ABSTRACT

Carin Denise Geathers, GETTING INTO GOOD TROUBLE: BUILDING CULTURALLY RESPONSIVE TEACHING PRACTICES FOR AFRICAN AMERICAN STUDENT SUCCESS IN MATHEMATICS (Under the direction of Dr. Matthew Militello). Department of Educational Leadership, December, 2023.

Collectively understanding the diligence and perseverance necessary for teachers to fully support student learning and not accept "give-up-itis" from students is essential for success in mathematics, especially for African American students. In the participatory action research (PAR), I examined the extent to which upper elementary school teachers in an urban school could effectively implement protocols during conceptual mathematics lessons that increased opportunities for African American students' equitable engagement in academic discourse. To do so, I engaged teachers in a professional learning community (PLC) model using improvement sciences and community learning exchange processes. To collect qualitative data, I observed classrooms, engaged in post observation conversations and collected and analyzed artifacts from our group discussions. The findings confirmed that (1) Teachers' experiences as students inform their current practices; and (2) the instructional leader's role is essential in operationalizing teachers' beliefs and skills into consistent engagement practices. This research has implications for practice, policy and research. When teachers co-construct learning, use common instructional tools and strategies, and reflect collectively upon their practice, they can begin to dismantle inequitable math practices. The PAR processes are useful to practitioners and should inform policy at the school and district levels. School-based practitioners can become action researchers and respond to their local issues and decide how to improve instruction. External researchers can study their processes to inform the educational research community.

GETTING INTO GOOD TROUBLE: BUILDING CULTURALLY RESPONSIVE TEACHING PRACTICES FOR AFRICAN AMERICAN STUDENT SUCCESS IN MATHEMATICS

A Dissertation
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Doctor of Education in Educational Leadership

By
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DEDICATION

for

Those whom I have loved (Constance, Ronnie, Oscar, Jr.),
do love (Claudia, Nia, Starr, Sarah, Stacey, Auna, Elaine, Clara, and Janice)
and will love (Me)

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CHAPTER 1: NAMING AND FRAMING THE FOCUS OF PRACTICE

Get in good trouble, necessary trouble, and help redeem the soul of America. John Lewis

I grew up in public housing and attended public schools in Hartford, Connecticut. From kindergarten to sixth grade, I had only two elementary teachers, Ms. A. and Ms. G. -- both African American women who taught mixed-grade combination classes. The students in the multi-grade classrooms were all children like me-African American, poor, and relying on the free lunch program to eat every day. My success as a math student is due to my teacher's content knowledge and implementation of effective mathematical teaching practices. These practices included competency in mathematics content and effective instructional practices that proved successful with African American students; commitment to ensuring students learned mathematics using a variety of strategies; and culturally affirming classroom management and engagement strategies -- all practices supported by the National Council of Teachers of Mathematics (2014). I have been lucky to have competent teachers who were well-versed in pedagogy, math content, and cultural competence (Hammond, 2015; Ladson-Billings, 1995b). That was the source of my interest in this project and study; I was and am committed to providing rigorous math content for African American students. I am committed to getting into good and necessary trouble to support African-American students to recognize their large voice and achieve Black genius.

Fifty years later, instead, significant achievement (standardized test scores) and opportunity (chance to engage with rigorous mathematics tasks, regardless of race, zip code or socioeconomic status) gaps persist for African American students. The 2015 National Assessment of Educational Progress (NAEP), referred to as the nation's report card, reports on reading and math tests: 43% of White 8th graders scored Proficient or above, compared to 13%

of African Americans (NAEP, 2015). African American students are often labeled as low intellect and lacking motivation; teacher expectations for them to learn rigorous mathematics have been low. Teachers often assume skill deficits in students rather than identifying and teaching to students' strengths (Delpit, 1995). "When teachers do not understand the potential of the students they teach, they will underteach them no matter the methodology" (Delpit, 1995, p. 175). The effectiveness of the teachers is deeply connected to what the teacher thinks of the student(s). If the teacher does not hold a real value for the student(s), they do not authentically engage them.

Current mathematics reform efforts examine the role of systemic racism and the "whiteness" of mathematics, the politics of mathematics and mathematics teaching, and the impact of teachers' lack of cultural competence, content knowledge and their lowered expectations of African American students' ability in mathematics (Copur-Gencturk et al., 2019; Egalite et al., 2015; Gutierrez, 2013; Hinnant et al., 2009; Reinholtz & Shah, 2019). I am positing that we can best address this issue by creating of a strong professional learning model that can effectively support changes in teacher mathematics practices as a key element in improving and sustaining student achievement (Boykin et al., 2011; Delpit, 2012; Grubb & Tredway, 2010; Hammond, 2015; Whitford & Wood, 2010).

The context of the study is a public, Title I elementary school in Oakland, California where I am principal. Since 2006, the school has been reconstituted two times, after the closing of two elementary schools. This led to frequent leadership changes. Prior to 2008, there were three principals in two years. The student population is over ninety percent African American or of African descent. Over 85% of the students are labeled as economically disadvantaged. The

student population is diverse with over fifteen different language groups, including students who use African American vernacular as a home language, an increasing number of foster youths, and three classrooms housing students on the autism spectrum.

The school has a total of eleven teachers, eight regular education teachers and three special education teachers. More than half of the teachers began working at the school because of a school closure in 2013. The school has been under threat of closure for several reasons, including low enrollment and, most recently, low achievement scores in reading and mathematics for African American students, the significant subgroup at the school. Next, I the focus of practice and proposed plan to address the current inequities.

Focus of Practice

In the PAR project and study, I investigated the extent to which third, fourth, and fifth grade teachers effectively implement protocols during conceptual mathematics lessons that increase opportunities for African American students' equitable engagement in academic discourse. I engaged teachers in an instructional leadership network model termed an equity-centered professional learning community (ECPLC) that operated as a Co-Practitioner research (CPR) group. As a CPR group, I supported teachers to develop requisite mathematics competence, skills, and strategies to address the needs of students (Berwick, 2008; Boaler, 2006; Langley et al., 2009; NCTM, 2014). Teachers worked collaboratively to examine classroom practice, implement culturally responsive instructional strategies, develop conceptually based math lessons, and engage in iterative cycles of inquiry. Next, I discuss the rationale for the (PAR) study; analyze the assets and challenges related to the FoP, the significance to practice, context and research, and the PAR connection to equity.

Rationale

A number of educational research studies document the underachievement and failure of African American students in mathematics (Gholson et al., 2012; Ladson-Billings, 1995a; Martin, 2000; Martin, 2009). “Mathematics education policy reports dating back 25 years have explicitly labeled Black children as mathematically illiterate” (Martin, 2009, p. 31). According to a 2004 report from the California Teacher Association (CTA), the widening achievement gap in California’s public schools raises many questions about educational equity and equality. African American students are often positioned as deficit, underachieving, unmotivated learners with inferior skills when compared to their White and Asian peers (Ladson-Billings, 1995a). African American students are overrepresented in the lowest performance levels on multiple measures of mathematics proficiency in elementary (e.g., 4th grade NAEP), middle (e.g., 8th grade NAEP), and high school (12th grade NAEP, SAT, and ACT).

Researchers seeking to understand the reasons behind the deficit mindset about African American students as math learners examined causes for the consistent underachievement of African American students (Berry et al., 2011; Howard, 2013; Johnson & Kritsonis, 2006; Morton, 2014). In their research, they discuss the achievement, opportunity gaps, and reasons why African American students consistently underperform below White and nonwhite students. These reasons include teachers' lack of culturally relevant pedagogical strategies, students' lack of motivation, parents' acceptance of mathematics as being very hard to learn. Gloria Ladson-Billings (1995a) in her groundbreaking qualitative study of eight teachers found that the effective teachers were effective if they consistently paid attention to the students a d developed relationships with them and their families. In the Ladson-Billings (2009) study, successful teachers are “like coaches, believing students were capable of excellence. These teachers shared

the responsibility of student achievement with parents, community members, and the students. Teachers also recognized the importance of community" (Ladson-Billings, 2009, p. 27).

For twenty-five years, the National Council of Teachers of Mathematics (1989, 1991, 2000, 2014) offered a vision of mathematics learning in which students should be treated as "active learners that construct their knowledge of mathematics through exploration, discussion, and reflection" (p. 37). While national and state standards focus on reasoning, problem solving, and perseverance, mathematics instruction has remained largely untouched by the NCTM principles, and teachers persist in teaching algorithms and procedures instead of conceptual and inquiry-based mathematics. "The challenge that teachers face is how to make this vision, and the standards that embody it, a reality in their classrooms" (Smith et al., 2018, p. 37).

In addition, the research on effective mathematics teaching has acknowledged identity as an important element for African American students inextricably linked to learning (Anderson, 2007; Boaler & Greeno, 2000; Hamm & Faircloth, 2005; Martin, 2000; Martin, 2009; Rodriquez et al., 2004; Stinson, 2006). Teachers are essential in ensuring African American students develop positive mathematics identities as well as mathematical competencies, especially in elementary school. Mathematics identity includes the beliefs that individuals develop about their ability to effectively understand mathematics in school and career contexts and to use mathematics to change the conditions of their lives, and a narrative that includes a strong belief that individuals were born to do math. Many students struggle in math classes because, at some point along their mathematical journeys, they began to believe that they are not "math people" It is the job of the teacher to help them see mathematics through a new lens, as something creative and relevant (Peart, 2018).

Likewise, the job of a mathematics teacher is to be knowledgeable about mathematics content and provide a foundation for elementary aged students in core mathematics standards including conceptual understanding. However, the quality of mathematics teachers in schools with large populations of African American students is poor, as compared to White students and the more time teachers spend on activities that take away from instruction time (Cherng & Halpin, 2016; Oakes, 1990; Villegas & Irvine, 2010). High poverty and predominantly African American schools tend to have poor academic curricula and have been described as unchallenging and mathematics teachers' expectations are low (Haycock, 2001).

Doabler et al. (2013, 2015) examined mathematics teachers who improved the academic performance of African American and other students of color in elementary school while engaged in a professional learning intervention. The professional learning focused on improving the rigor of classroom activity. Teachers implemented tasks in ways that emphasized mathematical reasoning and conceptual understanding. Doabler et al. (2013) found that in a given year in the classrooms where mathematics teachers coupled rigor and conceptually focused mathematics tasks, African American students' performance on standardized assessments grew.

This research points to the need to examine teacher competence, instructional practices, and cultural competence as necessary prerequisites for student success. As a result, I invited teachers to participate in an equity centered professional learning community (ECPLC) to create conditions that support improved mathematics teaching and learning. The goal is to support an instructional leadership network model committed to ensuring teachers have opportunities to examine instructional practices, collaboratively implement engagement protocols, develop conceptual mathematics lessons, and engage in iterative cycles of inquiry.

Analysis of Assets and Challenges

I identified the focus of practice (FoP after engaging in a mathematics focused professional learning community meeting. The analysis of the micro (classroom level), meso (school level), and macro (district level) assets and challenges is important in identifying the basis for school improvement and the starting point of the FoP. I identify those assets and challenges described at the micro, meso, and macro levels.

Micro Assets and Challenges

In a meeting I had with the teachers, I asked them to examine the micro level of assets and challenges at the school. Several assets emerged at the classroom/school level. Teachers listed the existence of working relationships, built on trust and respect, between and among teachers at the school. As a result, teachers, over the past three years, examined math assessment data and agreed based upon the data, that math teaching improvement was a focus. The teachers are knowledgeable about mathematics content and some math pedagogy. Teachers collaborate with their colleagues to get support on ways to improve teaching strategies and ways to assist with students who are struggling. Another identified asset includes students collaboratively working with each other to solve problems without being told to do so.

While teachers were willing to work collaboratively with each other, they agreed that math focused professional development is limited and not prioritized. The teachers stated they do not have the necessary curricular materials to work together to plan math lessons especially those to focus on conceptual mathematics or real-world application of math. Teachers are less confident about teaching mathematics and problem-solving in the inquiry and constructivist methods that are proposed by key researchers (Ball, 2005; Boaler, 2016; Lampert, 1990; Smith & Stein, 2011). Thus, I am interested in examining the extent to which teachers co-developing

math lessons that focus on rigorous math tasks and include teacher use of strategies that support academic discourse and development of math concepts can support improved math teaching. The goal is to increase the level of academic discourse in mathematics for African American students and support the implementation of culturally responsive teaching strategies.

