reflection process was useful for the principals and teachers; the teachers shared written reflections with the principals in professional development meetings.

Taking time myself to reflect definitely was helpful to me becoming a better coach. That is something I will continue to put into my own leadership practice, reflecting and giving

time to teachers to reflect. I reflected sometimes by writing. I reflected by reviewing their notes, their poster charts...looking at what they wrote and looking at the trend. (Principal A, interview, April 9, 2023)

In an interview with Principal B, she noted that she took more time to reflect and gave her teachers more time to reflect in meetings.

I think they appreciated being heard and being told that they are the ones closest to the work and they are the ones who can support the work and development of the work that we are doing at our school and that I valued their reflections. And I really did listen to what they wanted to say. For example, getting their reflection on how they felt on [the new math curriculum] mattered...It is always an issue that the curriculum is not aligned to the assessments. (Interview, April 9, 2023)

In the CPR meetings, the principals outlined attendance and participation in conferences, district professional development, and other instructional opportunities regarding math standards and new curriculum as crucial to their continued learning so they could assist teachers. In addition, the principals discussed recent articles and other works read during research studies. They noted how the recent professional development had supported their math identities by building their knowledge of patterns of practice, essential math components, the Common Core Math Standards. In addition, the principals felt their responsibility as coaches was support teachers with data, research, and professional development that would assist in developing strong math identities (n=37 or 13% of the evidence). The experiences were evident in securing their ability to coach their teachers in the content area. During the project, the principals easily engaged in collaborative discourse with their teachers regarding math instruction. The principals

said they addressed specific standards, assisted teachers in comprehending math concepts, and identified supportive resources because of professional development sessions.

Culturally Responsive Pedagogy

As the leader of instruction, principals are expected to support the development of teacher capacity to improve achievement for all students (Marshall & Khalifa, 2018). In doing so, principals needed to develop knowledge of culturally responsive practice (26% of the PAR Cycle Two data) and an awareness of equitable practices in teaching. Culturally responsive teaching is “using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them” (Gay, 2000, p. 29). The focus of CRP is:

on designing classrooms and schools that emphasize the culture of the learner. It increases the likelihood that students will effectively engage in the teaching/learning process through receiving and internalizing the content of the curriculum. It ensures that the pedagogical and cultural focus within the classroom is responsive to – and addresses – the culture of the learner. (Lomotey, 2022, p. 135)

The intent of CRP was easy to understand; the principals could explain the meaning and agree with the purpose. However, designing the coaching and professional development strategies to support CRP was more complex.

The principals expressed that the nurturing, ethno-humanistic approach to addressing the needs of the collective Black, felt like their personal cultural practices and derived from the earliest stages of life. However, to teach these practices made unpacking the concept essential. The principals said they felt that as African American women they were raised to nurture, to support, and to bring others along with them. They explained that as African American women

they had an innate feeling that they knew how to do this, that they lived and breathed this, that to show up as African American principals meant having CRP covered. “I do not think I can separate out what I do naturally every day” (Principal A, meeting notes, April 15, 2023). The principals questioned whether the experiences brought to the table were CRP ready and if they could teach what they felt was innate.

I facilitated a discussion about the difference between being CRP ready and having experiences as women of color in the United States educational system as students and as educators. The CPR meetings offered the principals a place to reflect on what culturally responsive assets were in place in their schools that celebrated the mathematical skills of all students in authentic and caring ways and promoted the development of strong math identity (n=24/8%). To create clearer understanding so that they could coach the teachers using CRP coaching practices and concurrently teach CRP practices that the teachers needed to use with students, we reviewed and discussed CRP evidence in classrooms. We reviewed the *Eight Competencies for Culturally Responsive Teaching* (Muñiz, 2020; see Figure 7) and used the chart to create an organizational tool identifying culturally responsive practices on the two school sites (see Figure 8). The principals used the tool to record evidence of CRP.

Both principals discussed how academic discourse, calling on strategies, focus on rigor, and conceptual tools like manipulatives promoted equitable practices in math instruction in their schools and thus might strengthen math identity in students.

As a district, as a school already, we have had numerous trainings on academic discourse, so a lot of my teachers know how to ask open-ended questions. They know how to ask probing questions...for three years we had to do a lot of professional development on academic discussion, the math pre-test, the math benchmark tests, and some data analysis

Figure 1 | Eight Competencies for Culturally Responsive Teaching



NEW AMERICA

Note. (Muñiz, 2020).

Figure 7. Eight competencies for culturally responsive teaching that principals used to support culturally responsive coaching and instructional strategies.

Reflect on one's cultural lens	Recognize and redress bias in the system	Draw on students' culture to shape curriculum and instruction	Bring real-world issues into the classroom	Model high expectations for all students	Promote respect for student differences	Collaborate with families and the local community	Communicate in linguistically and culturally responsive ways
Math Journey Lines	Equity Sticks	Professional Development	Application of mathematics relevant to students lives	Ensuring Access	Provide opportunities for student voice	Black History Celebrations	Ago Ame
	Access to the Curriculum	Implementation of Questions		Data Collection		Awards Nights	Scholars
Reflective Journals	Academic Discourse	Questions that interrogate students' experiences		Individual Student Plans		Math Night	Queens/Kings
				Teach Growth Mindset		IEP	
Group Discussions	PLC Meetings			Not have "giveupitis"		SST	
	CLE Meetings			Practice, Practice, Practice			
				RIGOR			

Figure 8. The common tool we used to collect CRP evidence.

when we were doing IABs. Also, things like anchor charts, ring statements, academic discussion charts with question starters. (Principal B, CPR meeting, August 22, 2022)

Principal A said,

Most teachers in my building don't need content. Like they understand the big ideas and the big learnings at each grade level. We have done [questioning] too in math...and we know the calling on strategies. And still, teachers call on students they think have the right answers. (CPR Meeting, August 22, 2022)

The principals implemented CRP strategies to support the teachers in engaging the collective Black students by inviting and welcoming their cultural practices and encouraging the inclusion of all student voices (n=23/7%). Both principals identified academic discussion, questioning, and calling-on as CRP strategies that would support equity in the math instruction. In the CPR meetings, the principals discussed how the research supporting the implementation of CRP could be included in the professional development meetings with teachers and that time should be allotted for administrators and teachers to identify personal beliefs, then reflect on if and how these beliefs supported the development of positive math identity. Both Principal A and Principal B acknowledged that little priority had been placed specifically on math practice or on the collective Black students in math prior.

As we determined that a belief in the collective Black was essential to successfully teaching the group of students, the principals wanted to establish practices that would help teachers identify personal beliefs and begin to build strong student mathematic identities. In the professional development plans, the principals provided the teachers with the opportunity to reflect on their beliefs, which raised two questions the principals focused on during the study that were not part of the study's essential questions: (1) How do we know if the teachers believe that

all students can learn? (2) How do we know if the teachers believe they can teach math? The principals had an opportunity to plan, discuss, reflect, and share ideas in CPR meetings that they felt would support coaching strategies, teacher growth, and the building of strong math identities. One principal commented,

I want it to come from them, I want them to get the pieces of paper on the wall and have discussions about what does that feels like. Do our students feel safe to be here? Our students, if they get something wrong, do we take the time to correct them and make sure that they understand? Also, will our students learn mathematical concepts? I would think you are going to use some manipulatives instead of giving them 25 questions, you are going to give them an exit ticket, and then you are going to correct them during recess and those kids that get it wrong you are going to call them into a small group while the other kids are doing some reading and you are going to talk them through it so that they can get it! Just being able to accept that oh they just got it wrong, no, we can't keep operating like that. (Principal A, CPR meeting, August 9, 2022)

Principal B discussed her teachers, summarizing the hopes and dreams of the students.

What is the big picture? I don't want them to just do an activity and put it on the wall, I want them to reflect on what they learned from that. Teacher reflection, what did you do, what did you learn about your students? What did you learn about yourself as a teacher, by reading your students' hopes and dreams? (Principal B, CPR meeting August 9, 2022)

The discussions in the CPR meetings afforded principals the opportunity to reflect on how professional development supported the development of culturally responsive practices in the mathematics classroom. That prompted them to discuss what coaching strategies could be implemented to encourage teacher implementation of these practices. The principals hoped to

create a structure that would increase student voice and promote diversity in the cultural practices in the classroom.

Developing Coaching Strategies

Creating a structure to support change meant rethinking and reorganizing professional development and reviewing coaching opportunities. In an August CPR meeting, the principals reflected upon their yearly professional development plans and identified coaching strategies (17% of the PAR Cycle Two data) that could be implemented with specific teacher groups. The principals' plans included reviewing teacher reflections of the fourth and fifth grade teachers who they were focused on during their projects.

The principals' review of the teachers' reflections revealed fears, weaknesses in math knowledge, and lack of confidence. Principal B explained, "Many of my teachers do not feel comfortable teaching math. [They are] math wounded." Principal B said, "Some of my teachers used this term, their math education was not good, and they were 'math wounded.'" However, Principal A said her teachers described their experiences with math instruction differently.

My teachers did not say they were math wounded per se, but all of them could talk about a specific event or person, usually a teacher that interrupted their math learning, and most of them were negative. Most teachers said when I first learned math it was fun, we did games, we did this we did that...But every single one of the five talked about at this time, sometimes it was middle school, sometimes it was high school, sometimes it was college, where that stopped. And it was either due to something a teacher did or did not do. (Meeting notes, August 22, 2023)

The principals noted that this was evidence of negative experiences impacting math identity and possibly impacting teacher practice.

The principals discussed coaching teachers to examine what math education felt like to the students so that they could create an environment free from math wounding and in which learning from errors happened when students gave a wrong answer. Their hopes for implementing strategies (8% of PAR Cycle Two data) included ensuring the implementation of hands-on practices, student talk, and achievement measuring through entry and exit ticket strategies (CPR meeting notes, June 1, 2022).

In an interview, Principal B said that changing math practices in the classroom meant implementing “small groups, learning during through play, fun, high expectations, believing in your students, and access to the curriculum” (Principal B, interview, April 9, 2022). Principal A said,

[Teachers] need instructional strategies that are engaging and that are conceptual so that they can stop doing what they have been doing which has not been quite effective and do some different things that kids can build on and learn and use... I told the teachers to stop being afraid to let them struggle and allow them to engage in academic discussion. (Interview, April 9, 2022)

Both principals highlighted the desire for their students to see themselves reflected in math instruction.