Meso Assets and Challenges

At the meso level, the school district level created and administered mathematics benchmark assessments aligned to standardized test expectations, and teachers have had the opportunity to provide input at the district level. As a result, the district provides data to help teachers identify student growth and areas of need in mathematics aligned to the assessments. District personnel are an asset including mathematics coaches and teachers on special assignment (TSA) whose work focuses on providing training and professional development to teachers, upon request, in mathematics content, planning, implementation of curriculum, and data analysis.

Although these supports are available to teachers, stated challenges, include limited access to ongoing mathematics professional development at the district level that is pertinent to the kind of math instruction that is constructivist. There is no district-wide adopted math curriculum; though each school can choose a curriculum; however, teachers have to supplement curriculum due to its shortcomings. Grade level pacing guides are not responsive to the time needed to fully develop math concepts; they do not include time for students to build foundational math skills, engage in academic discourse, solve rigorous math tasks, or develop mathematics mastery of mathematical practices.

Macro Assets and Challenges

At the macro level, national common core standards creates common expectations for mathematics achievement. These expectations include rigor, defined as balancing conceptual

understanding and procedural fluency with real-world applications. While these standards exist, the implementation of the standards and the lack of curriculum that provides rigorous math lessons does not. Other challenges at the macro level, identified by teachers, included the lack of sufficient funding and other resources to support low performing subgroups especially African American students. Mathematics teachers lack sufficient training and professional development to effectively work with African American subgroups (i.e., culturally relevant pedagogy). A summary of the assets and challenges as identified by the participants in the community learning exchange are shown in the revised fishbone diagram in Figure 1 (Bryk et al., 2015; Rosenthal & Younger, 2015)

Significance

The (PAR) is significant because over 90% of students in the selected school are African American students. On the most recent state math assessments, administered in 2018-2019, only 28% of the students enrolled exceeded or met grade level standards mastery. In this study, I address two persistent issues: teacher practices that provide equitable student access and teacher professional development and collaboration to support access to mathematics. The FoP can add to the research regarding effective math practices to support teachers of African American students through professional development. While teachers have worked in professional learning communities, most of that input has centered on creating agendas that include non-curricular items rather than planning math lessons that integrate engagement protocols and focus on conceptual understanding.

Secondly, district and state assessment data for African American students are consistently lower than forty percent mastery in mathematics. In this PAR study, I supported teacher collaboration to identify strategies that support African American students in third, fourth

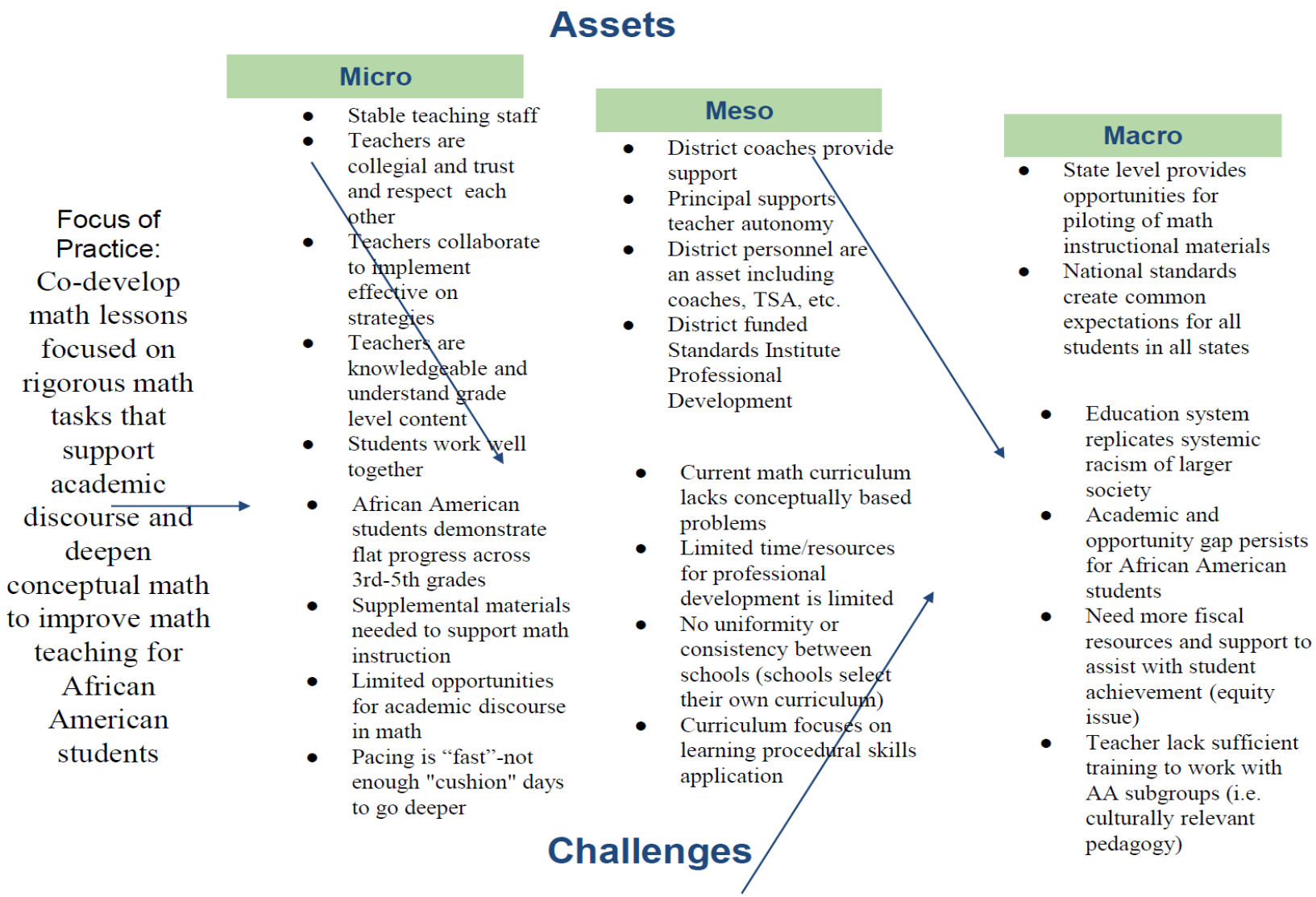


Figure 1. The fishbone diagram represents an analysis of the assets and challenges of FoP.

and fifth grades to improve conceptual understanding through the integration of academic discourse protocols in mathematics. By providing structures that encouraged collaboration, teachers examined instructional practice, co-developed lessons, collected data, and implemented strategies that impacted mathematics learning. The FoP highlighted the importance of analyzing teacher practice between teachers who support similar student populations.

The PAR significance to practice can inform and identify best practices for teachers of African American students. To achieve this goal, the PAR study must be grounded in practices that support teacher inquiry and collaboration. Advocacy must include developing and implementing rigorous math lessons that engage African American students, are culturally responsive, deepen students' academic discussion, and problem-solving skills.

The FoP can add to the research regarding effective math practices to support teachers of African American students through professional development. While this is a small study, the PAR process provides a process for school level research teams to investigate their practices. Furthermore, the FoP can highlight the impact of co-designed conceptual mathematics lessons between teachers who support similar student populations.

In terms of policy, the PAR is significant to local and state policy as it could add to decision making regarding teacher education programs including an emphasis on curricular adoptions that meet the needs of African American students and statewide professional development and preparation that focuses on effective instructional practices that are successful with African American students.

Connection to Equity

A recurring issue is student access to rigorous math curriculum (Boykin & Noguera, 2011; Delpit, 2012). Stevenson and Stigler (1992) argue that U.S. parents were more likely to

suggest that their children's poor mathematics performance was attributable to a lack of innate ability rather than motivation and hard work. Teachers often accept the narrative of the mathematics achievement gap and the deficit view of African American students' inability to understand and learn mathematics because they are cognitively dissonant, deficient, and unmotivated. Kendi (2019) states “accepting there is an opportunity gap, rather than an achievement gap, is considered anti-racist” (p. 103). The focus of practice directly relates to issues of equity since African American students often struggle with mathematics and building positive math identities. The limited opportunities of students to engage in academic discourse and build fluency with procedures on a foundation of conceptual understanding is at stake. Couple this with a lack of teacher competence in engagement strategies and an inability to consistently implement culturally responsive instructional strategies impacted student achievement, either negatively or positively. Next, I discuss three equity frames -- political, psychological, and sociological -- that influence equity in the PAR study and support this focus of practice.

Political Frame of the Focus of Practice

The political mandates at the state and district level directly impact school level responsiveness to African American student needs. In 2008, California released a policy report with ten stated goals. Goal two --Recognizing Multiple Gaps and Multiple Strategies -- highlighted the need to shift from traditional to more innovative and “balanced” forms of instruction and more supportive environments to narrow and eliminate opportunity gaps for children of color. To narrow the gaps, we must recognize the importance of different strategies.

Gutiérrez (2013) describes how teaching mathematics is political. Mathematics as a content area is often elevated over other content areas including reading and science.

Mathematics is often viewed as objective; answers are either right or wrong. People who are proficient at mathematics are defined as intelligent, nerds, and geeks. Teachers of mathematics in urban schools where a majority of the students are African American reproduce this enduring narrative regarding mathematics (Ladson-Billings, 1995b). Teachers do not always view these students as intelligent, and the students do not want to be viewed as nerds or geeks by their peers or others who accept the stereotype that they are not good at mathematics and consistently underperform. In practice, this can become a self-fulfilling prophecy and an example of cognitive dissonance.

Psychological Frame of the Focus of Practice

Students of color internalize the racial stereotype surrounding math performance that can affect their classroom performance (Steele, 2010). Students begin to see others as "good at mathematics" but not themselves. Teachers may remediate by giving students worksheets and institutionalizing "skill and drill", or drilling student in mathematics content that results in the killing student motivation to learn mathematics. Rather than implementing rigorously engaging mathematics lessons and tasks that challenge African American students cognitively, they too often resort to math facts and procedures. School leaders create schedules that eliminate enrichment courses like music and art and emphasize more instructional minutes dedicated to memorizing math facts and/or more assessments to monitor students. School leaders and teachers are needed to disrupt and challenge the prevailing narrative that African American students cannot think mathematically and consistently achieve at high levels.

As a school leader, we need to support teachers in understanding and reframing mathematics and the teaching of mathematics for African American students. School leadership must create conditions for teachers to provide students with positive experiences through actions

and words to create environments for improving student success (Rigby & Tredway, 2015). Thus, teachers must provide students with opportunities to engage in academic discourse during conceptual mathematics lessons and engage with rigorous math tasks.

Sociological Framework of the Focus of Practice

The action research takes place in an urban school that is focused on creating opportunities for teachers of African American students to engage in academic discussions as they learn mathematics conceptually. I am interested in investigating the extent to which teachers, collaborating in a PLC model, investigate instructional practice by engaging in cycles of inquiry. Our work as instructional leaders was to develop professional learning opportunities for teachers to help them co-create and implement mathematics lessons for students to excel in mathematics. For this to happen, the PLC reflected on the sociological effects of African American student achievement. This PAR project examined effective instructional practices that supported the cultural strengths and academic achievement of African American students in our school. Guajardo et al. (2016), state that educators create community learning exchanges and work to establish conditions of safety and trust so that people can openly share their gifts, challenge each other, their schools, school districts and their communities in order to better meet the needs of students.

Participatory Action Research Design

The purpose of this PAR project: Engage a group of five elementary teachers in building their capacity to support African American students in math classes. The PAR methodology positions the lead researcher as a co-researcher and active participant; thus, as lead researcher, I facilitated and co-developed a professional learning opportunities in academic discourse and conceptual mathematics teachers that aligned teaching practices with the specific needs of

students. The goal was to develop teacher capacity and instructional leadership through an equity-centered professional learning community (ECPLC) approach. I invited the third, fourth, and fifth grade teachers to engage in the math focused ECPLC. This involved teachers working collaboratively to examine classroom practices, implement culturally responsive instructional strategies, develop conceptually based math lessons, and engage in iterative cycles of inquiry (Bryk et al., 2015; Fisher et al., 2009; Hammond, 2015).