Principal A explained how the information from the exploration of the teachers’ math identity development resurfaced later while coaching her teachers and how she incorporated the information into her practice to support classroom math instruction:

If they said that they were turned off by lecture style, then I would go in and see them lecturing. I would coach them about that. Sometimes what they couldn’t see is that they would teach using methodologies that they did not like or respond to, so I could have

coaching conversations that helped them make shifts in their teaching. (Observation, April 14, 2023)

Principal B's reflection and CPR discussion about coaching her staff through the "math wounded" conversation led to a planning outcome that inspired her to design a professional development session with her teachers. In the session, Principal B asked her teachers, "How do we create classrooms safe from being wounded during mathematics instruction" (Principal B, CPR field notes, 2022). Principal B said that she wanted to be direct and intentional not just present an activity to post on a wall. "I wanted them to reflect on what they learned; I wanted the teachers to do their reflections by giving everyone a slide to write on." The Jamboard activity the principal implemented returned the following responses from her teachers:

- Allow for vulnerabilities.
- Create a classroom environment where honesty is a core value.
- Endeavor to engage in growth mindset thinking strategies.
- Emphasize the importance of trial and error.
- Allow students to experience hands on learning.
- We learn from our mistakes.

Excited about the development, she later announced that "after each of the meetings, I am going to write a leader reflection, I am going to write what I learned as a leader from doing those things" (CPR Meeting, August 22, 2022).

In their personal reflections, the principals noted concerns about including the time to implement professional development including coaching sessions because the district plans had not been released. Both principals cited the district plans as barriers to their school site professional development plans. As the district plans were unscheduled in the beginning of the

year, the principals were unable to solidify the school site plans with verified meeting dates and identified content. Thus, the principals created two PD plans to address the possible path the district might take.

Historically in the two schools, principals had been allotted special funding to support the development of students and teachers learning the foundational building blocks in reading; how reading is structured, how to identify the essential components. According to the principals, the district had partnered with them to establish goals and provide resources addressing reading and building identity regarding literacy, but not math. “We have reading tutors, reading partners, all types of literacy support, but no support for math. There is one group that comes in and supports kids with math facts, nothing on the conceptual piece” (Principal B, field notes, September 12, 2022).

Principal reflection and teacher reflection guided the two school leaders in understanding how their teachers learned mathematics. The teachers’ reflections not only traced their early experiences in mathematics but identified areas of comfort and discomfort within the subject area. This information guided the principals in developing coaching strategies and activities that could support teachers individually to improve mathematics instructional practices, including the implementation of mathematics discussions and written reflections or journaling. The principals agreed that continuous principal reflection and discussion would improve their coaching practices. In addition, they felt the need to provide resources addressing foundational building blocks, structure, and essential components of mathematics when coaching.

The principals’ reflected on leadership practice in writing and in a CPR group that served as an African American female affinity group. They discussed teacher practice and reviewed coaching strategies, while connecting with their personal values and beliefs. They shared

experiences between the principals and the teachers, along with personal reflection on their individual leadership practice, supporting the principals with identifying coaching strategies that would improve math instruction at their respective school sites. In summary, I identified developing identity, CRP, and developing coaching strategies as the emergent themes influencing principal leadership and supporting strategies to improve mathematics instruction.

Findings

Consistent reflection supported us to examine accomplishments and barriers. Principals used reflection to create school culture that supported teachers to build stronger math identities for themselves and, in turn, for students and to become confident and knowledgeable about instructional practices. Most of all, they focused on developing a culture in which all adults held the common belief that all students are math capable. Drawing on the data from PAR Cycles One and Two, I determined two essential findings:

1. Reflection on math identity was a critical factor for elementary African American principals and the teachers they coached.
2. By focusing consistently on the values they held for the collective Black, the principals implemented culturally responsive coaching strategies and concurrently encouraged teacher implementation of culturally responsive practices in the math classroom.

Math Identity of Principals and Teachers

Identities form directly through our experiences and impact our purpose; by engaging in reflection, principals refocused and revitalized purpose, strengthened identity, and influenced culturally responsive practice. Because the principals had deep experiences in discussing their math identities, in turn, the principals worked with the teachers in their CPR groups to identify

their identities. In the study, principals' self-examination of purpose revealed core values rooted in their leadership identity that guided their decision making. They recognized the multiplicity of their identity as learners and leaders of instruction. The exploration of early educational experiences reminded Principal A and Principal B how they learned and what encouraged and deterred learning. Reflecting upon aspects of their identities including as learners, African American women, community members, and school leaders affirmed the principals' abilities and perseverance, supporting their desires to challenge inequity as leaders and make math accessible to all students. Specifically, as a part of the critical reflections of Principal A and B, they identified how hegemonic implementation in math expectations negatively impacted math experience for them as learners and for them as principals guiding teachers. Conversely, experiences in culturally supportive environments nurtured math skill development.

In the literature on improving math instruction, little attention is paid to the elementary teacher identity as math learners and teachers (Boaler, 2015; Smith & Stein, 2011; Stein et al., 2000) even though Xenofontos and Andrews (2023) report, "It is broadly accepted that teachers' professional identities influence how they teach and what their pupils learn" (p. 1). As evidenced in this research study, the teachers' early experiences as math students often affected their perception of themselves as math teachers and students as math learners, who are termed math victors or math victims in the Xenofontos and Andrews (2023) study of 22 experienced primary grade math teachers. A necessary step in promoting change in math classrooms is investigating and discussing identity as the teachers' identities may directly influence their confidence and ability to engage in culturally responsive or cognitively rigorous math instruction. In discussing math identity for adult learners (principals and teachers), I focus on principal math identity

formation and how they transferred their experience in discussing math identity to the teachers with whom they worked.

Principal Math Identity: Formation

Both principals said that they initially loved math. Recalling her childhood, Principal A said, “I love math and always did” (CPR Meeting, April 15, 2023). Principal B loved it initially but changed when the classroom experience became isolating in middle school. Principal B reconnected with her love for math as a college student. “Now I love math; I love problem solving. It is a joy when you get to the right answer” (Principal B, CPR meeting, April 15, 2023). Both principals said that their confidence was boosted and their skill levels increased when they were in supportive environments while learning. In addition, they added that they learned the most about math when helping their own children to develop math skills.

Principal B was nurtured and supported in elementary school both at home and at school. Her move from her neighborhood school into a gifted program with mostly White students left her feeling isolated and unsupported. She was immersed into a cultural experience that did not reflect her previous experiences and placed her in a position in which she struggled to keep up and engage, both because she entered into the program in the middle of the semester and because of the differences in cultural practice. However, Principal B’s skill development in math was supported at home.

Principal A was immersed into an educational program that made her feel cared for and nurtured. The program reflected cultural practices she recognized and valued from teachers that looked like her; they were African American. Although Principal A was raised in an impoverished neighborhood, she thrived in and embraced mathematics practices. She felt confident and safe in taking risks.

All of my math teachers throughout high school were African American and they included cultural information when we learned different math specialties. My teachers really knew us. We had access to their knowledge every day all day was about math and we were engaged. The teacher would put on a timer when we were cleaning up, we would sing and count, things like that. By third, fourth, and fifth [grades] we had to show up with questions and answers in math. We had to move up with a drawing to prove things like three times five was fifteen. It built our confidence. We knew what we knew. In middle school, I knew the math, but I remember playing around and the teacher paddled me in front of the class. I remember that, but what I remember most is that she was crying and I was crying and she was saying you are going to need this math, you cannot play around. You need math for when you get ready to go to college. And college was this foreign thing. My mom had talked about us going to college, but I didn't know anyone that had gone to college, but I never played again in her class and that teacher became one of my beloved teachers that I would go back to see when I came home from college.

(Interview, April 9, 2023)

During middle school, Principal B's skills withered. Her love for mathematics diminished along with her confidence in the subject, negatively impacting her math identity.

Most of the kids had come from other GATE programs and I had never been in GATE before. I was coming in mid semester and I had to try to catch up. I had to really work hard just to earn a B. In middle school I went into pre-algebra and I missed the beginning of class and it was like a new language and they kept saying I would catch on; I would catch on. I went from As to Cs and I became insecure and lost my confidence. I didn't feel like I could catch on and I didn't feel like anyone was helping me. By high

school I had lost the enthusiasm for math. But in college, in my credential program, I had a math class that was welcoming. The teacher praised me and kept saying how good I was at it. I received the highest score on the final. (Interview, April 9, 2023)

Math Identity: Principals with Teachers

Review of their experiences as math students encouraged the principals to re-examine how to approach teachers to improve mathematics instructional practices in the schools. Although much of the research on identity assumes a positive math perspective for working with students to improve their math identities as learner (Barba, 2022), clearly, teachers, as well as principals, need to re-examine their histories as math learners, which were often not positive (Xenofontos & Andrews, 2023). Particularly for many elementary teachers, emotions related to math are an issue, and most certainly those emotions transmit to their students (Cross & Hong, 2012). Thus, the principals re-evaluated professional development practices and coaching strategies to focus on the development of math identity. Because the principals had experienced a deep conversation about their identities, they could see how we often jump to instructional practices in teacher professional learning and assume that teachers are comfortable with their math identities and discussing mathematics conceptually with students.

Both principals were committed to creating educational experiences for students in elementary schools that supported positive math identity development, but they recognized that the teachers must interrogate their identities first. One principal said the CPR meetings were “an opportunity” to “reflect,” “grow,” and to gain knowledge about “best practices” while sharing “similarities” and “frustrations.” Both principals spoke strongly about what they termed “character assassination of children.” This reference regarding children being left out of instruction or sent out of class because of behavioral concerns and not being able to undo the

stigma attached to their behavior. “You cannot ruin the reputation of a child by the time they have reached the second grade,” Principal A (CPR Meeting notes, April 15, 2023). They agreed that this “criminalization” is wrong. “It happens as early as kindergarten,” said Principal B (CPR meeting, April 15, 2023). “Often the child sitting in the office is one of the brightest” said Principal B (CPR Meeting notes, April 15, 2023). The principals felt a mindset change from fixed to growth was required and they recognized that this must start with teacher reflection about identity (Dweck, 2014); in employing the liberatory design mindsets, the principals focused on understanding fear and discomfort and attending to healing as key responsibilities for themselves and when working with teachers to shift instructional practices (Anaissie et al., 2021).