Theory of Action and Research Questions

The PAR study is grounded in this theory of action (ToA): *If teachers participate in a professional learning community and effectively implement protocols during conceptual mathematics lessons, then teachers will equitably engage African American students in academic discourse to learn conceptual mathematics.* In the PAR study, I aimed to support teachers in a professional learning community (Lampert, 2005; Voelkel & Chrispeels, 2017) to focus on improving instruction for African American students from the inside out (Grubb & Tredway, 2010). The overarching research question: *How do third, fourth, and fifth grade teachers effectively implement protocols during conceptual mathematics lessons to support stronger and equitable engagement for African American students?* The sub-questions were:

1. To what extent do teachers effectively collaborate and plan the use of protocols during conceptual math lessons for African American students?
2. To what extent do teachers implement culturally responsive instructional practices to equitably engage African American students during mathematics?
3. To what extent did the process of engaging in collaborative observation and post observation conversations support changes in instructional practices during math?
4. How did the process of facilitating the development of classroom teachers to build

their capacity to implement culturally responsive instructional practices in math class affect my role as an instructional leader?

I analyzed my role as instructional leader and learned how I could help facilitate the development of classroom teachers to build their capacity to implement culturally responsive instructional practices in math class.

PAR Activities and Cycles of Inquiry

In Table 1, I indicate the cycles of inquiry and proposed activities. In Chapter 3, I describe the cycles of inquiry and the proposed data in more detail. According to Creswell and Creswell (2018), qualitative research identifies three types of data collection types: qualitative observations, including field notes to document and record activities at the site; qualitative interviews, which can be both semi-structured and open-ended questions to capture viewpoints of participants; and documents, such as journals, emails, and meeting notes. I collected and analyzed the co-created and implemented data from mathematics lessons and the professional learning activities, and classroom observations. I used protocols during community learning exchanges and collected CLE artifacts. I kept a record of reflective memos to capture my own thoughts. I coded all data collected during and after iterative cycles of inquiry, developed categories for the data in the Pre-Cycle, emergent themes in PAR Cycle One and findings in PAR Cycle Two. Next, I discuss how we engaged in the PAR through Community Learning Exchange and improvement science processes.

The selection of (PAR) for this study is foundational and informed the study. To engage in the PAR study, the work was grounded in community learning exchanges axioms and processes and improvement science principles.

Table 1

PAR Improvement Cycles

Research Cycle	Time Period	Activities
PAR Pre-Cycle and Context	Spring 2022	Form ECPLC, Use CLE protocols to analyze FoP, Analyze literature and identify strategies to implement, Observe classrooms, Write reflective memos
PAR Cycle One	Fall 2022	Facilitate ECPLC meetings using CLE protocols, Observe classrooms, Facilitate post-observation conversations, Write reflective memos, Conduct member checks
PAR Cycle Two	Fall 2022-Spring 2023	Facilitate Community Learning Exchange (CLE), Facilitate ECPLC meetings, Observe classrooms, Write reflective memos, Conduct member checks

Community Learning Exchange

A community learning exchange (CLE) provides an opportunity for the members of a school to engage in an exchange of ideas, surfacing of concerns and problem solving around issues that directly affect the community. The five axioms of the CLE are fundamental components of the PAR study and interacted with the improvement science principles I facilitated CLE protocols with ECPLC members to practice equitable engagement strategies in our meetings that can be integrated in conceptual math lessons and implemented in classrooms. The process of surfacing the problems and working toward solutions that respond to the school and its community's unique situation and needs with "those closest to the work" is the power of the CLE (Militello et al., 2009). Goals of the CLE include continuing to nurture professional relationships between participants and create conditions for teachers to open their classrooms to each other, critically examine and improve their practice (see Table 2).

Inquiry teaching and learning, academic discourse, culturally and linguistically responsive pedagogy, and universal design for learning are core principles in the Project I^4 Framework (Tredway et al., 2019). I used these principles to create the professional development frame for the FoP.

Improvement Science

The PAR project is rooted in improvement science principles and processes (Bryk, 2015). As a professional learning community (ECPLC), we met to make improvements through the use of three disciplined inquiry cycles using the Plan-Do-Study-Act (PDSA) model. First, the members of the ECPLC co-planned and taught conceptual math lessons. I, as lead researcher, collected and analyzed data after classroom observations. This work happened through a networked improvement community with teachers working together to illuminate and integrate

Table 2

Community Learning Exchange Axioms

Number	Axiom
1	Learning and leadership are dynamic social processes.
2	Conversations are critical and central pedagogical processes.
3	The people closest to the issues are best situated to discover answers to local concerns.
4	Crossing boundaries enriches development and the educational processes.
5	Hope and change are built on the assets of dreams of locals and their communities.

their collective wisdom. In addition, the participants made the work problem-specific and user-centered, focusing on improvements to classroom instruction.

Study Considerations

I was the site administrator and the lead researcher for the entire duration of the research study. Details of the limitations, validity, and confidentiality and ethics in the research design are provided in Chapter 3. The study's size is a limiting factor. Only upper elementary teachers participated in this qualitative study. The findings are to the local school but may not be generalizable to other settings. I collaborated with and coached a small sample of teachers and observed five teachers over a relatively short period of time, approximately fourteen months. Thus, the sample size, time, and resources may limit the study. Finally, my role as the site administrator could have been a limiting factor as I evaluate each of the participating teachers. I assured participants that observations completed for the PAR project were not used for evaluations.

Issues of reliability and validity are important in PAR as these criteria ensure methodological rigor. Likewise, indicators of trustworthiness involve establishing credibility, dependability, and confirmability (Lincoln & Guba, 1985). Teachers may be concerned about data collection and analysis. As lead researcher, I used reflective memos and member checks to triangulate evidence collected throughout the PAR.

I asked participants to participate and assured them that their participation was not mandatory and they were not under obligation to do so. Those who agreed to participate signed the IRB informed consent letter of participation. In addition, the security of the data collected and the confidentiality of the participants was of the utmost importance in this study. None of the material co-created, generated, and collected from study participants will be replicated or

disseminated in any way. I stored all data in a secure location and destroy all data after three years.

Conclusion

In Chapter 1, I introduced the purpose of the participatory action research: to implement an Equity Centered Professional Learning Community (ECPLC) model to influence and improve mathematical instructional teaching practices for a group of upper elementary teachers. I discussed the micro, meso and macro assets and challenges that are currently in place. Three frames --political, psychological, and sociological -- influence the context and participants in the PAR study. In Chapter 2, I present a literature review from theoretical, normative, and empirical perspectives. In Chapter 3, I reiterate more completely the research design, methodology and the model of data collection procedures I used during the PAR in more depth. In Chapter 4, I discuss the context of the study, and the results of the Pre-Cycle in which I coded initial data and developed categories. In Chapters 5 and 6, I discuss the emergent themes from PAR Cycle One and the findings from PAR Cycle Two. In Chapter 7, I discuss the findings and the conclusions of the study including findings and implications for future practice.

CHAPTER 2: LITERATURE REVIEW

In the participatory action research, I sought to understand how teacher practices strengthen conceptual understanding and equitable academic discourse for African American students in upper elementary mathematics classes. To explore this topic, I discussed research about the qualities of teaching and learning that provide support for African American students. In reviewing the literature, I concentrated on three key areas: culturally responsive teaching and learning; professional learning communities; and mathematical literacy for African American students (see Figure 2). In the first section of the chapter, I described culturally responsive teaching and mathematical teaching practices that support African American students. Then, I defined professional learning communities (PLC) and improvement science structures that supported building teachers' instructional practices. In the final section, I discussed the importance of conceptual understanding as a foundation for mathematical success.

Culturally Responsive Teaching

Demographic shifts in urban school districts across the country acknowledge significant increases in diverse student populations. Students are entering classrooms with various ethnic, cultural, and linguistic backgrounds and experiences. Studies on cultural diversity advocate for teachers to design learning environments that acknowledge and nurture students' unique cultural experiences and strengths. Culturally responsive teaching (CRT) was borne out of the need to change the social-emotional, academic, and achievement outcomes of African American students (Delpit, 1995; Gay, 2018; Ladson-Billings, 1995a). Ladson-Billings (1995a) conducted a qualitative study of eight teachers' practices with diverse students; as a result of her findings, she introduced the term culturally relevant pedagogy to describe teaching and pedagogical strategies that focus on the culture and experiences of African American and other students of color. These

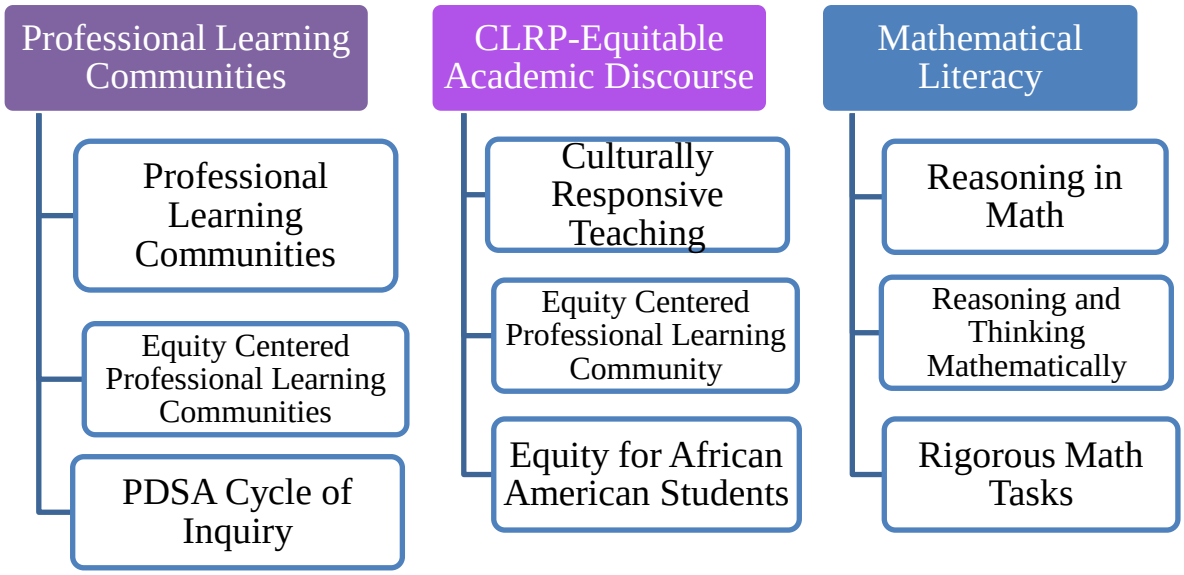


Figure 2. The diagram represents the three topics and sub-topics of the literature review.

practices, however, are often not reflected or acknowledged in mainstream classrooms and school settings.

Defining Culturally Relevant, Responsive, and Sustaining Pedagogy

In *The Dreamkeepers: Successful Teachers of African American Children,* Ladson-Billings' (1994) seminal work, she identified the practices of eight teachers who support African American students. Gloria Ladson-Billings defines culturally relevant pedagogy as an approach to teaching that recognizes the important of students' cultural knowledge and backgrounds in affirming their cultural identity while assisting them in developing critical perspectives that challenge inequities in schools and other institutions. She identified three goals of culturally relevant teaching practices that help to ensure African American students' success. First, teachers must help students develop positive cultural identities without sacrificing academic achievement. Second, teaching practices must yield consistent academic achievement in content areas. Third, teachers must encourage students to use their academic abilities to analyze and critique social injustices and inequities.

Geneva Gay (2018), building upon Ladson-Billings' foundational research, focused on teacher strategies and classroom practices. Gay (2018) reviewed teacher programs and identified instructional practices that supported marginalized students. She advocated for teachers to better understand and learn about their student's culture, home life, and background to better support them in the classroom. Gay (2018) theorized that enabling marginalized students of color to accomplish cultural, academic, and personal competence was evidence of the praxis of culturally responsive pedagogy, that is, as classroom practices were enacted, students of color school achievement improved significantly. This success is most evident in learning "spaces" where culturally relevant content, teacher attitudes and expectations, and instructional actions converge

(Gay, 2018, p. 181). Gay (2018) developed a framework aligning practices that used the "cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning relevant to and effective for students" (p. 31) and advocated for teachers to view the cultural differences of students as assets. She encouraged teachers to address caring, communication, curriculum, and instruction by building stronger and meaningful student-teacher relationships, creating nurturing classroom environment, and utilizing instructional materials that reflected the cultural backgrounds of the diverse students in their classrooms. Gay (2018) coined the term culturally responsive teaching to define teaching methods that use "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. 36). Similar to Ladson-Billings, Gay (2018) emphasized the need to provide opportunities for students to use their lived experiences to challenge issues of inequities in their lives and those of their diverse peers.

Paris' (2012) theoretical essay expanded on cultural relevance and culturally responsive pedagogies by developing a vision of what he terms culturally sustaining pedagogies. Paris and Alim (2014) argued that simply making lessons relevant would not alone ensure African American students would attain academic success. They advocated for sustaining practices, or those practices that helped students develop positive cultural identities while students learned mathematics or problem-solving. When teachers enact a culturally sustaining framework, they "support multilingualism and multiculturalism in practice and perspective for students and teachers" (Alim, 2014, p. 88). Culturally sustaining pedagogy asks: (1) What do students already know? (2) What are their strengths? And (3) What are the strengths of their families and communities? Employing culturally sustaining pedagogies means tapping into and investigating

the funds of knowledge that students bring to the classroom. Moll et al. (1992) described the concept of "funds of knowledge" to refer to historically accumulated and culturally developed bodies of knowledge and skills essential for household or individual functioning and well-being. Funds of knowledge are the essential cultural practices and bodies of knowledge that are embedded in the daily practices and routines of families. Paris and Alim (2014) argued that students live in a diverse world, and schools should develop skills needed to grapple with social injustices and issues of race, class, and other inequalities to facilitate students' abilities to leverage their content learning toward redressing socio-political injustices in our society. Ladson-Billings (2014) in two essays confirmed the importance of Paris' framing of culturally sustaining and particularly recognized the importance of cultural elements of pedagogy.

These scholars help to highlight and deepen awareness of the needs of African American and other students of color. Whether culturally relevant, culturally responsive, or culturally sustaining, the pedagogies should include asset-based approaches that build positive cultural and academic identities and include critical thinking skills as a foundation for understanding, analyzing, and challenging social issues are goals for African American student success.

Equity for African American Students in Math

Closing the mathematics achievement gap begins with acknowledging that equality and equity are not synonymous, and educational outcomes for minority children are a function of their unequal access to key educational resources, including skilled teachers and quality curriculum, rather than a function of their race (Khalifa, 2018) – termed the opportunity gap (Boykin & Noguera, 2011) or the educational debt (Ladson-Billings, 2006). Traditionally, schools have provided African American students with few opportunities to connect mathematics to their lives and experiences and math pedagogy often exclude the unique needs of African

American and other children (Tate, 1997). “Good” math teaching describes the traditional Eurocentric type of mathematics, devoid of cultural ways of being. Culturally responsive teaching requires, “Getting children's brains fired up so that their brain cells grow,” this is the only way to start closing achievement gaps” (Hammond, 2015).

Culturally Responsive Teaching in Mathematics

Despite recent reform efforts in teaching and learning in mathematics education, the underachievement of African American students persists and results in dynamic inequality as students progress through schooling (Grubb & Tredway, 2010). The National Association for the Education of Young Children (2002) and the National Council of Teachers of Mathematics (2002) reported that improving math in the early grades should be a national priority equal to reading. Two major research findings support the importance of mathematics learning in urban preschool classrooms that primarily serve African American and other children of color. Duncan et al. (2007) used longitudinal data from a primarily low-income and minority sample of children to examine the extent to which preschool mathematical competencies, specifically basic and advanced counting, predicted fifth grade mathematics achievement. They found that preschool students with an early foundation in math knowledge offered a strong predictor of later school success—in reading as well as math. Secondly, in a study of 357 children and their families who participated in the Chicago School Readiness Project, Pressler et al. (2016) examined whether greater exposure to cumulative poverty-related risk from preschool through 5th grade is associated with greater risk of student retention and suspension in 6th grade. Their findings suggest racial disparities in children’s math achievement are present prior to students entering kindergarten. These opportunity gaps predict persistent achievement gaps as students move from elementary to high school (National Assessment of Educational Progress, 2015).

In general, students in urban school districts in low-income areas do not have access to the rigorous math curricula or high-quality math instruction necessary to engage students in deep math learning, leaving them “un” and “under” prepared for college-level math courses. Boykin and Noguera (2011) call this the opportunity gap as many students of color do not access to high quality teaching and learning nor rigor in the mathematical tasks. Without early exposure to high-quality math environments, instruction, and curriculum, African American students in higher education institutions are assigned to remedial math courses at a higher rate than their White peers (Chen, 2016; Preston, 2016). African American students' access to higher education as well as their career trajectories is limited. The National Science Foundation (2001) found that African American college students received only seven percent of the science, technology, engineering, and mathematics (STEM) bachelor’s degrees awarded. In 2014, the percentage of advanced STEM degrees remained roughly unchanged.

Decades of research examining teaching practices that best support positive outcomes of African American students reveal that students succeed when they have opportunities to learn meaningful, rigorous mathematics; effective mathematics teaching cultivates the mathematics abilities of all students; and equitable access and support in learning mathematics includes attention to students’ identities (Boaler & Staples, 2008; Cross et al., 2009; Gutiérrez, 2013; Kisker et al., 2012; Malloy & Malloy, 1998; NCTM, 2014). Each and every student must have access to rigorous mathematics instruction.

More than three decades of research has revealed that high-quality mathematics education includes creating opportunities for students, especially African American students to engage with rigorous math tasks to improve their mathematical reasoning skills. However, what are often offered to improve such efforts, such as reducing teacher turnover and hiring more

qualified teachers, to provide engaging early math experiences for African American students have had little impact on improving their mathematics achievement or math trajectories (Zilanawala et al., 2017). In their study of Black male 4th graders, they found that putting students in more challenging learning environments is the only variable that had any effect over time. Increasing opportunities and exposure to math involvement in early childhood classrooms in urban classrooms, serving children of color from low-income families, requires fundamentally rethinking and restructuring math learning opportunities that include a foundation in conceptual mathematics understanding (NCTM, 2014). Teachers must employ not only effective instructional strategies to help students gain a deeper understanding of mathematics but increase rigor of tasks and provide equitable access to facilitate the deep learning of mathematics for all students.

Hammond (2015) analyzes how a neuroscience-based approach to meeting the cultural needs of African American students can be successful. She states that culturally responsive teaching leverages the brain's memory systems and information processing structures. Effective teachers who understand the oral cultural traditions of African American students can use these as the basis for activating the brain's memory systems to turn mathematical information into usable knowledge. Cultural responsiveness mimics students' cultural learning tools. Employing culturally responsive instructional strategies helps teachers create a bridge to learning to help students deepen mathematical thinking and conceptual understanding. In the next section, I share research on equity for African American students and the building positive math identities.

Ferguson (2003) evaluated how schools can positively affect the Black-White performance gap beginning in kindergarten and persisting through secondary school. His research examined two potential sources for the disparity: teachers and students and provides

evidence for the proposition that teachers' perceptions, expectations, and behaviors interact with students' beliefs, behaviors, and work habits in ways that help to perpetuate the Black-White test score gap. Ferguson (2003) reported that African American students benefit academically from mindset interventions, or those interventions that teach African American students that their most basic abilities can be developed through dedication and hard work. This view creates a love of learning and a resilience that is essential for great accomplishment (Dweck, 2015). Black students who are taught by Black teachers are more likely to graduate from high school and to enroll in college compared to their peers who are taught by non-Black teachers (Gershenson et al., 2017). In addition, white students show improved problem-solving, critical thinking, and creativity when they have diverse teachers (Darling-Hammond, 1998). For Black students to succeed, they need positive math identities and experiences from kindergarten through high school.

Building Positive Mathematical Identities

Aguirre et al. (2013) define math 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 the lives" Aguirre, 2013, p. 14). Math identify for each student is the perceptions of how others perceive them as a mathematics learner, beliefs about the nature of mathematics, engagement in mathematics, and perception of self as a potential participant in mathematics (Aguirre et al., 2013; Anderson, 2007; Boaler, 2002a; Grootenboer & Zevenbergen, 2007). Students with a positive math identity develop critical math agency who are able to take on rigorous tasks and participate with other students in problem-solving. As Vygotsky (1978) theorized, we know that social interaction plays a critical role in children's learning and through such social interactions, children go

through a continuous process of learning**.** He stated: “Children grow into the intellectual life around them” (Vygotsky, 1978, p. 78), substantiating the importance of teachers creating learning environments that support young students' mathematical identities. One of the first steps in culturally responsive teaching is for teachers to create classroom environments more conducive to learning, foster positive relationships with their students, and meet students' developmental, emotional, and academic needs, thus helping students create a positive mathematical identity (Hammond, 2015).

Identity affects student success, and the teacher is a primary source of developing a positive identity. Teachers who create math classrooms where students receive emotional support reported increased engagement in mathematics learning. For instance, in a study by Birch and Ladd (1997) about kindergarten students’ identity as math students, they reported liking school more and experiencing less loneliness if they had a close relationship with their teachers. Further, kindergarteners with better teacher-student relationships showed better performance on measures of early academic skills. In a three-year longitudinal randomized controlled trial, Rimm-Kaufman et al. (2014) found that fifth graders said they were willing to exert more effort to understand the math lesson, enjoyed thinking about and solving problems in math and were more willing to help peers learn new concepts when supported by teachers. As a critical point to how important early success in math is, mathematical identity influences life-long decision-making (Williams, 2018). Since teachers are critical in this process, I examine how professional learning communities show promise for supporting teachers as they support the advancement of African American students’ academic and social-emotional learning outcomes – particularly in mathematics.

Professional Learning Communities

Professional learning communities (PLC) are a form of teacher collaboration. Professional learning communities are defined as "ongoing groups . . . who meet regularly for the purposes of increasing their own learning and that of their students" (Lieberman & Miller, 2008, p. 2). An effective PLC is a tool of social inquiry aimed at closing the research-practice gap and increasing the likelihood of evidence-based and team-based learning practices in schools (Berwick, 2008; Langley et al., 2009). PLCs have achieved broad acceptance among educators, and PK–12 school leaders are steadily looking to implement and maintain PLC-based operational improvement programs. Collaborative professional learning can increase educator effectiveness if the learning community is committed to continuous improvement, collective responsibility, and common goal alignment. The professional learning community model flows from the assumption that the core mission of formal education is not simply to ensure that students are taught but to ensure that they learn. This simple shift– from a focus on teaching to a focus on learning– has profound implications for schools (DuFour & DuFour, 2009). While PLCs show enormous promise for collaborative problem-solving by teachers, the organizational structures and purposes are often not clear to teachers, and they can become *pro forma* meeting spaces where little is accomplished.

Purpose of PLC

PLCs are envisioned as interactive, networked societies in which teachers use systemic collective inquiry to transform what they have experienced (Curry, 2008; Little, 2005; McLaughlin & Talbert, 2006; Whitford & Wood, 2010). In a continual cycle of improvement, PLCs can provide mechanisms for adult learning that are embedded in the teachers' work and allow and require teachers to collectively evaluate and find solutions to practice challenges based

on facts about student achievement (Woodland, 2016). PLCs can positively influence school culture, teacher self-efficacy, teacher isolation, organizational ability, and the development of a collaborative culture of high-quality instructional practice (Caprara et al., 2006; Talbert, 2010).

Akiba and Liang (2007) examined the effects of six types of teacher professional learning activities on student achievement growth over 4 years using statewide longitudinal survey data collected from 467 middle school mathematics teachers in 91 schools merged with 11,192 middle school students' mathematics scores in a standardized assessment in Missouri. The data collected showed that "teacher-centered collaborative activities to learn about mathematics teaching and learning appear to be more effective in improving student mathematics achievement than learning activities that do not necessarily involve such teacher-centered collaborative. (Akiba & Liang, 2007, p. 8). Professional learning communities emphasize collaboration among teachers at a school site, learning rather than teaching, and holding participants accountable for results. Working in isolation is not beneficial and does not lead to substantial success of an organization (DuFour, 2004). Kouzes and Posner (2012) agree that collaboration is a critical competency for achieving and sustaining high performance. Collaborative practice is especially true in the field of education.

Equity Centered Professional Learning Community

"A commitment to equity is a quest for every student doing well and means systemic personalization" (Gleason, 2013, p. 6). Equity Centered Professional Learning Communities (ECPLC) are defined by their focus on educational equity in which dimensions of privilege and oppression (e.g., race, ethnicity, socioeconomic status, gender, sexual orientation, religion) are not predictive of or correlated with educational outcomes, broadly defined, in any significant way, and where all learners are able to participate fully in quality learning experiences (Poekert et al., 2020, p. 1).