Identifying foundational values and beliefs supported the principals’ identity development. The principals used critical reflection to drill down on math experiences and note significant events impacting the math journey taken and reconnecting with their perspectives and values; thus they concentrated on Freire’s (1970) guidelines for praxis – critical reflection to change actions – as a guide to their work. They then mirrored the reflection process in CLE meetings with teachers, engaging them in a process revisiting earlier experiences in math as students at various level and as teachers. The intent was to facilitate inclusive and caring spaces for discussions to support the teachers in sharing their stories. In this way, principals guided and reframed math meaning-making with teachers while nurturing their sense of self. Additionally, the principals used collaborative time and structures to support teachers in recognizing areas of the content they had not mastered and in which they were uncomfortable. Through this process, the principals identified areas of importance for planning professional development and individual coaching sessions with teachers. According to Principal B when discussing what

happened to them in our discussions and what they transferred to teachers, “Being able to take this time to reflect centered them and gave them confidence in their decisions as well as research to support their thinking” (Coaching observation, May 28, 2023).

Principal A noted that her teachers’ reflections revealed excessive support to the students, barring them from productive struggle and rigor. This included asking low level questions and failing to provide the wait time necessary to allow students to think through the mathematics problems. Principal A referred to this as evidence that teachers did not believe the students could engage in the higher level thinking needed to solve the mathematics problems successfully and independently. Once acknowledged, Principal A said the teachers began incremental changes that would address the needed changes in practice including focusing direct attention on questioning strategies.

A best practice for student engagement includes the teacher posing a question to the whole class, allowing all students time to think and process the question and construct a response, providing students with opportunities to discuss responses with partners or in small groups, and then calling on one student to provide an answer. During PAR Cycle Two, teachers began to shift their teaching to replicate this process. (Principal A Dissertation, 2023).

Principal B noted that the self-reflection assisted the teachers in recognizing that the instructional practice of completing the curricular workbook pages eliminated time for students to engage in academic discourse. Additionally, Principal B said that the reflections revealed a large amount of instructional time was dedicated to teacher-talk time and that calling on strategies were limited to students who raised their hands (consistently the same students with the right answers). Principal B explained that the process of calling on only students who raised

their hands limited the number of students called on and eliminated students experiencing the productive struggle. Two stories from the principal experiences with teachers confirm the importance of math identity as a critical factor in initiating changes in teacher practice. Identity is complex and multi-layered – the principals’ experiences included reflections as African Americans, females, teachers, and in religion, family, school – based on interactions and expectations. In addition to their school experiences, the principals reflected on their familial experiences as youth and how they learned despite what others may have perceived as home barriers including poverty, cultural isolation, single parent homes, little family education, and low expectations. Some of these experiences were similar for the teachers and their students. Thus, the principals adopted the positive disposition toward supporting teachers to uncover their experiences as math students as a crucial element in their ability to change instruction and engage in culturally responsive practices.

Culturally Responsive Practices

Both principals held a strong value about the collective Black experience and what that could and should mean for teaching Black children. However, they worried about teachers’ collective lack of belief in students that seemed to be primarily a result of teacher fears and inabilities – in essence – a lack of belief in themselves as competent math teachers. Hammond (2015) posits that “a critical first step for teachers is to understand how their own cultural values shape their expectations in the classroom” (p. 55). Teachers understanding personal cultural values is key to creating trusting spaces for students. Thus, the principals were fully aware that relationships with teachers as well as parents and students was central, and they believed that culturally responsive practices start with relational trust between and among all adults. Thus, building academically trusting environments for students requires establishing trusting

environments for teachers. Principals created opportunities for risk-taking, inquiry, and reflection (Boaler, 2015; Hammond, 2020) in professional development and helped teachers explore personal cultural values and implement culturally responsive pedagogy. The principals modeled as a way of communicating what culturally responsive practices look like. They lived their belief in the collective Black in building relational trust, coaching teachers, and supporting teachers to implement culturally responsive practices.

Principal Relational Trust

To unlearn practices and implement change, principals emphasized their relationships with teachers and with parents and students as essential components to any reform effort (Bryk et al., 2010; Kee et al., 2010). Both principals had maintained their positions at their school sites for more than 15 years allowing them to establish long-term and often endearing relationships. The principals further established trust with teachers by encouraging vulnerability, developing common language, becoming knowledgeable about the curriculum, and building inquiry teams. Trust was strengthened with families daily as they recognized and respected students' caregivers. The principals knew that relational trust was a necessary condition for any substantive change (Tredway & Militello, 2024).

Successful reform requires principals to develop and nurture trusting relationships so that staff can take risks by trying new practices and implementing new strategies. This vulnerability can force teachers outside of their comfort zones, challenging their feeling of safety. In contrast, trust – nurtured over time -- can decrease anxiety and the feeling of risk related to change. Long-term and extensive change calls for in-depth reflection and honest conversations about the effectiveness of practices and the recognition of ineffective practices.

Talking honestly with colleagues about what's working and what's not means exposing your own ignorance and making yourself vulnerable. Without trust, genuine conversations of this sort remain unlikely. Further, relational trust supports a moral imperative to take on the difficult work of school improvement. Most teachers work hard at their teaching. When implementing “reform,” they must assume risks, deal with organizational conflict, attempt new practices, and take on extra work, such as engaging with colleagues in planning, implementing, and evaluating improvement initiatives. Teachers quite reasonably ask, “Why should we do this?” A context characterized by high relational trust provides an answer: In the end, reform is the right thing to do. (Bryk & Schneider, 2002, p. 8)

The principals practiced building relational trust with staff members by coaching them to implement new practices, reflect on their teaching, and record themselves delivering math instruction. They established common understandings of common language, ensuring that all teachers had agreement regarding the meaning of terminology like culturally responsive practice, math wounded, student voice, academic discourse, and rigor. In addition, both principals attended math professional development outside of their schools and participated in the math professional development with their teachers allowing them to discuss curriculum, standards, and strategies with knowledge.

The principals had developed strong relationships with students and families. They discussed generational interactions noting that some of the students attending their schools were the children of their previous students. They easily and rapidly identified which adults belonged to which children in the hallways and upon pick up. They met with siblings, parents, grandparents, etc. Principal A and Principal B made time with and for the students’ caregivers a

priority. During the study, both principals discussed one area of respect that they felt lent to the strong relationships with caregivers and was a cultural norm for them. Principal B said, “I never address parents by their first name,” (Interview, April 9, 2023). “No matter how well and how long you know parents and coworkers, you refer to them in public by their last name,” Principal A (Interview, April 9, 2023). Additionally, the two principals stressed that strong relationships with the students’ families impacted student academic outcomes, especially in regard to mathematics. However, at times they modeled pushing parents to believe in their children as competent mathematicians.

I am sitting in parent meetings and parents will say I understand why my child is not doing well because I did not do well in math either. And I say no no, this is not hereditary. All of us can learn math. The students I see who have been most successful is boys who have loved math. I have to create more opportunities for them to be able to show what they know. And I have to get the teachers to give them the opportunities to be able to do that. (Principal A, interview, April 9, 2023)

Math is that gatekeeper to higher education. You have to in elementary school get a good foundation and build those skills so that you can then take those algebra 2, Intermediate algebra and those classes that are required to be able to go to university level. And since math is the gatekeeper to higher education and often higher education is the gatekeeper to a better quality of life, therefore, math is an essential civil right that we need to just fight for. A lot of our parents want their kids to learn how to read, reading illiteracy is not okay, but they are okay with math illiteracy. It is like I am not good in math so I know my child is not good in math. It’s okay I wasn’t that good in math either; you can get a C in math, but you better not get an A in reading. I feel it is because often people have not

had quality math instruction. They did not understand the conceptual components of math to be able to build on so therefore they just think they can't do it. But it is in their DNA. We created the pyramids. We were the first mathematicians. (Principal B, interview, April 9, 2023)

The longevity in tenure as principals on their school sites afforded Principal A and Principal B the ability to make strong connections with their staff and school community while building relational trust. They sought to create school environments in which all students thrived and deliver consistent messages regarding trust and belief in all students – a belief in the collective Black. The principals used relational trust to guide their supportive actions with the intention of promoting Black children as doers and knowers of mathematics, which is in contrast to “are often confused persistent narratives of inferiority, criminality, and general ineducability of these children” (Gholson & Wilkes, 2017, p. 228).

Principal Actions to Support Teachers

In this study, the principals’ plans included procedures and activities of learning together with their teachers through coaching and professional learning. They approached culturally responsive teaching and learning by modeling with teachers what they expected in classrooms. They observed the CPR teachers frequently and had post-observation coaching meetings. They prepared for the coaching conversations by reflecting with me about what they observed and how they would frame the post-observation conversation – without telling teachers what to do, they wanted to use data so that teachers could make decisions. They were learning to guide by coaching instead of telling or recommending changes as they had often done in the past. The shift for them was important as they needed to entrust teachers to become aware of the areas of change and work to improve their practices – particularly to instill confidence in the African-

American students that they could be doers and knowers of math. In addition, they organized professional learning for the CPR teachers that included all teachers in the school. Principal B added “evidence” of CRP as a category in her professional development to verify equitable practices that supported student culture were implemented and discussed. Principal A adopted the “evidence” practice in her professional development plan. Both principals recorded evidence of practices to develop.

In my site visits and coaching observations, I highlighted that the principals worked in collaboration with their teachers by probing, listening, leading, and stepping back to let teachers lead and make decisions. Three quotes from principal conversations highlight their approach to coaching.