The work of ECPLCs aligns with rigorous academic achievement standards and local improvement goals. Teachers must continuously build skills, knowledge, and dispositions through ongoing professional learning with the tenet of collective responsibility. Effective ECPLCs primarily occurs several times per week among established teams to promote a continuous cycle of improvement and are facilitated by well-prepared leaders at schools (Hirsh, 2009).

For PLCs to be successful, effective teacher team movement through a sequence of stages is required for instructional progress, including understanding the fact, owning the issue, identifying a response, initiating actions, and tracking the outcomes of such actions (Garmston & Wellman, 2013). The PLC inquiry cycle in Figure 3 outlines six essential characteristics that are at the heart of successful PLCs. The areas that educators must engage in an inquiry process include the following: a focus on learning, creating a collaborative culture, engaging in collective inquiry, being action oriented, a commitment to continuous improvement, and a focus on results. PLCs must engage in using cycles of inquiry in which they collect evidence. To organize a PLC, the According to DuFour (2004), a professional learning community emphasizes collaboration among teachers at a school site, learning rather than teaching, and holding participants accountable for results guidelines about the inquiry process and collect evidence if EC- PLCs are to be a cornerstone of change. The improvement science processes can provide that structure.

Plan-Do-Study-Act (PDSA)

Plan-Do-Study-Act (PDSA) cycles are a form of inquiry cycle that can assist professional learning communities in improving pedagogy, instructional methods, and using evidence to make informed decisions. According to Lewis (2015), improvement science

Note. (Adapted from DuFour et al., 2010).

Figure 3. Inquiry cycle.

theorizes that, “two different types of knowledge are needed: basic knowledge from the discipline of education (for example, knowledge about effective mathematical tasks and instructional strategies) and a system of profound knowledge” needed to enact basic disciplinary knowledge within organizations (Deming, cited in Langley et al., 2009, p. 75). Professional learning communities using the Plan-Do-Study-Act (PDSA) cycle, a mechanism for accelerated loops of learning from experience, build trust by engaging in the work of change. PDSA provides PLC members the guidelines for improving their practices; thus, PDSA is a useful process for participatory action research.

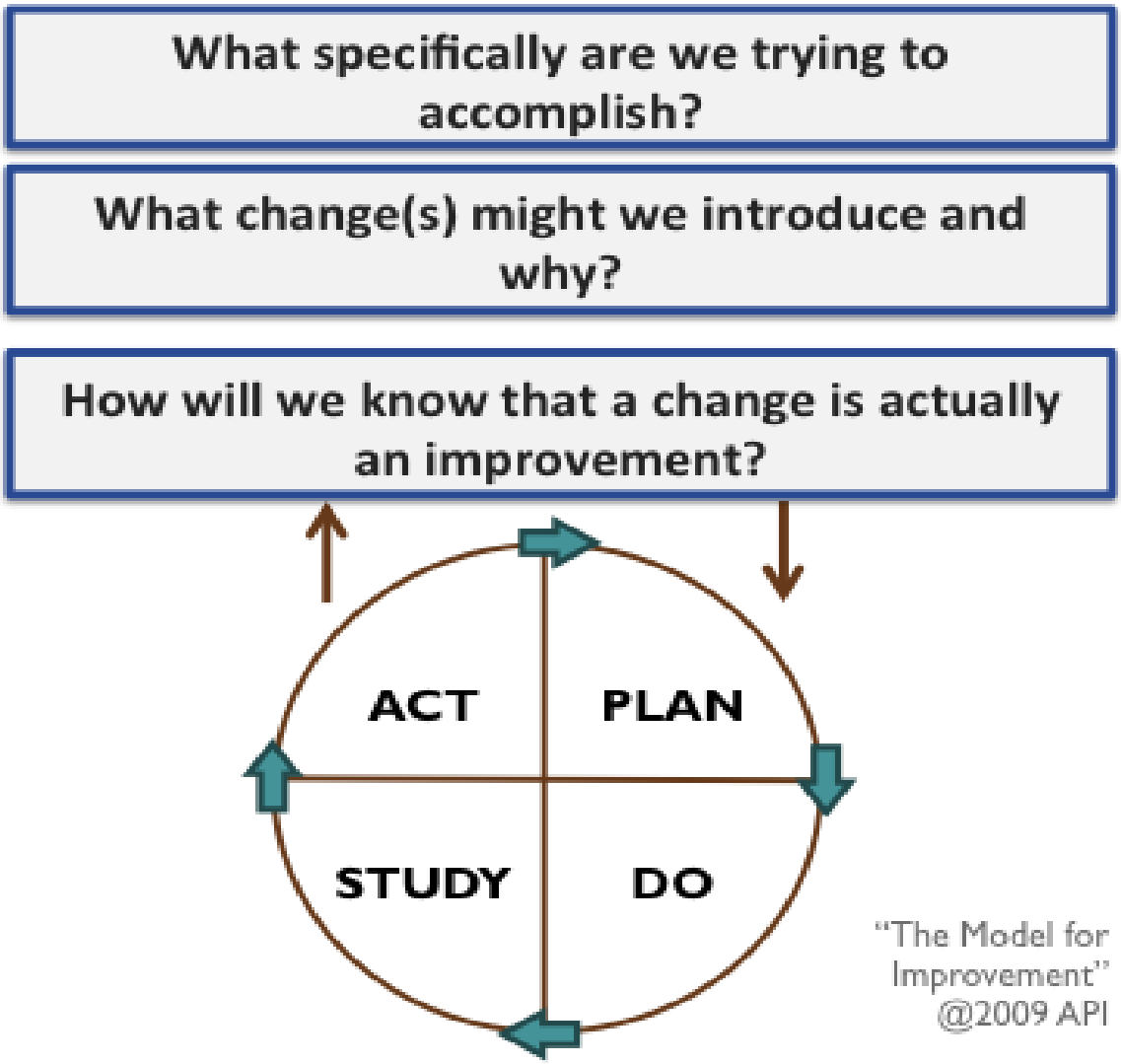
PDSA cycles involve an iterative process for all those involved. PDSA is accompanied by three main questions that guide change efforts:

1. What are we attempting to achieve?

2. How can we decide if a move is beneficial?

3. What changes will we bring that would make it better?

The Plan-Do-Study-Act (PDSA) (see Figure 4) process and three essential questions (adapted by Langley et al. 2009) provide a visual understanding of the heart of the Plan-Do-Study-Act (PDSA) cycle. Each PDSA is essentially a mini experiment including implementing some change, a prediction of the outcome, and collecting information to determine if the change seems to be an improvement. Plan-Do-Study-Act (PDSA) cycles are carried out once the changing concept and measurement techniques are determined. According to Lewis (2015), brief PDSA cycles evaluate potential changes that help students develop relations outside of the current mathematical context and enhances students' belonging, a mutual feeling of responsibility, and attendance. PDSA cycles, which are at the center of improvement science, mimic the systematic experimentation of scientific research but are tailored to fit everyday



Note. (Langley et al., 2009).

Figure 4. Plan-Do-Study-Act (PDSA) and three essential questions.

activities. Hypotheses about how to improve are developed and tested. Evidence of their efficacy is gathered and utilized to determine if a change concept should be implemented, modified, or abandoned. Based on the evidence gathered, new iterative process of learning about the problem and potential solutions is initiated. In many circumstances, a concept will fail and must be abandoned, and in others, the modification concept will take multiple cycles of trying various adjustments before operating dependably.

In this PAR study, I used the improvement science principles and the PDSA cycle to support PLC members to use the PDSA cycle, make changes to instructional practices for African American students in mathematics, and do the work that was necessary to actualize improvement of learning outcomes for all students. As an ECPLC, we studied and observed the results and acted on what we have learned in the process. The PDSA supported action-oriented learning, with the intent of improving with each approach.

Next, I share research on adult learning theory, peer observation, feedback, and coaching conversations that are a part of a PDSA cycle.

Adult Learning Theory

Anyone who seeks to engage teachers as adult learners must develop action steps that actively involve teachers in the process, encourage teachers to embrace the content that they will receive and empower them to do whatever it is you want them to do. Andragogy, the study of how adults learn (Knowles, 1990) outlines four key principles that support teachers as adult learners. Application involves exploring answers to common questions for teachers learning new content including “What does this mean for me?” and “What am I going to do with this?” As a facilitator and instructor, I see the goal as providing opportunities for teachers to practice and apply new learnings. A key tenet of adult learning is immediate application of new content – in

this case pedagogical choices in the classroom. Effective engagement ensures teachers are not left on their own to practice or figure out what to do with the content once they get back to the classroom; conversations are essential part of the PDSA process and fortify adult learning.

The second principle, problem solving, involves helping teachers to solve problems specific to their classrooms or schools. Principals can help teachers become problem solvers by providing scenarios or specific problems in their classroom or schools that they have agreed need to be solved. Scenarios allow groups of teachers to think of ways to solve the problem get teachers talking and thinking and provide opportunities for discourse and collaboration.

Involvement, the third principle of adult learning, applies to how teachers want to be involved in their learning, how they want to be up and moving, and how they want to be thinking and interacting with other teachers. Effective facilitators design activities that directly relate to the content they need to learn. Involvement must be purposefully structured in order to lead people to the content, to the assumptions that need to be made and that lead back to the problems that they were trying to solve previously or that relate to the scenarios that they are currently working on.

Finally, experience, the fourth principle. Teachers have a vast variety of experiences in their personal life and their professional life. Effective engagement taps into the wealth of knowledge and wisdom that lies within teachers. Teachers want to share their experiences with each other. Principals can help draw out experiences to help build new knowledge and encourage teachers to learn from each other through storytelling and discussions. Teachers must have opportunities to talk and engage in discussions that directly correlate back to the content that is being presented and with the overall goals, whether those are training goals or instructional goals. Shared experiences have the ability to help teachers build new knowledge on the old

knowledge that they carried into the room. Teachers as adult learners need application, problem solving, involvement, and experience to meet their needs. To be more impactful with adult learners, principals and facilitators need to give them practice, scenarios, activities, and time for shared experiences through storytelling and discussions.

As the lead researcher of my school team, I wanted to engage a community of teachers to make necessary improvements in conceptual mathematics instruction. Relational trust is fundamental to school improvement (Bryk et al., 2010; Robinson et al., 2008) states leaders need to focus on relationships, on the core business of teaching and learning to influence student outcomes. I wanted to support teachers to build their capacity and make meaningful changes in classroom practices that ultimately supported student achievement. As an instructional leader, I must create the conditions for opportunities to engage in peer observation, feedback and coaching conversations to support teacher improvement in mathematics (Bambrick-Santoyo et.al, 2018).

Peer Observation

Formative peer observations can be an excellent way to get another perspective on classroom teaching (Hammersley-Fletcher & Orsmond, 2004). Observing others can often spark a new idea or approach for colleagues. Formative peer observation is distinct from evaluations, it is non-judgmental, constructive, and can lead to facilitated dialogue. Peer observations are a starting point to a broader, collaborative conversation. These observations are most effective when aligned to the teaching strategies or learning goals those being observed would like to receive feedback on (O'Leary, 2014). Peer observation of teaching adds another dimension to professional development, it can be a place to try new things in the classroom and receive

feedback and it can generate ideas and lead to interesting collaborations between colleagues. Peer observation of teaching can get teachers together to discuss teaching.

Feedback

The basis for goal setting and professional learning comes directly from the feedback teachers receive as a result of classroom observations. Feedback is a description about the quality of teacher instruction provided to the teacher, usually after an observation. Teachers who engage in collegial conversations grow professionally (Wiggins, 2012). Collegial conversations being held within schools, between administrators and the teachers, and among teachers themselves through the use of PLCs (professional learning communities) provide the basis for quality conversations about student learning. Effective and consistent feedback drives targeted professional learning for teachers.

Coaching Conversations

Coaching conversations are a shift from telling, problem solving, and giving advice to enabling other people to have ownership of their challenges and take responsibility for their actions (Cheliotes et al., 2018). The goal of personal ownership of change occurs by taking an 'ask' approach, by listening, and asking questions to enable adults to find their own solutions. Coaching conversations are intentional and require pre-thought and planning. Coaching conversations focus on the other person, their strengths, challenges, and the attributes they bring to the conversation. The purpose of coaching conversations is to stimulate thinking, growth, and change that lead to action. Coaching conversations are about the other person's learning (Cheliotes et al., 2018, p. 5).