Initially, coaching was more intentional because of using the vocabulary with it, observation, post observation, coaching conversation. I would say I was able to develop better skills as a coach by learning how to question teachers about teaching. I used to say how did that lesson go for you? And the teacher would reflect. But now, my questions are more directed to the data I collect. Like why do you only call on five hands? I ask more coaching questions to get the teacher to identify their needs themselves. (Principal B, interview, April 9, 2023)

When it comes to mathematics a lot of my coaching will come from curriculum. If the teachers are hitting all of the points of the lesson design, and if they are pacing themselves, and if they are following the curriculum, then they are going to teach well. But every now and then you get teachers who do not prepare or prepare well and as they are developing their anchor charts, there are questions like what other kinds of visuals

could you have provided, or why did you choose this visual? (Principal B, interview, April 9, 2023)

In my leadership journey, initially, I knew nothing about the mathematic standards and rigor that is when my journey became about learning the standards in math. Now I know enough to have a discussion and understand the marriage of the standard and the practice. Once the standards became the focal point, I really had to learn to coach teachers. I could no longer just rely on best practices. I had to learn the standards and then tie them to best practices. I knew kids had to have time to show what they knew, but I thought that meant calling people up to the board. Now I know that means letting them talk and share with each other and the teacher. (Principal A, interview, April 9, 2023)

During the classroom observations, the principals modeled how to work one-on-one with students -- disciplining and/or teaching. They discussed co-teaching lessons, subbing when teachers were out, and completing lesson plans as needed. They discussed working with other teachers to support and lead the work. They noted that their extensive personal knowledge of students and families aided them in coaching conversations with teachers. The principals recognized and acknowledged the growth and achievement of specific students and ways to support individual students because of their familiarity with them. In addition, they were confident asking questions regarding specific standards or content because of their previous math training.

However, as with the emphasis on math identity, the principals' experiences in their CPR meeting with me as the researcher of their coaching practices influenced how they organized the professional learning so that teachers had adult learning experiences in CRP. They modeled CRP strategies during the coaching sessions with teachers and worked in collaborative structures with

four or five teachers at a time during several professional development sessions. In particular, they modeled the use of questioning without giving answers and allowing teachers to seek math solutions using academic discourse. As well, they conducted professional learning for teachers on equitable calling on practices to diminish hand raising as the primary discourse pattern. They investigated how and why teachers used turn and talk without think time and urged them to shift to more thoughtful questions and more opportunities for thinking and dialogue. Two principal conversations about principal reflections on teacher shifts in practices include:

I think there is a better growth mindset and I feel my teachers have been able to use more strategies if kids don't get it. I think what I have seen is that a teacher teaches a lesson, and then they do exit tickets, and then they collect them and then during recess they will quickly grade them and put those in a pile and then the kids who got it will do I Ready and the kids that didn't get it the teacher will call to the carpet in a smaller group. Now the teachers are valuing if the kids didn't get it they are now not blaming the kids. They are saying if the kid didn't get it what can I do to make sure they do. They create an anchor chart to review or give more time with dialog so they could understand what the kid didn't understand. (Principal B, interview, April 9, 2023)

Teachers like for me to come in and see that they are doing good work. There used to be times when they were worried about me coming in. But now they say oh great you are here. I value that I have learned to be more reflective in my practice and I value that I have given my teachers more time to be reflective in their practice. That reflection time was a new way to help them grow and talk and chalk talk or reflect and they learned so much just from their own reflections and I learn from listening to their reflections. And they learn from listening to each other. I would say our conversation around race,

around CRP, around micro aggressions. Maybe you shouldn't say it like that or maybe you shouldn't do it like that. I did not have to say it because they were building trust and calling each other out. (Principal B, interview, April 9, 2023)

Principal B shared a coaching experience:

An African American male teacher who I feel he has his own kind of insecurity about his black kids and he just didn't see it himself. I am in his class observing, he asks a question and he is calling on hands. He gave kids time to talk about it first and then he is checking for understanding. He called on an African American kid first and after the kid answered. The teacher says well no I need you to take some time and think about it. Then he goes to Margaret (she is white) and she has got it; she gives the correct answer. Then he goes back to the first kid and he kind of gets it. Then he calls on another African American kid and he does get it and he says well remember what Margaret said. Then he calls on another Black male and said think about what Margaret says. Then he calls on another one and before the kid can answer, he said just say what Margaret says. He didn't see it. He missed that he was having each of the African American kids reflect and repeat what the white female student's response. He was devastated when I pointed it out. (Principal B, interview, April 9, 2023)

As an example of Principal B observing a recorded lesson and preparing her coaching strategies for a fourth grade teacher, the principal noted in her notes what the teacher said: "We will draw and use a tape diagram to make sense of two step addition word problems and makeup addition word problems. Then we will estimate and write equations to assess the problems." In a conversation with me about preparing for coaching, Principal B noted that the teacher stated a clear objective in the first 46 seconds of the lesson. She made a note to herself that the

curriculum they were using may have as many as four objectives in one lesson. She thought she needed to use the data to coach the teacher to have the students read the lesson objective aloud while the teacher reads it and then approach the math problem. She wanted to use the coaching session to guide the teacher to ask the students what they know about the math in the problem before they begin the problem solving.

In another example, the teacher directed the students to show a thumbs up or thumbs down in response to a question. As she prepared for the coaching conversation, Principal B noted that “within the first minute, she [the teacher] had done total participation protocol (thumbs up)”. In addition, Principal B noted that the teacher had included anchor charts on the wall of a previous lessons. The charts were accessible to students if they needed them for reference. However, she wanted to remember to use questioning to ensure that the teacher used the data to discuss the lesson. The teacher said, “We are going to begin with fluency. I am going to be showing you a number line to 1000. I will show you numbers and then ask you what is missing. I see most of you are ready.” Principal B noted that there was a pattern in the routine the teacher used. She noticed that the students followed her direction, but there was still not quite evidence of student learning about fluency (see Figure 9). Principal B noticed the rapid pace of questions and noted that she wanted to discuss pacing with the teacher – especially as the students built fluency in algebraic equations. She noted that the teacher used more wait time and think time and had doubled the instructional time for this portion of the lesson. She made a note to ask the teacher why she doubled the fluency time. “It is strong teacher voice but there are things like total participation protocol, warm demanding, checking for understanding. When students are asked to share, what are you doing? That’s new school. There is a rational for why she has chosen the kids she has chosen. Seventeen minutes in, Principal B noticed that the teacher had

Fluency

T: What were you doing each time?

S:: Adding 1000

T: We were adding 1000s

T uses equity stick to call on a different student.

T: I want you to take a look at the Tape diagram on the board now. Awesome

Tape diagrams are what?

S: – response

T – When you add to addend we get _____?

Sts: We draw them.

T. What do you know about a tape diagram?

T: What does the 1000 represent?

T: An equation that represents this tape diagram

Thumbs up when you think you have this answer. Show me your board.

Look at the tape diagram and write a math equation that makes sense.

Thumbs up when you are ready. Good

T; Hold up boards 2099

$$4627 - 2998$$

$$W + 2099 = 4627$$

T; Lamont, I love what you came up with $7509 + \quad = 58,002$

T: On the board, can I have a volunteer? $5000 + 3000 = \underline{\quad}$?

T: How do you write this in standard form?

The whole equation, write it in standard form.

Does anyone not know what standard form is?

Can anyone tell him what standard form is?

One student raises his hand.

Sts: They read as a group. This should be quick.

Figure 9. Transcript of a teacher-student interaction.

not heard from half of the kids individually and that she had called on some students more than once. She made a note to ask the teacher how she chooses the students who are answering. The kind of evidence collection in which the principals engaged focused their attention on equitable and rigorous academic discourse in mathematics, and their coaching conversations using evidence and guiding teachers to make decisions changed how they interacted with teachers.

In an effort to promote culturally responsive pedagogy, student academic discourse, and improved student learning, principals engaged with small groups of teachers to bolster their observation and coaching skills. They coached with a belief in the teachers' ability to make decisions and think about practice – reflecting the collective Black that they are the doers and knowers of their work and that the teachers' confidence could grow and practices could change if they modeled that basic CRP value. Concurrently, through coaching, they guided teachers to change their practices by using evidence from their classrooms and focusing the coaching conversations on the CRP practices that they knew would increase access and rigor. Because they had cultivated relational trust with teachers and organized professional learning that attended to their readiness levels – all the time keeping in mind their math identities as students and now teachers – they slowly made progress on the goal of culturally responsive practices for math. In the process I engaged in with them, I could observe that coaching for cultural responsiveness required a new set of knowledge and skills on the part of the principals.

Conclusion

In this chapter, I detailed the PAR Cycle Two activities, emergent themes, and research findings. The principals' reflection upon early experiences as learners of mathematics supported them in understanding their feelings and practices as leaders of math instruction for teachers. They examined personal experiences and then coached teachers in a reflective process that

revealed both positive and negative aspects of math identity. The reflections addressed significant beliefs and practices that could directly impact student learning. The principals focused on relational trust as a necessary condition for change. They reviewed methods to apply culturally responsive pedagogy to support improvements and shifts in teaching methods including increased emotional focus on self-awareness and confidence, deeper understanding of motivation and values, and assumptions and beliefs. Both principals believed that strong self-awareness would support individuals to become more sensitive to potential cultural differences, address potential biases, and improve the development of mathematics identity.

CHAPTER 6: DISCUSSION AND IMPLICATIONS

I am not a math person. I have uttered this statement and heard it uttered multiple times. As I began the research on math identity, I came to understand not only the fallacy in this statement but the damage and destruction caused in reciting it (Moses & Cobb, 2001; Muhammad, 2023). Historically, math has been believed to be a subject successfully mastered by only a few elite individuals who neither looked like me racially, nor represented my gender. “Math is for white people” and more specifically, White males, is an historical belief permeating our educational system that often results in alienating spaces in our classrooms. I remember being one of a few African Americans and females in math classes. I remember not being expected to do well in mathematics classes. I remember being told, it is okay, you are not a math person. I can remember believing this and then learning to recite it. I am not a math person. I am not a math person. I am... As an educator, I have watched student after student who struggled to achieve in math and question why they had to learn it anyway. I remember struggling with an answer to offer them as an explanation. Why do they have to learn geometry, algebra, calculus?

When we speak of culturally responsive pedagogy (CRP), people inadvertently associate the concept with race. Recently during a professional development session I facilitated on CRP, a White female teacher told me that the women at her table were confused when I asked them to identify three important factors about their culture. She said, “We are White; we didn’t think we had a culture.” It took them 20 minutes in dialogue to determine that the cultural experiences and practices that occurred daily were White culture. This was profound to her (discovering that she had a culture) and just as profound to me (discovering that she did not know she had a culture).