In the PAR research project, the ECPLC acting as Co-Practitioner Researchers participated in one-on-one and group post observation conversations during and/or following an

observation in which we have collaboratively designed lessons and made choices about appropriate pedagogy. This was particularly important when shifting to conceptual math learning as teachers' experience was primarily in teaching math from a procedural stance. In the next section, I share research about mathematical literacy that can support African American students' ability to speak, think, and reason mathematically.

Mathematical Literacy

The National Council of the Teachers of Mathematics (NCTM, 1989) argues that reading and writing should be recognized as integral to mathematics learning, reflecting a belief that since reading and writing necessitates the utilization of verbal expressions, numbers, symbolic expressions, and graphical representations, reading is a vital component within the development of reasoning, communication, and connections in mathematics. "Students who have opportunities, encouragement, and support for speaking, writing, reading, and listening in mathematics classes reap dual benefits: they communicate to learn mathematics, and they learn to communicate mathematically" (NCTM, 2014, p. 60). Mathematics literacy or numeracy refers to the ability one possesses to problem-solve, reason, and analyze information to solve real-world problems. Developing mathematics literacy helps students understand and use the language of math which in turn helps them to make sense of math problems by understanding the terminology.

Teachers can engage students in using the language of mathematics in the classroom in multiple ways. However, that requires that teachers plan for times when students discuss and justify their thinking in mathematics and building their capacity to communicate mathematically. Teachers must plan for the use of relevant math vocabulary within the context of daily mathematics lessons and model how they want their students to communicate their learning.

Teachers can promote mathematical writing by making their thinking explicit as they explain problem-solving strategies. Teachers can engage and motivate students to speak, ask questions, reflect on their thinking, and write their thoughts in mathematics journals. Helping students articulate and clarify ideas about mathematical concepts, explain their problem-solving strategies, and defend their views about mathematics-related issues help build mathematical literacy skills.

Finally, much of the research and the practice-based literature cites generic ways to build mathematical literacy by teachers changing practices to support student dialogue. However, equitable academic discourse for African American learners requires that we integrate what we know in general about strong conceptual math teaching and learning with culturally sustaining pedagogical practices that support their experiences, build (or rebuild) their math identities, and focus on discourse patterns that may support them to gain confidence in mathematical discourse.

Next, I discuss several areas of generic best practice – reasoning and thinking mathematically, conceptual understandings and rigorous math tasks, and equitable academic discourse. I conclude with an analysis of equitable discourse for African American students.

Reasoning and Thinking Mathematically

When students become active doers of mathematics, they can realize the greatest gains of their mathematical thinking. The process of sense making begins when classrooms are filled with curious students' thoughts and ideas (NCTM, 2011). However, African American students face a variety of challenges in participating equitably in the sensemaking that researchers advise. Because African American students -- especially in urban, high poverty areas -- tend to be clustered in low-income, isolated schools with teachers who are relatively unprepared to address their mathematical content needs – particularly with conceptual math.

Yet, the research is clear -- creating opportunities for students to engage with rigorous math tasks supports their mathematical reasoning skills (Boaler, 1998; Smith & Stein, 2011). The Common Core State Mathematics standards call for students to develop greater conceptual understanding and mathematical reasoning outlining expectations around the use of language to explain, to argue and to display knowledge in very complex ways. To achieve the goals of the standards students must be able to solve mathematical problems and verbally explain how they arrived at an answer. Without adequate instructional support and opportunities to practice, this is challenging for students, especially students of color.

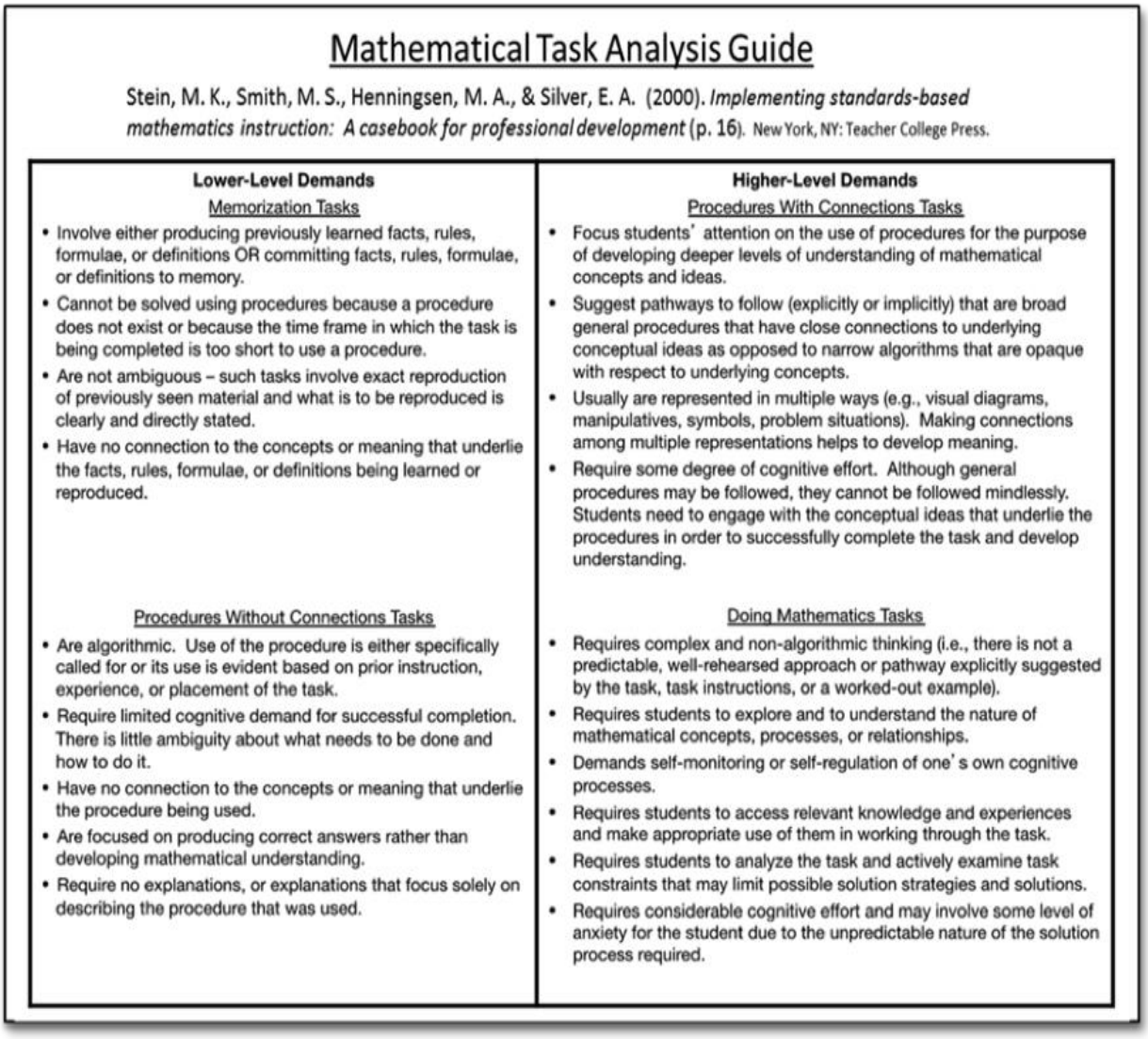
The standards for mathematical practice are those standards meant to capture the processes and proficiencies students must know how to use, the knowledge and skills, the habits of mind or thinking skills that are specific to mathematics. One of those skills is the ability to construct arguments, to reason and to think about why "the math" works. Students, especially African American and students of color, need to be able to use mathematics in college and career as well as in their daily life. Students need to be able to reason mathematically. A mathematical practice standard that builds upon the former is modeling. Modeling means taking a problem external to mathematics, thinking of a mathematical description of that problem that can be manipulated mathematically, coming to a mathematical solution, and then interpreting that solution back again in terms of the real problem. This is at the heart of what most students will be doing with mathematics once they leave school, namely using it to solve problems outside of mathematics classes.

Conceptual Understanding and Rigorous Math Tasks

The National Council of Teachers of Mathematics (NCTM) describes conceptual understanding in terms of the learning opportunities that should be afforded to all students

arguing all students should have the opportunity to acquire conceptual knowledge and to understand underlying math concepts. Another critical learning opportunity for all students is to connect new learning with prior knowledge to develop intentional connections between past learning and present learning. Finally, the NCTM encourages all teachers to present learning opportunities to students to engage with challenging math tasks to develop their ability to understand and explain the mathematical concepts of math problems. Stein and Lane (1996) state that "[i]f we want students to develop the capacity to think, reason, and problem solve, then we need to start with high-level, cognitively complex tasks" (Stein & Lane, 1996, p. 11).

Stein et al. (2000) defines cognitive demand as the kind and level of thinking required of students in order to successfully engage with and solve a math task to help teachers reflect on the tasks they created for their students. They examined curricular materials the teacher received, how teachers set up math tasks, how the tasks were implemented and their impact on student learning. Stein et al. (2000) identified four different levels of cognitive demand of math tasks, separated into two specific categories. Low demand which goes from memorization to procedures without connections and high demand which are math tasks that have procedures with connections to "doing math", the highest cognitively demanding tasks. Teachers can classify the math task by level of cognitive demand by looking at the entire task, not just individual parts and analyzing how much cognitive demand is required to complete the entire task. Teachers must also ensure tasks are aligned to grade levels and the ability of the students; that is, a task that may be at a high level for one grade or for one set of students may be a relatively low demand task for another set of students due to their own experiences or their mathematical abilities. Next, I discuss equitable academic discourse and effective questioning that support students in developing academic discourse and student engagement (see Figure 5).



Mathematical Task Analysis Guide

Stein, M. K., Smith, M. S., Henningsen, M. A., & Silver, E. A. (2000). *Implementing standards-based mathematics instruction: A casebook for professional development* (p. 16). New York, NY: Teacher College Press.

Lower-Level Demands	Higher-Level Demands
Memorization Tasks • Involve either producing previously learned facts, rules, formulae, or definitions OR committing facts, rules, formulae, or definitions to memory. • Cannot be solved using procedures because a procedure does not exist or because the time frame in which the task is being completed is too short to use a procedure. • Are not ambiguous – such tasks involve exact reproduction of previously seen material and what is to be reproduced is clearly and directly stated. • Have no connection to the concepts or meaning that underlie the facts, rules, formulae, or definitions being learned or reproduced.	**Procedures With Connections Tasks** • Focus students' attention on the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas. • Suggest pathways to follow (explicitly or implicitly) that are broad general procedures that have close connections to underlying conceptual ideas as opposed to narrow algorithms that are opaque with respect to underlying concepts. • Usually are represented in multiple ways (e.g., visual diagrams, manipulatives, symbols, problem situations). Making connections among multiple representations helps to develop meaning. • Require some degree of cognitive effort. Although general procedures may be followed, they cannot be followed mindlessly. Students need to engage with the conceptual ideas that underlie the procedures in order to successfully complete the task and develop understanding.
Procedures Without Connections Tasks • Are algorithmic. Use of the procedure is either specifically called for or its use is evident based on prior instruction, experience, or placement of the task. • Require limited cognitive demand for successful completion. There is little ambiguity about what needs to be done and how to do it. • Have no connection to the concepts or meaning that underlie the procedure being used. • Are focused on producing correct answers rather than developing mathematical understanding. • Require no explanations, or explanations that focus solely on describing the procedure that was used.	**Doing Mathematics Tasks** • Requires complex and non-algorithmic thinking (i.e., there is not a predictable, well-rehearsed approach or pathway explicitly suggested by the task, task instructions, or a worked-out example). • Requires students to explore and to understand the nature of mathematical concepts, processes, or relationships. • Demands self-monitoring or self-regulation of one's own cognitive processes. • Requires students to access relevant knowledge and experiences and make appropriate use of them in working through the task. • Requires students to analyze the task and actively examine task constraints that may limit possible solution strategies and solutions. • Requires considerable cognitive effort and may involve some level of anxiety for the student due to the unpredictable nature of the solution process required.

Figure 5. Mathematical task analysis guide.