This information -- how part of the population has been kept from the expectation of being capable of mastering mathematics and how a different part of the population may believe

that they do not have a culture – may help to explain why the collective Black have historically not been successful in mathematics. A change in expectation and access are essential to ensuring that all students can succeed in the mathematics classrooms and can recite what I now say: We are all math people.

During the participatory action research (PAR) study, I observed two African American female principals (AAFP) in small urban elementary schools lead math initiatives to improve the instruction in their schools so that all students can have access, high expectations, and success in the mathematics curriculum. In the process of leading math initiatives in their schools, the women focused on understanding their experiences in math, their personal feelings, and what they believed to be true about learning mathematics. They reflected, discussed, struggled, studied, facilitated professional development, and coached.

Using participatory action research and critical ethnography, I focused the PAR study on the principals (AAFP) who developed their strengths as coaches in working with elementary teachers in math classrooms. The overarching research question was: *How do African American female principals develop and implement culturally responsive coaching practices that support coaching in math classrooms?* The sub-research questions support the overarching question:

1. How does personal reflection on identity as African American female principals influence culturally responsive leadership practices?
2. How do school leaders use culturally responsive practices to coach?
3. How does the process of collaborating with African American principals support my leadership development?

The theory of action for the study was: *IF* I work collaboratively with other African American female principals to develop and implement a culturally responsive coaching model,

THEN principals will be able to support teachers to implement culturally responsive instructional practices in elementary mathematics classrooms.

Discussion

In examining PAR findings, I reviewed sources that deepened the understanding of the emergent themes and the two findings:

1. Reflection on identity was a critical factor for elementary African American principals and the teachers they coached.
2. By focusing consistently on the values they held for the collective Black, the principals implemented culturally responsive coaching strategies and concurrently encouraged teacher implementation of culturally responsive practices in the math classroom.

The two findings are linked; first I discuss how our discussion of identity was critical in our understanding of self as leader and how the values for the collective Black influenced the principals' coaching. These two factors were in play as they worked with teachers; the teachers' understanding of their identity as math students and teachers supported them to shift their practices. After I connect the findings to the extant literature, I advance a framework for changes to principal leadership that consist of changes to instructional mathematical practice. The activities in which we engaged over the PAR study were crucial for our collaborative work (see Table 8).

Principal Reflection on Identity

During the PAR study, principals analyzed experiences and beliefs about mathematics instruction in reflective journals and conversations. Creating equitable classrooms requires principals to focus on math identity to identify individual beliefs and dispositions about

Table 8

Key Activities: Two PAR Cycles of Inquiry

Activities	PAR Cycle One Summer 2022 May-Jul, 2022	PAR Cycle Two Fall/Spring 2023 Aug 2022 -May, 2023
Meeting with CPR members (n=6)	***	***
Individual Interviews (n=4)	**	**
Site Visits (n=2)	**	
Coaching Observations (n=2)	*	*
Conversations with ECU Professors (n=13)	*****	*****

mathematics before moving to improve others if they seek to initiate equity in classrooms (Annenberg Institute for School Reform, 2004). Strong, positive math identities thrive in equitable environments and encourage student ability to achieve in mathematics. Principal knowledge and beliefs impact teacher practice (Knight, 2007). During the course of the study, principals focused on the development of personal math identity by first reflecting upon their early experiences as learners and teachers of mathematics instruction and then coaching teachers to do the same – reflect on identity and examine and implement culturally responsive practices.

Principal Math Identity

As the principals investigated their math identities – including how they experienced math as students and how they perceived their strengths as math observers and coaches, they engaged in reflective activities to support their understanding of personal experiences, values, and beliefs. Math identity, the belief about one’s ability to engage in mathematics, evolves and expands the ability to be effective and successful in mathematics (Hill et al., 2005; Moses & Cobb, 2001). While developing student identity as successful math learners is critical, math identity of adults is a critical topic for consideration; researchers often assume positive identity in teachers to implement more rigorous math instruction. For example, in a study of school leaders, principals should “know what questions to ask teachers about instruction, be able to identify high-quality mathematics and science teaching in classrooms, recognize specific considerations related to mathematics and science, and attend to equity in science and mathematics classrooms” (Cunningham, 2021, p. 1). Similarly, Rigby et al. (2017) concentrated on what principals should know about math as their observations and feedback to teachers considered generic instructional practices, not particularly pertaining to math. Yet, for teachers to facilitate more rigorous learning for students, articulating their identities as math students is a critical factor.

In this ethnographic study of two principals, the focus on knowledge of math and the kinds of questions the principals ask teachers needs to be premised on the principals' understanding of their math identities and how they had conversations with teachers about their identities. Because principals in the study analyzed their early math identity through journaling activities and discussion, they could identify how their present attitudes and interactions with math intersected with personal experiences. By recalling their initial feelings about the curricular area and how school and family impacted those feelings, they experienced old feelings of confidence and anxiety about math and their roles as leaders who support teachers in math. They were fully aware that district professional learning for mathematics assumes that they and the teachers are expected to engage in new curricular efforts; however, they could now see that the ability to fully engage for them and teachers is tied to their math identities. Principals are often critiqued for the lack of knowledge in subject areas when supervising teachers, and they and their supervisors support stronger instructional supervisor roles for leaders (Grissom et al., 2021; Honig & Rainey, 2020). However, they miss a critical first step in the process – the math identity of principals and teachers.

Both principals enjoyed and loved math initially. The CPR discussions included descriptive memories of teacher support and nurturing in culturally supportive classrooms. However, though the positive experiences and development in math remained positive for one principal, the trajectory changed for the other with the change in environment. Evidence from the interviews, observations, and CPR meetings conclude that the development of their math identity was impacted by their experiences. Changes in school brought about opposing experiences for the two principals. For example, in the activities, the principals wrote reflections about how their confidence in mathematics changed in response to the exposure of the educational environment.

While one of the principal's journals and interviews reflected the experience of a nurturing and caring environment in an impoverished but culturally supportive African American school in which she thrived; the other principal reflected upon her skills diminishing in a middle class gifted program, in which she felt unsupported and isolated as one of few African Americans.

As the principals discussed how their home environments impacted their math journeys, Principal B discussed her experience coming from a two-parent home and family college experience while Principal A was raised in a single-parent home with little education and no experience in college. Principal B experienced math conversation and experiences in her home that supported her math instruction and encouraged her to learn more. Principal A had little support with math instruction in her home but was encouraged and supported to do well in school.

The process of reflection supported the principals in identifying which experiences at school and in their homes encouraged the development of their math identity as well as experiences that led to diminished identity. Cunningham (2021) reported on the myth of Black parents lack of support for children's math identity; her research indicates that "when Black children learn mathematics in classrooms void of context and cultural relevance, their mathematical identities are stifled" (p. 26). In her study of eight families, she discussed four clear ways that Black parents do support math in their children: pragmatic skills of financial literacy, aspirational careers, affirmational or encouraging, and race-conscious applications to Black culture and history. In the case of the principals, their stories about math identity indicated that their parents were aspirational, affirming, and race-conscious. In addition, both principals reflected upon the positive impact professional development in the math curriculum had in supporting their ability as leaders of math initiatives. As we moved from PAR Cycle One into

PAR Cycle Two, both principals recognized how reflection on personal experiences and values identified the development of math identity and how the impact of the same could be useful for working with teachers on math identity development and encouraging culturally responsive practices in the mathematics classroom. The principal's work on math identity was a precursor to teacher development of strong math identity.

Principals Support Teacher Identity Development

The principals committed to creating professional development addressing positive math identity for teachers as an approach to improving math instructional practices. Elementary teachers who were not confident math students often experience anxiety in teaching math (Bursal & Paznokas, 2006) or report that they “had experienced times of reduced confidence in mathematics...with conscious and unconscious acknowledgment of their individual dispositions framed by their pasts” (McCullough, 2016, p. 7). In a study of teachers' math anxiety, Patkin and Greenstein (2020) found that elementary teachers may improve in other areas of knowledge and skill as they move from novice to experienced teachers, but math anxiety – a lack of self-efficacy in teaching math -- does not fade over time. Martin (2000) in his framework for analyzing mathematics socialization and identity for students points to agency for mathematics success, which includes personal identity and goals, perceptions of others, and belief about mathematical ability and motivation – all factors for students, but more importantly as we see in this study – critical points for teachers and leaders. Only by participating in communities of practice in which they can express their lack of confidence could teachers mitigate their concerns to become more confident in their work, feel less guilty about their lack of knowledge or skills, and be ready to do as Boaler (2015) suggests – prepare students to develop “active mathematical identities that

include self-belief as well as adaptive expertise” (p. 61). Otherwise, the teachers pass on their negative math identity and anxiety to students.

Principals discussed the conversations with their teachers about personal fear of mathematics and lack in the confidence of their knowledge. The principals re-examined their professional development plans. Focusing on changes in mindset, they worked with teachers in the CPR groups to identify reflective activities addressing math and identity for teachers. Utilizing critical reflection, the principals engaged teachers in reviewing their math experiences as students. The principals planned time for collaboration, content review, and coaching sessions to support teachers in building confidence and improving personal math identity. And, most importantly, as the teachers revealed their qualms to a small group of teachers, they found support and comradery and began to share strategies for supporting them to become more confident math teachers. Once they voiced their anxieties with others and recognized the needed shifts in their math identities, they were more willing to become risk-takers and experiment with higher cognitive math.

The critical reflection and the shift in approach to professional development reconnected the principals to their leadership purpose and values, strengthening identity development for principals first and then with teachers. Both principals reported an increase of confidence in their leadership ability and their ability to support equitable success for all students in the math classroom. In interviews, they noted incremental changes in student participation strategies, questioning strategies, less teacher talk time, and productive struggle – all factors of more equitable and rigorous instruction. Ultimately, the principals noted that the reflection on and development of teacher math identity was a critical process in improving instruction, especially for the collective Black.

Values Guide Culturally Responsive Coaching

In this PAR study, examination of values, experiences, beliefs, and leadership practices guided African American, female principals in the implementation of culturally responsive coaching strategies and encouraged teachers to implement culturally responsive practices in the mathematics classroom. Because they believed in the value of math as a civil right (Moses & Cobb, 2001) and recognized math as a gateway or gatekeeper (Douglas & Attewell, 2017; Hughes, 2021; Martin et al., 2010), they demonstrated the value of the collective Black in their interactions and coaching choices to support teachers. By living their beliefs, the principals cultivated relational trust between themselves and with the teachers to support the implementation of culturally responsive practices.

Math as a Civil Right

According to Moses and Cobb (2001), access to full economic citizenship depends on math and science literacy. Recognizing that without a strong math educational background, students could lose their rights to have full citizenship, the principals clearly messaged high and inclusive expectations for all students. They did so in professional development, coaching sessions, newsletters, etc. The principals supported teachers in mastering and using the grade level math curriculum with the clear purpose of ensuring that all students could access full citizenship and protecting them from infringements to their access that could deter this possibility.

Acknowledging that access to the curriculum did not ensure engagement (Moses & Cobb, 2001), the principals coached the implementation of engagement strategies-- academic discourse, calling on practices, and productive struggle -- with the hope of improving instruction and student outcomes. Both principals agreed with Moses that mathematics was as important as

literacy to citizenship and financial stability for families. However, in coaching sessions and professional development meetings, teacher reflections revealed concern and trepidation regarding areas of the math curriculum. Some teachers had not developed positive math identity and others avoided areas of the curriculum that made them uncomfortable, raising questions about how equitable implementation could be provided.

Math as Equity Issue

During the study, the principals helped support the rights of the collective Black children by clearly messaging that all students must be extended every educational effort and included as full participants. They confronted concerns and challenged negative stereotypes in real-time by pointing out poor practice and providing strategies that supported equitable instruction. They organized professional development meetings to increase time for reflection and discussion. The discussions revealed that some teachers lacked self-confidence, and some avoided the rigor components of the curriculum, threatening the possibility of complete participation in mathematics (Bronson & Long, 2023).

A culture without established high expectations can support good intentions and bad practice simultaneously (Evans et al., 2020), which inevitably promotes inequities. The principals advocated for belief in teacher and student ability and reassured teachers that if they focused on rigor, the students would rise to the opportunity of productive struggle and academic discourse. The necessary condition of relational trust with participating teachers set up the premise that they could be warm demanders for students precisely like the teachers needed to be for students (Delpit, 2012; Ware, 2006). Through honest conversation and recognition of areas of personal growth areas, the principals supported teachers, mirroring what they wanted teachers to

do for students. Only then could the positive elements of the collective Black be invoked to support student learning.

The Collective Black

Regarding math, the identities of the collective Black have been portrayed negatively, subjecting them to poor instruction (Delpit, 1995). Rather, the principals modeled the message and held high beliefs in the brilliance of the collective Black. Focusing on the collective Black means that teachers must disentangle Black students who are lumped together as unsuccessful in math; as Gholson and Wilkes (2017) state: “The identities of Black children as doers and knowers of mathematics are often confused (or mistaken) with stereotypical images of various social identities...to perpetuate persistent narratives of inferiority, criminality, and general ineducability of these children” (p. 228). To undo the belief that Black children cannot learn or do math, Siddle Walker (2015) posits that equality and inspiration are learned qualities.

Yet, in the two participating schools, assessment scores reflected the performance of the collective Black students in the lowest quartiles, not unlike the research on the collective Black in other schools (Gholson & Robinson, 2019; Gholson & Wilkes, 2017; Martin, 2009). The principals banked on the belief that developing stronger teacher and student mathematical identity would contribute to academic success for Black students in math (Berry et al., 2011; Martin, 2009). The leadership promoted implementation of culturally responsive pedagogy (Aguirre et al., 2013; Martin, 2019) to increase the student performance levels. The principals reported that there were incremental changes. However, to push elements of equitable access and cognitive rigor, principals needed relational trust with teachers, and teachers needed relational trust with students.

Relational Trust

The discovery of fear and low confidence levels reflected in teacher journal entries, spurred me to review relational trust between and among the principals and teachers. Culturally responsive teaching requires a resource of trust (Bryk et al., 2015; Grubb, 2008). The principals and I established and nurtured trust within the CPR group early on as we were in the same doctoral program and had at one point been principals of elementary schools in the same school district. Additionally, we had shared a desire to create safe and nurturing learning environments for the collective Black students in math classes. In observing the principals with their school CPR groups and meeting with them individually, I noted candidness and full inclusion. As we honestly reflected on our expressions, shared our deepest concerns, and discussed our purposes, we agreed that trust was a significant factor in the implementation of coaching strategies and culturally responsive practice.

In the site and coaching observations, I observed a high level of trust at each school site as a necessary condition for school change (Tredway & Militello, 2024). The trust between the principal and teachers was based not only on tenure longevity of each principal (15 years), but on how the principals consistently communicated regarding expectations in weekly newsletters and group emails to keep staff abreast of agreements and expectations. Both principals had open-door policies, made time to address concerns, and met with staff often. During professional development sessions, the principals encouraged risk taking and supported teachers who needed assistance with understanding the curriculum. The principals began extending this trust into the coaching of culturally responsive practices by using evidence from informal observations in classrooms to frame post-observation conversations in which teachers identified their next step goals with principal guidance. In the school level CPR groups, the teachers shared their math

identity, shared their instructional dilemmas, and started to count on each other as well as the principal for advice about changing practices.

In our CPR meetings, principals reviewed levels of trust in coaching practices. In the reflections, both principals shared a desire to improve the experiences and success of Black children in the mathematics classroom. The discussions included positive and negative educational interactions of the principals, their children, students, and staff members. They valued the teachers' vulnerabilities and turned purpose to progress based on the firm commitment to improve the experiences of the students. They did not doubt that teachers wanted to be more effective and demonstrated their belief in the teachers as a way of modeling what they expected teacher to do with students. Principals focused on how teachers could exemplify their stated beliefs in students.

Reflections on teacher math identity supported principals in disrupting “established norms of teachers”; they acted on the shared value they had and on an intense and urgent desire to improve academic achievement in math for the collective Black students. In the case of coaching and the spirit of changing practice, they supported teachers to clearly identify goals and plan collaboratively. The principals shifted from reflecting to planning supports for teacher reflection, a necessary step if teachers were to understand how their values about student performance must match their actions in the classroom (Hammond, 2015). Both principals created structures for teacher reflection including time for written reflections in meetings and encouraging teachers to record and watch their instruction. They created time and space for honest conversations about what was and was not effective, a necessary condition to reform and one that engenders and deepens trust (Bryk & Schneider, 2002). They were clear about addressing harmful micro-aggressions impacting learners and teachers in the collective Black

(Chun & Feagin, 2019). In addition, they engaged in instructional conversations using mathematics terminology during professional development and coaching sessions. By the end of the study principals reported an increase in trust. They cited teacher participation from teachers who they had previously not been able to reach and/or shifts in practice from teachers who they had struggled to engage in culturally responsive practices. Trust as a necessary condition for school change efforts (Tredway & Militello, 2024) is the foundation of actions to change instructional practices.

Principal Actions Support Teachers

The principals' values and beliefs to support all students in the mathematics classroom, including the collective Black who had historically not been successful (Gholson & Wilkes, 2017), became evident in PAR Cycle One and remained a focus throughout the study. Recognizing teachers, especially new teachers "had minimal opportunities for face-to-face experiences where they learned the culture of schools and developed a repertoire of strategies for how to build a community and craft culturally responsive instruction" (Many et al., 2023, p. 2), the principals sought to address the need. The focus the value of inclusivity and equity in math led to the principals' creation of professional development and activities that encouraged teacher implementation of culturally responsive practices.

Principal A and Principal B valued instructional support as children and as educators. In meeting notes and interviews, Principal A discussed the nurturing educational environment she experienced and valued as a student noting belief was never a concern..."we knew they believed we could do it. It was not a question if you could; you did" (Interview, July 6, 2022). Principal B valued the opportunity to implement her value of support because of an early educational experience she endured without school support that led her away from her love of math which

she regained later. She described this experience in math as isolating and at times lonely. The principals valued including rigor, involving students in academic discussion, high level questioning, and independent learning skills including these practices in the plans and activities and noted them as significant to the implementation of culturally responsive teaching.

During CPR meetings, the principals planned and reflected with me, identifying culturally responsive coaching strategies that supported teachers in implementing culturally responsive practices. Having established a connection between their values for the collective Black and the culturally responsive practices, the principals were able to shift their practice and plan activities encouraging teachers without diminishing trust in professional development by modeling; and by guiding with questions and data, not telling, while coaching teachers individually. An additional shift occurred with both principals agreed to add “evidence” of CRP to their professional development documents as a process of monitoring and recording where student culture was supported by the implementation of culturally responsive practices. In addition, this added shift supported principals in identifying areas of need where CRP was not practiced.

The principals leaned into the shifts in practice and began learning with the teachers and stepping back to afford teacher leadership. In this way, Principal B said she could “develop better skills and learn how to question teachers about teaching” by using data to support teachers. Principal A said she learned more about the standards and best practices. She said initially she thought of students showed knowledge as students raising their hands and being called on. “Now I know that means letting them talk and share” (Interview, April 9, 2023). Principals modeled practices during classroom observations, coaching, and co-teaching. As a researcher of their coaching practices, I influenced the organization of professional learning the principals provided

teachers as adult learners. Our meetings included research, discussion, and modeling of CRP strategies. The principals modeled questioning strategies that allowed student discovery and math solutions formed through student-student conversation. They reported that the implementation of new practices had increased culturally responsive practices and were encouraged by changes in the relationship between them and the teachers. Principal A noted her teachers became excited about her visits to the class. She said, “They like me to come in...They used to worry” (Interview, April 9, 2023). Principal B said her teachers were implementing more CRP strategies and had improved their growth mindset. However, both principals were concerned about teacher “relapse” into former practice and discouraged by the use of the banking model in district professional development.