Theoretical Framework for Equitable Academic Discourse in Mathematics

Hufferd-Ackles et al. (2004) describe the development of a theoretical framework aligned to the building of a math-talk learning community - a community in which individuals assist one another's learning of mathematics by engaging in meaningful mathematical discourse. The goal of the discourse community is to encourage student-initiated talk and build their collaborative efforts to solve problems. The framework describes levels of math talk components beginning with questioning to explaining mathematical thinking to source of mathematical ideas to responsibility. Each component is evaluated on a continuum of levels from zero to three, with zero being the initial stages of each component and three being the achievement of mathematical discourse in each component. The authors suggest teacher use of the framework can build students' communication skills and mathematical understandings. Discourse communities are unlikely to develop unless classroom participants have opportunities to engage in rich mathematical work, typically initiated by the tasks that are posed (Hufferd-Ackles et al., 2004).

Mathematical tasks are important vehicles for building student capacity for mathematical thinking and reasoning. Student learning is greatest in classrooms where the tasks consistently encourage high-level student thinking and reasoning and least in classrooms where the tasks are routinely procedural in nature (Boaler, 2016; Boaler & Staples, 2008). Not all tasks are equal in providing opportunities for student thinking and learning. Math tasks are characterized by the level of cognitive demand needed to complete the task. Low-level tasks require low cognitive demand. These tasks often require students to reproduce previously learned facts, rules, formulas, definitions or commit them to memory and have no connection to concepts or meaning that underlie the facts, rules, formulas, or definitions. High-level tasks require students to explore and understand mathematics and may involve some level of anxiety because the solution path is

not clear (NCTM, 2014). The most difficult for teachers to implement well are tasks that require great cognitive demand and are often transformed into less demanding tasks during instruction (Stein et al., 1996).

"Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships" (NCTM, 2014, p. 35). The four purposes (types) of teacher questions are:

1. To gather information - Student recalls facts, definitions, or procedures
2. To probe thinking - Student will need to explain, elaborate, or clarify their thinking
3. To make the mathematics visible - Student will discuss structure and make connections among ideas and relationships
4. To encouraging reflection and justification - Student shows a deep understanding of reasoning and action, including arguing for validity

Effective teachers teach students communication skills to ensure they have productive and respectful conversations, one of the most important math skills that they can learn. Teachers can develop sentence frames and utilize questions to encourage students to listen to one another, to disagree, to question each other and learn to justify their ideas. Questions that encourage mathematical discourse help students make sense of mathematics, promote student-to-student discourse where students talk to each other instead of talking to the teacher, and encourage students to learn from each other. Questions help students to connect mathematics its ideas and its applications enabling them to see patterns and think about how they can translate what they are learning now to or what they learned before it to what they are learning now.

Equitable Academic Discourse for African American Students

The NCTM (2014) describes mathematical discourse as whole class discussions in which students talk about mathematics in such a way that they reveal their understanding of concepts; students learn to engage in mathematical reasoning and debate. Discourse involves asking strategic questions that elicit how a problem was solved and why a particular method was chosen. Students learn to critique their ideas and others' ideas and seek out efficient mathematical solutions. The features of mathematical discourse are structure, content, purpose, and product. Math discourse is critical for math learning and honoring discourse patterns of African American students is necessary if they are to fully engage. This is particularly critical if students have not developed identities as being successful at mathematics.

As Zilanawala et al. (2014) indicated in their study of 4th graders, a way to improve math achievement is to systematically create opportunities for African American students to engage with rigorous math tasks supports their mathematical reasoning skills. NCTM (1991) recommendations urge teachers to initiate and orchestrate discourse by posing questions that elicit, engage, and challenge students' thinking; by listening carefully to students' ideas and by asking students to clarify and justify their ideas orally and in writing. Classroom discourse, which includes listening and speaking, provides access to ideas, relationships among those ideas, strategies, procedures, facts, and mathematical history (Chapin et al., 2009). However, this discourse must engage students and attend to their cultural patterns (Paris, 2012; Paris & Alim 2014). Emdin (2016) names this co-generative dialogue in which the teacher welcomes self-expression and values the voices of the students as they co-construct meaning, but perhaps in a cultural form that is not typical of school. Conversations can only act as scaffolds for students' abilities to develop mathematical language because discussion provides opportunities to

simultaneously make meaning and communicate that meaning and do so based on their cultural assets (Mercer & Howe, 2012; Zwiers & Crawford, 2011).

Thus, the structure of discourse needs to be multi-directional and responsive; that discourse may not be turn-taking as is so common in schools but more improvisational. While students carry the responsibility of participating, reacting, and evaluating the contributions of their peers, they may affirm each other in cultural ways that the teacher has to understand and foster. Student responses extend the instruction with the teacher supporting the conversation rather than reducing or, in some cases, removing the cognitive load from the students. Mathematical discourse provides the opportunity for students to think and evaluate what their peers are saying. Content of mathematical discourse helps draw connections among ideas, enabling students to distinguish between valid and invalid arguments.

The content of culturally responsive and sustaining mathematical discourse helps draw connections among ideas, enabling students to distinguish between valid and invalid arguments. Students develop shared understandings and construct knowledge through dialogue while the teacher builds on student ideas to design curriculum rather than superimposing a predetermined structure upon the students. The purpose of mathematical discourse is to assist the teacher and students in learning more about the topic. Student conversation is focused on exploring and explaining ideas and connections. The discourse of the class seeks to engage students, promote inquiry, and establish new understandings; this is a more active approach to traditional conversations in the classroom.

Students engage in discourse to construct, negotiate, and verify mathematical ideas. Teachers support students to synthesize ideas through intentional interventions ensuring students reach shared understandings in a deeper analysis of mathematics. Discourse in the classroom

requires three things: participation, which are opportunities in the dialogue for students to become engaged, question others, try out new ideas, and hear diverse points of view. Discourse requires commitment, where students are open and willing to hear the position of their peers and discourse requires reciprocity, or a willingness for students to engage in an equilateral exchange with others.

Mathematical discourse is important because it builds mathematical fluency (NCTM, 2014). A mathematician should be thinking mathematically, building fluency that establishes a student as an expert, building confidence. Discourse removes a teacher from the role of the answer holder and gives confidence and curiosity back to the student; putting them in charge of their own learning and enabling students to demonstrate mastery. Discourse allows students to share their ideas and provide teachers an opportunity to push thinking and address the absent understanding when they are identified in the classroom.

Summary

The participatory action research sought to understand the strategies that support upper elementary teachers' as they collaborate to design and implement conceptual math lessons that increase opportunities for academic discourse for African American students. Furthermore, in this participation action research, we used research regarding culturally responsive teaching, professional learning communities, and equitable academic discourse to inform our actions. To make progress on this goal, educators needed to understand the importance of culturally responsive instructional practices and conceptual understanding as a foundation for increasing students' access and success and be fully aware of how to combine culturally responsiveness dialogue with mathematical rigor. In addition, in the PLC, we needed to learn about pedagogy and instructional strategies that are successful for African American students.

Conclusion

In this chapter, I shared literature that influenced the project's main research question: How do third, fourth, and fifth grade teachers effectively implement lessons focused on conceptual mathematics to support stronger and equitable engagement for African American students? First, I addressed studies on culturally responsive teaching as well as teaching and learning attributes that benefit students. I discussed mathematical instructional techniques for African American learners. I examined academic discourse research and its implications. I described professional learning communities (PLC) and the frameworks that have been demonstrated to help instructors improve their practices. In the final section, I discussed conceptual understanding and rigorous math tasks and their effectiveness in helping teachers design lessons to build students capacity to engage in academic discourse and build positive math identities. In the PAR study, I looked for ways to improve teachers' math instructional strategies so that they could better serve children's academic and social-emotional needs. The literature review discussed in this chapter provided support as I collaborated with the participants of the PAR project.

CHAPTER 3: RESEARCH DESIGN

In this PAR study, I investigated the extent to which third, fourth and fifth grade teachers effectively implement protocols during conceptual mathematics lessons to equitably engage African American students in academic discourse (Ladson-Billings, 1997; Zwiers & Crawford, 2011). The PAR study was grounded in the following theory of action (ToA): If teachers participate in a professional learning community and effectively implement protocols during conceptual mathematics lessons, then teachers will equitably engage African American students in academic discourse to learn conceptual mathematics. The setting of the PAR research study is a public Title I elementary urban school in in Oakland, California. In the study, I invited five third, fourth and fifth grade teachers to participate in integrating common protocols into conceptual math lessons to support African American students. Over the course of fourteen months, teachers implemented protocols during mathematics lessons to provide opportunities for students to engage in academic discourse. As lead researcher, I observed teachers' instructional practice, collected data, and engaged in post observation conversations with them. The goal was to develop teacher capacity and instructional leadership through an equity-centered professional learning community (ECPLC) approach.

Concurrently, this group acted as Co-Practitioner Researchers (CPR): they examined the evidence that I collected and analyzed to make informed decisions about next steps. They validated the results of each cycle of inquiry for accuracy through conducting member checks (Creswell & Guetterman, 2019). This process involved teachers working collaboratively to examine classroom practice, implement culturally responsive instructional strategies, develop conceptually based math lessons, and engage in iterative cycles of inquiry (Bryk et al., 2015; Curry, 2008; Fisher et al., 2009; Langley et al., 2009; Woods, 2010).

In this chapter, I discuss the process for conducting a qualitative research study; the primary methodology of PAR is informed by activist research methodology. Activist research (Hale, 2001; hunter et al., 2013), community learning exchange (CLE) axioms and protocols (Guajardo et al, 2016), and the improvement science process (Bryk et al, 2015) are essential in designing and implementing the PAR process. The PAR study included three iterative cycles over a fourteen-month time frame (Fall 2021-Fall 2022). After an overview of the qualitative research process, I describe the study participants, sampling process, data collection and data analysis. I conclude with considerations for the study including the study limitations, validity, confidentiality and ethical considerations (Creswell, 2007).

Qualitative Research Process: Participatory Action Research

The goal of qualitative research is the "development of concepts which help us to understand social phenomena in natural (rather than experimental) settings, giving due emphasis to the meanings, experiences, and views of all the participants" (Mays, 1995, p. 110). Qualitative methods use techniques such as narratives and ethnographies to understand the deeper meaning of behaviors, relationships, and emotions (Gerdes & Conn, 2001; Saldaña, 2016). Throughout the PAR study, I collected data from various sources including classroom observations, coaching sessions, lesson plans, member checks and reflective memos. Creswell and Clark (2007) stated, "exploring the data means (a) examining the data with an eye to developing broad trends and the shape of the distribution or (b) reading through the data, making memos, and developing a preliminary understanding of the database" (Creswell & Clark, 2007, p. 130). After collecting the data, I organized the data in data sets and coded the data to determine categories in the initial Pre-Cycle, emerging themes in PAR Cycle One, and findings in PAR Cycle Two.

Elements of Action Research

The selection of PAR research for this study was intentional. As a methodology, PAR involves developing and cultivating dynamic relationships between researchers and participants and self and community so that communities of practice build collectively with each other; they can simultaneously do healing and change work while conducting research (Gerdes & Conn, 2001). The PAR process puts power for decisions in the hands of the community members; they identify what is important, when it is important, and who needs to be involved. They identify the problem and how it might be solved. Access to the data in real time supports Co-Practitioner Researchers to make immediate changes and take intentional steps to implement changes, responding to the data trends in real-time (Creswell & Guetterman, 2018). In this study using action research, I included teachers as Co-Practitioner Researchers in an ECPLC, focused on equitable access to conceptual mathematics and rigorous math tasks for African American students (Hale, 2001; Hammond, 2015; hunter et al., 2013; Ladson-Billings, 1997; Silver et al., 1995). In addition to the PAR process, I used the improvement science processes in three iterative cycles of inquiry (Bryk et al., 2015) as well as CLE protocols and processes (Guajardo, et al., 2016) to drive the research design and respond to the research questions by collecting and analyzing data.

The focus of practice is: *Integrate equitably engaging protocols in designing and implementing conceptual mathematics lessons in upper elementary classrooms.* Consequently, the overarching question guiding this research study is: How do third, fourth and fifth grade teachers co-design lessons focused on developing conceptual understanding and academic discourse in mathematics to support equitable engagement for African American students? I

designed PAR activities, in three iterative cycles, to answer these sub-questions systematically and methodically:

1. To what extent do teachers effectively collaborate and plan the use of protocols during conceptual math lessons for African American students?
2. To what extent do teachers implement culturally responsive instructional practices to equitably engage African American students during mathematics?
3. To what extent did the process of engaging in collaborative observation and post observation conversations support changes in instructional practices during math?
4. How did the process of facilitating the development of classroom teachers to build their capacity to implement culturally responsive instructional practices in math class affect my role as an instructional leader?