Framework for Change

As a result of participatory action research and ethnographical study, I developed a framework for supporting principals to develop culturally responsive practices in coaching teachers to implement CRP in classrooms (see Figure 10). A critical aspect of the framework is that school leaders must establish reflective processes that reveal and strengthen the math identity of the adult educators – first, as leaders and then as facilitators of teacher learning and reflection. Then teachers need to learn about and plan to use culturally responsive pedagogy. The process included collaboration and intentional planning which led to shared language and shared experiences (Spillane, 2013). The process is cyclical as the principal as leader continues to observe classrooms and coach teachers and use the evidence to support the coaching conversations and the professional learning of teachers. The framework aligns with the recommendations of the Grissom et al. (2021) meta study of effective instructional leadership in

which the school leader is pivotal in establishing productive school culture and collaborative learning practices and invests in developing both effective teachers and leaders.

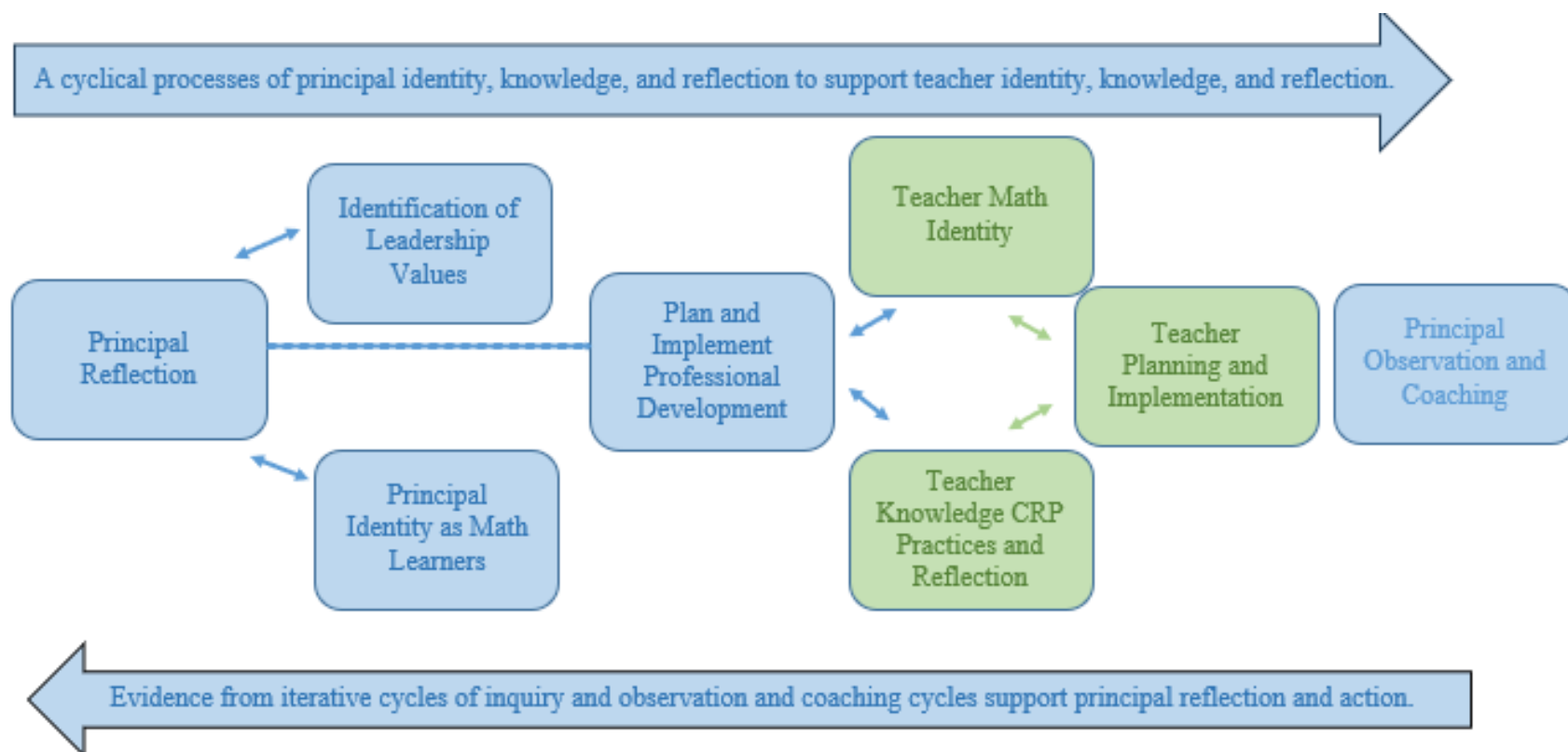


Figure 10. Framework for coaching teachers to use culturally responsive pedagogy in math classrooms.

During the course of the study, I met with two African American female elementary school principals, the co-practitioner researchers in their studies, and shared resources, experiences, and strategies that could be developed to support improving culturally responsive coaching practices in the mathematics classroom. We engaged in discussions and activities that would positively impact all students, with a focus on addressing the needs of the collective Black. I provided resources regarding culturally responsive teaching practices (Gay, 2002; Hammond, 2015) that assisted us in developing a defined understanding of what CRP looked like in elementary schools and the math classroom (Muñiz, 2020). We reflected on and examined early childhood experiences that anchored our beliefs and values about math education (Muhammad et al., 2021) and practices that supported equity for all students (Battey & Leyva, 2016; Gholson & Robinson, 2019; Martin, 2009). Through personal shared experiences, instructional observation, and culturally responsive coaching we identified principal and teacher reflection as a significant factors of math identity development.

Secondly, the examination of how principals' values impact the implementation of equitable teaching practices extends Cuban's (2013; 2023) work on the effect of teacher beliefs and experiences in school reform. Cuban's investigation on the effective modification in instruction and learning describes a failure to understand how teachers teach, resulting in the educational system repeatedly practicing change without reform. We found that the implementation of reflective practices and activities focused the school leaders on their values and supported coaching strategies that encouraged teachers to implement culturally responsive practices in mathematics. During the CPR meetings, the principals shared their reflections on the development of math identity with each other and identified key values and beliefs that guided their leadership. The principals then mirrored the reflective strategy with teachers discovering

significant details regarding teacher beliefs and skills levels that changed how the principals designed professional development and coached math instruction.

Implications

The findings and conclusions in this study offer implications for other principals, school leaders, coaches, schools, districts, and educational policymakers in search of equitable practices and improved mathematics experiences for all students. By implementing reflective practices that support the confidence and knowledge of principals and teachers in mathematics, leaders can create school cultures that promote collaborative professional learning and positive math identity development. Intentional reflective practices that focus on the deep understanding and discovery of educational beliefs, instructional practice values, and specific curricular knowledge and needs can lead to equitable mathematics instruction that addresses the collective Black and shifts historical bias. This is possible if school leaders facilitate professional development that implements reflective practices and coaching strategies and support adult equitable engagement and personal discovery. This study serves to elucidate the importance of school leaders establishing reflective practices that reveal and promote the clear school values and beliefs that drive school culture, while supporting instructional implementation and identity development.

Practice

The PAR findings support promising practices for school leaders, coaches, and teachers. As a result of participation in this PAR, CPR members developed an understanding of reflection on practice and equitable instructional strategies in math classrooms. The findings demonstrate the crucial importance of intentional attention on the development of math identity of principals and the significance of consistent focus on leadership values to encourage the implementation of culturally responsive practices. Through collaboration and research, the principals improved their

knowledge of coaching culturally responsive practices and reflection and developed a strong understanding of the importance of developing positive math identity in adults as a method to reach students. Principals learned to create space and time for reflective activities that grounded the educators in the values and beliefs necessary to implement CRP. In addition, they recognized the significance of maintaining and nurturing the relational trust they had established at their schools. Though focused on equitable practices in the math classroom at two Oakland schools, the PAR processes are applicable to equitable school improvement in other subject areas or school contexts by the persons situated to address the concerns (Guajardo et al., 2016).

Policy

The PAR was designed to address the inequitable instructional practices impacting the collective Black students in the math classroom by focusing African American principals on the implementation of culturally responsive practices in mathematics. At the local, state, and national level, collective Black students have historically been locked out, denied access to civil rights and equality by the gatekeeper, mathematics (Douglas & Attewell, 2017). School leaders must ensure that reflection on adult math identity and culturally responsive coaching practices are included in professional development to support teachers in the delivery of equitable mathematics instruction and access for all.

Secondly, districts and states should adopt policy and provide funding that support collaborative structures supporting principal reflection based on the improvement strategies identified by the schools and when possible by affinity group. The study findings indicate that adult reflection strengthened identity, both in math and leadership.

Research

During the PAR study, I used community learning exchange axioms (Guajardo et al., 2016) and activist research relying on critical ethnographic principles to implement a qualitative study that used these principles: make the project problem-specific and user-centered; accelerate improvement through communities of practice (CoP); develop an iterative improvement process and respond to teacher understandings; and believe in the power of conversation and honor local wisdom. Using these research methods, we anchored our PAR study in ethnographic inquiry. As a co-practitioner researcher (CPR) group, we researched and reflected collaboratively, learning from each other and the literature that contributed to our understanding of this study.

Through a PAR approach, using iterative evidence to make decisions, the CPR team analyzed evidence and improved school practices through this process. By reflecting on our experiences and identifying values we engaged in cycles of inquiry and reconnected to the shared commitment of improving equitable instructional practices for principals, teachers, and the collective Black students. More school level research by practitioners who are closest to the work is necessary to better inform school communities.

The research of this study supports the idea that developing a culture of reflection and adult inquiry improves continuous practice and supports the establishment of self-confidence and life-long learning. More research on understanding adult math identity and leadership reflection is needed. Specifically, we need to understand how to support the poorly developed math identity of some elementary school teachers. Additionally, a research recommendation would be to look more closely at how cultural affinity groups can support the work of African American principals and the implementation of culturally responsive practices.

Limitations

Several limitations may have impacted the study. First, I acted as the lead researcher in the study and a colleague with the two principals. As the research in this study focuses on African American female principals, we were African American female school leaders. In addition, the two other CPR members have a prior, long-term relationship, and we were colleagues in the same school district for many years. Therefore, I entered this research as an insider working in collaboration with other insiders (Herr & Anderson, 2014). Time was a limitation in the PAR study. The two improvement cycles spanned 16 months, yet we needed additional time to see the full effects of observations and conversations on coaching practices. During PAR Cycle Two, I had difficulty in observing and conducting CPR meetings effectively because of the exigencies every school faced because of COVID.

The size of the study was useful to the type of study as I could focus deeply on the stories and experiences of two elementary school principals in schools that had majority African American student populations. Thus, the findings are not specifically replicable. However, the processes in which we engaged – journey lines to determine math identity, discussions about identity, culturally responsive pedagogy, and coaching – are replicable for other topics and questions. To address any biases the CPR team or I held, we used research literature to ground our understanding. As a team, members planned, implemented, and reviewed the CPR agenda and actions, allowing multiple perspectives and voices to inform the CPR work.

Leadership Development

As I reflect on my leadership growth from this PAR study, I think of my position as an African American school leader. Until now, though an administrator for 20 years, I have thought of myself as an educator, a teacher. Though always focused on equity, I realize that I was not as

informed as I believed and that most of my experiences were formed within a system that reflected a singular ideology. The research (articles and books), presentations, and conversations increased my awareness of and hunger for knowledge about equitable mathematics instruction, teacher identity, educational values, and the practices and procedures that support improved learning cycles, including but not limited to collaboration, affinity groups, and inquiry. I have been reminded of not just my significance as an African American leader in a field in which there are too few of us, but my responsibility.

I began this part of my educational journey in Summer 2019 as a member of the Project I⁴ Cohort. I was excited to have the opportunity and to join in with other leaders I knew and with whom I had practiced. I learned about implementing CLE axioms, my role as a researcher-practitioner, and relational trust -- all of which were required as foundational components of the work I would need to complete the PAR study. I came to the work with little understanding of these components or the significance they would add to my personal and professional growth.

As a result of this learning and research project, I became a stronger collaborator and facilitator. My role as a practitioner-researcher working with other principals made me a better leader, a better listener, a better learner. Learning in a community of practice group with other principals while sharing experiences from leaders and teachers closest to the issues (Guajardo et al., 2016) was effective and life changing. The opportunity to reflect individually on my practice and then share the reflections with other school leaders support my ability to develop clear leadership goals and then support teachers in reflection. I came to understand that reluctance in teaching can be about lack of confidence and the need to provide trusting spaces for all educators to reflect enables awareness and growth. Through awareness and growth educators are able to

establish and/or reestablish belief in the abilities of the students they are teaching and see the brilliance in them (Muhammad, 2020).

Conclusion

Some educators cannot see the opportunity side or the abilities of the students in their classrooms. When we cannot see the brilliance, we struggle to empathize, to sympathize, to inspire, or to give credence to the possibilities of who our children are. We fail to recognize the mathematicians seated in our classrooms and deny them access to the education they seek and the civil rights they deserve (Moses & Cobb, 2001). Because of their commitment to the community and the macro and micro aggressions they address daily, African American principals are perfectly positioned to be leaders with a responsibility for all of the students but especially those students whose experiences are reflections of realities outside of the hegemonic reality within the educational realm we identify as school. As an African American woman and a school leader, I have learned the significance of addressing the biases in mathematics head on. I have learned to reflect on my experiences, to remember my values, and to lead with intention in regards to ensuring equitable access for all students to mathematics. Additionally, I now recognize that inspiration is not just for the children and that there is no time to wait; coaching to change practice can shift leader and teacher practice if we nurture and maintain relational trust; collaboration is essential to the change. Most importantly, we are all mathematicians.

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APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building · Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office 252-744-2914 · Fax 252-744-2284 · redc.ecu.edu/umcirm/

Notification of Exempt Certification

From: Social/Behavioral IRB
To: Marie Roberts
CC: Matthew Militello
Date: 5/23/2022
Re: UMCIRB 21-001652
Alienating Environments

I am pleased to inform you that your research submission has been certified as exempt on 5/23/2022. This study is eligible for Exempt Certification under category # 1 & 2ab.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

Document	Description
Alienating Environments(0.01)	Study Protocol or Grant Application
Consent Form(0.01)	Consent Forms
Interview Protocol(0.01)	Interview/Focus Group Scripts/Questions

For research studies where a waiver or alteration of HIPAA Authorization has been approved, the IRB states that each of the waiver criteria in 45 CFR 164.512(i)(1)(i)(A) and (2)(i) through (v) have been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

APPENDIX B: CITI TRAINING CERTIFICATE



Completion Date 14-Dec-2020
Expiration Date 14-Dec-2023
Record ID 39985179

This is to certify that:

Marie Roberts

Has completed the following CITI Program course:

Not valid for renewal of certification
through CME.

Responsible Conduct of Research

(Curriculum Group)

Social and Behavioral Responsible Conduct of Research Course 1.

(Course Learner Group)

1 - Basic Course

(Stage)

Under requirements set by:

East Carolina University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w524cef75-fbad-4584-aa5a-75dfec3af0bb-39985179

APPENDIX C: CONSENT FORM: ADULT PARTICIPANTS



Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk

Title of Research Study: **African American Female Principals Design a Culturally Responsive Coaching Model to Help Teachers Support the Collective Black Students in Mathematics**

Principal Investigator: Marie Roberts

Institution, Department or Division: East Carolina University, Department of Educational Leadership

Address: 900 Camlin Street, Ahoskie, NC 27910

Telephone #: 252-332-9046

Study Coordinator: Dr. Matthew Militello

Telephone #: 252-328-6131

Participant Full Name: _____ Date of Birth: _____

Please PRINT clearly

Researchers at East Carolina University (ECU) study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research.

Why am I being invited to take part in this research?

The purpose of this participatory action research (PAR) is for African American female principals to co-design a coaching model to support teachers to meet the cultural and cognitive needs of the collective Black students in mathematics class. You are being invited to take part in this research because of the role you have within the school setting and because you would make a great volunteer. The decision to take part in this research is yours to make. By doing this research, we hope to learn together as a team of co-practitioners how African American female principals can collaborate to create professional processes that implement culturally responsive pedagogy into mathematics supporting equity.

If you volunteer to take part in this research, you will be one of about five people to do so.

Are there reasons I should not take part in this research?

There are no known reasons for why you should not participate in the research study.

What other choices do I have if I do not take part in this research?

You can choose not to participate.

Where is the research going to take place and how long will it last?

The research will be conducted at Burckhalter Elementary School and Piedmont Avenue Elementary School, both are in Oakland, California. You will need to come *to the elementary school, multi-purpose room, approximately three times* during the study. The total amount of time you will be asked to volunteer for this study is 3 hours over the next fourteen months.

What will I be asked to do?

You will be asked to do the following: you may be asked to participate in an interview and attend community learning exchanges during the study. The interviews and community learning exchanges may be recorded in addition to handwritten notes by the research team members. All of the interview questions will focus on your experience with using common protocols that are equity based focused on culturally responsive pedagogy in the mathematics classroom.

What might I experience if I take part in the research?

We don't know of any risks (the chance of harm) associated with this research. Any risks that may occur with this research are no more than what you would experience in everyday life. We don't know if you will benefit from taking part in this study. There may not be any personal benefit to you but the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?

We will not be able to pay you for the time you volunteer while being in this study.

Will it cost me to take part in this research?

It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?

Only the lead researcher will know that you are part of this research and unique identifiers will be used so that names are not associated with the research participant and data.

How will you keep the information you collect about me secure? How long will you keep it?

The information in the study will be kept confidential to the full extent allowed by law.

Confidentiality will be maintained through the data collection and data analysis process. Consent forms and data from surveys, interviews, and focus groups will be maintained in a secure, locked location (closet in principal's office) and will be stored for a minimum of three years after completion of the study and destroyed afterwards. Electronic data will be stored on Pirate Drive. No reference will be made in oral or written reports that could link you to the study.

What if I decide I don't want to continue in this research?

You can stop at any time after it has already started. There will be no consequences if you stop and you will not be criticized. You will not lose any benefits that you normally receive.

Who should I contact if I have questions?

The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 510.830.6200 (days, between 8:00 am and 4:00 pm or email robertsmar19@students.ecu.edu.

If you have questions about your rights as someone taking part in research, you may call the University & Medical Center Institutional Review Board (UMCIRB) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director for Human Research Protections, at 252-744-2914.

I have decided I want to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

Participant's Name (PRINT)	Signature	Date
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Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above and answered all of the person's questions about the research.

Person Obtaining Consent (PRINT)	Signature	Date
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Marie Roberts	Signature	Date
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APPENDIX D: DATA COLLECTION INSTRUMENT: THE INTERVIEW PROTOCOL

Introduction

Thank you for taking time from your busy schedules to meet with me today. I appreciate your willingness to participate in this focus group interview and will limit the time to one hour.

My name is Marie Roberts. I will serve as the moderator for the interview with assistance from Carin Geathers and Zarina Ahmad who will record notes. My study is on African American female principals co-creating a coaching model for teachers to meet the cultural and cognitive needs of the collective Black students in mathematics class. My hope is that this study will lead to these principals gaining a better understanding of their own and their staff members math identities and cultural practices, then use this information to increase learning opportunities for all students in their classrooms.

Disclosures:

- Your participation in the study is voluntary. It is your decision whether or not to participate and you may elect to stop participating in the interview at any time.
- The interview will be digitally recorded in order to capture a comprehensive record of our conversation. All information collected will be kept confidential. Any information collected during the session that may identify any participant will only be disclosed with your prior permission. A coding system will be used in the management and analysis of the focus group data with no names or school identifiers associated with any of the recorded discussion.
- The interview will be conducted using a semi-structured and informal format. Several questions will be asked about both the individual knowledge and skills gained and organization practices used. It is our hope that everyone will contribute to the conversation.
- The interview will last approximately one hour.

Interview Questions

TURN RECORDER ON AND STATE THE FOLLOWING:

“This is Marie Roberts, interviewing (Participant’s Name) on (Date) for the Alienating Environments Focus of Practice Study.”

Create 5-10 Questions on your topic. The questions should be open-ended and aligned to the research questions.

1. How do you define culture?
2. What was your experience with mathematics in elementary school?
3. What culturally responsive practices are presently implemented in your school?
4. What professional development on culturally responsive pedagogy have you implemented?
5. Do you feel that the implementation of culturally responsive pedagogy will support improved achievement for your collective Black students? If so, why?