A description of the action research process includes a discussion of: (1) activist research (Hale, 2001; Herr & Anderson, 2014; hunter et al, 2013: Koirala-Azad & Fuente, 2009); (2) improvement science (Bryk et al., 2015); and (3) community learning exchange (CLE) protocols and axioms (Guajardo et al., 2016).

Activist PAR

PAR methodology employs inquiry that is conducted *with* like-minded persons in an organization or community but never *to* or *on* them (Cohen et al., 2018). Participatory activist research extends action research to engage in actions that promote social change and support researchers to engage in renegotiating power dynamics. Freirean (1970) and activist principles (hunter et al., 2013) support those who engage in the research process to understand the root causes of inequality, oppression, violence, and related conditions of human suffering. I selected activist research for the study because the participants will become partners – Co-Practitioner

Researchers -- in the entire research process including selecting the research topic and deciding what actions we should take as a result of the data that I collect, analyze, and share with them (Herr & Anderson, 2014). Iteratively, we examined our progress toward the common goal – in this case, that is equity for African American learners in math classes. According to hunter et al. (2013), when paired with activist research, action research is particularly useful to our work in schools and communities because participants are engaged in "understanding and facilitating social change through research" (p. 1). As an educator, I used activist research because we engaged in research cycles to transform the classroom teaching and learning. I invited the community of teachers to become involved in an equity-centered professional learning community that operated as Co-Practitioner Researchers; they were closely involved in the inquiry and continued reflection in order to act, Freire's (1970) *praxis,* was an important part of the process. I engaged with the teachers in investigating current instructional practices in mathematics and creating changes to teaching practices that are equitable, rigorous, and ensured equitable access.

Improvement Science

Improvement science principles are foundational elements for this research (Bryk, 2015). In Chapter 1, I used a revised improvement science – the fishbone --process to analyze the assets and challenges of the focus of practice (Bryk et al., 2015; Rosenthal, 2019). Central to the research study and IS processes is the use of the cycle of inquiry process – Plan-Do-Study-Act (PDSA). That means that we initially plan and do something as a trial effort in a small group, then study the results, and finally plan for next steps based on iterative decision. PDSA cycles are a basic method of inquiry in inquiry research to guide the rapid learning of the teachers in the ECPLC. As an ECPLC community, we relied on the IS principle of disciplined inquiry to drive

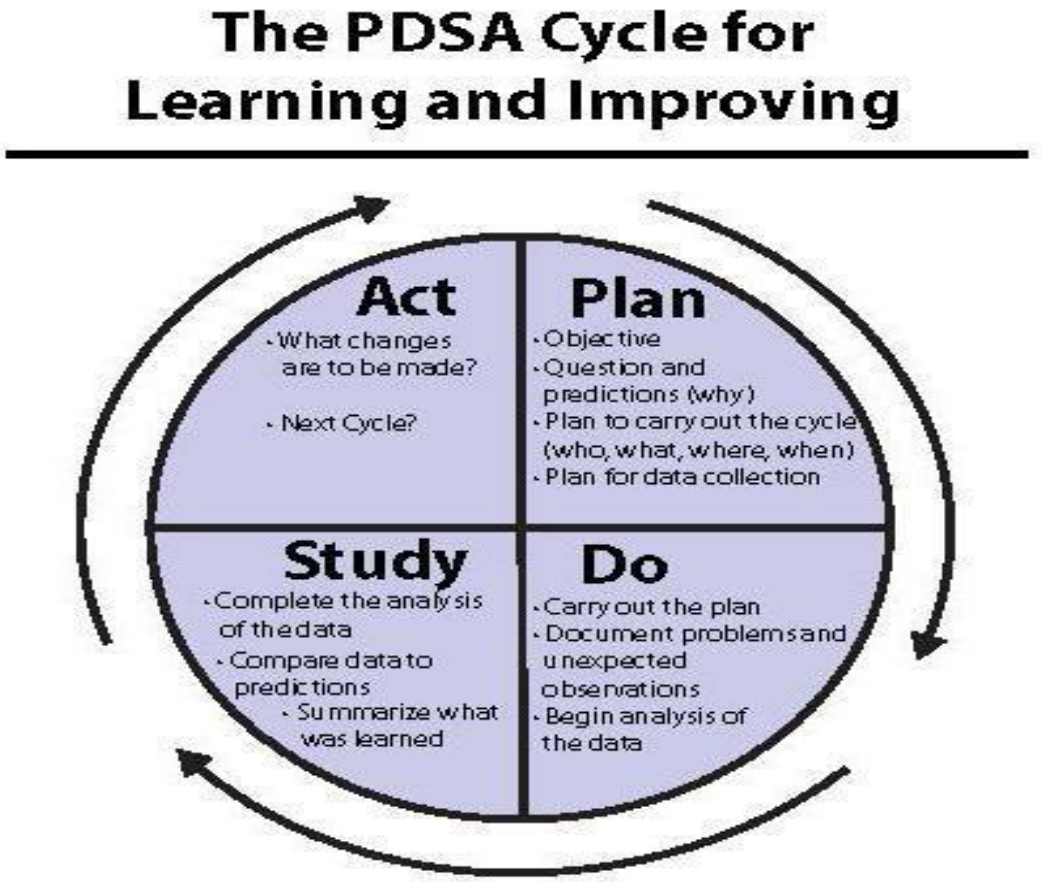
improvement. Using this process, I collected and analyzed data during the inquiry cycles. Members of the Co-Practitioner Researcher (CPR) group provided feedback on actions and helped inform next steps over the course of the iterative cycle (see Figure 6 for PDSA elements).

The equity centered-professional learning community (ECPLC) matches the term NIC (networked improvement community) of the improvement science and is a team of educators who share a commitment to the collective ownership of improving teaching and learning action research (Berwick, 2008; DuFour, 1998; Langley et al., 2009; Reeves, 2019). This ECPLC consisted of upper elementary teachers. I investigated the instructional practices of ECPLC members as they engaged in the focus of practice, identified by participants in a community learning exchange (CLE) described in Chapter 1, I described in the participant section of the chapter. The ECPLC group engaged in three iterative inquiry cycles, and we depended upon community learning exchange processes for our meetings and artifacts from those discussions were helpful in the data collection and analysis process.

Community Learning Exchange (CLE)

The community learning exchange (CLE) axioms and processes align with action research and improvement science. CLE processes have the potential of bringing committed people together "to create and share information and knowledge in furtherance of the work of the community" (McLinden et al., 2019). CLEs as a theory and practice acknowledge the

> power of place and the wisdom of the people working closest to the problem to address local issues. People residing in local communities know the issues firsthand and therefore need to be fully involved in constructing the organizing focus and selecting pedagogies to [address] these issues. (Guajardo et al., 2016, p. 25)



Note. (Adapted from Deming, 2000).

Figure 6. Plan-Do-Study-Act (PDSA) cycle of inquiry model.

By facilitating meetings using CLE processes, I can encourage the ECPLC group and other community members to openly examine their common challenges, collective gifts, and then "freely exchange successful approaches and tools that can drive changes within themselves, their organizations (including schools), and their communities" (Guajardo et al., 2016, p. 3). The five CLE axioms or guiding principles are at the core of the PAR project include:

- *Learning and leadership are dynamic social processes*. The foundation of effective school and community change efforts are relationships; these individual and group relationships are necessary and learning must occur to support them.
- *Conversations are critical and central pedagogical processes.* Conversations, especially between two or more people in a collegial relationship, invite the exchange of ideas.
- *The people closest to the problems are best situated to find answers to local concerns.* The wisdom of the community fosters a creative agency that helps people use their unique perspective, voices, and power to respond to the local problems, linking their destinies together.
- *Crossing boundaries enriches the development and educational process.* An integral part of community learning exchanges is the ability to cross boundaries between local schools and the surrounding communities. CLE encourages the exchange of ideas between people of different generations, races, cultures, economic classes, etc.
- *Hope and change are built on assets and dreams of locals and their communities.* CLE allows participants (themselves and others) to share their unique story and express hopes and dreams as they map their assets, gifts, and ideas, thus viewing

everyone's roles and power in their communities in different, collective ways. (Guajardo et al., 2016, pp. 29-34).

The CLE axioms align with the proposed focus of practice. By engaging the ECPLC group, I created opportunities to build collegial relationships between and among the members and these relationships acted as the foundation for later courageous conversations that moved the focus of practice forward. The third axiom highlights the idea that like-minded teachers are those closest to the issue and best situated to develop and improve pedagogical practices for equitable access for students in mathematics. I used improvement science principles and the PDSA cycle to collect, organize, and analyze evidence for qualitative analysis from the action research study to move the work forward.

Giving all participants equitable access to engage in conversations was critical and central to the pedagogical process. I invited the ECPLC members to be a part of regular meetings and we hosted a community learning exchange with other teachers in our school. I invited participants, included other classroom teachers, resource and specialty teachers, and support staff as well as parents of African American children, volunteers and the other members of the larger school community who work directly with African American students, as they were the people closest to the issues and thus are best situated to discover answers to the concerns (Guajardo et al., 2016).

The Role of Praxis

Freire (1970) urges us to view our work in this way: “Liberation is a praxis: the action and reflection of men and women upon their world in order to transform it” (Freire, 1970, p. 79). Reflection is vital to PAR study, but, as Freire suggests the reflection has a critical component of addressing a deep social issue, interrupting the status quo in order to address that issue, and

generatively working together to experiment with how to institute changes that make a difference – in this case, for African American students. In the ECPLC, the group members engaged in praxis- reflection that was embedded throughout the three PDSA cycles. The group had regular opportunities to reflect on learnings as part of the inquiry process.

During the PAR study, I posed questions and designed activities that encouraged praxis, what Freire (1970) advocated for as the process of co-learning through reflection. As a group, we wanted to reflect on our work to better inform our practices. At the meetings, members reflected on lesson designs, data after classroom observations, readings, improvements, and challenges. As the lead researcher, I provided support space and time for participants to use reflection to drive interventions and improvement and ensure that our design and implementation fosters equitable actions.

Reflection was an important part of my leadership development as a school leader. I regularly wrote reflective memos. These memos documented my experiences throughout the PAR study, captured reflections after ECPLC meetings, CLEs, classroom observations, and meetings. I embedded reflection throughout PDSA cycles and helped inform leadership decisions related to activities, professional development, data collection and analysis throughout the PAR cycles. Ultimately, the goal was to use regular reflection and reflective memos to document personal leadership growth and development. I shared that leadership journey and my learning in the final chapter of the dissertation.

Action Research Cycles

I facilitated three improvement or action research cycles that began in the fall of 2021. During the Pre-Cycle or planning phase, the ECPLC members met to review the focus of practice, describe current instructional practice, and identify changes to classroom instruction. I

used CLE processes to engage the group. At the conclusion of each cycle of inquiry, I conducted member checks, which are processes in which "the researcher asks one or more participants in the study to check the accuracy of the account…whether the description is complete and realistic, if the themes are accurate, and if the interpretations are fair and representative" (Creswell & Guetterman, 2018, p. 261). In this case, I shared the data analyses from observations and from the meeting notes with ECPLC members to determine accuracy, validity, and next steps.

The focus of the ECPLC group was to design conceptual lesson plans that informed classroom instruction and ensured access to conceptual mathematics by accelerating social learning using improvement science principles (Bryk et al., 2015, p. 144). Establishing an ECPLC group that met regularly for collaborative lesson planning and design ultimately led the members to use the evidence to make decisions and ask generative questions based on the evidence; teachers refined their instructional strategies in each cycle of inquiry.

The PAR consisted of three action cycles: Pre-Cycle, PAR Cycle One, and Par Cycle Two. The project timeline was Fall 2021 (PAR Pre-Cycle), Spring 2022 (PAR Cycle One), and Fall 2023 (PAR Cycle Two) (see Table 3).

Participants, Data Collection, and Analysis

The primary PAR participants included the ECPLC members. I engaged in collecting and reviewing data generated by participants as they design, implement, and reflect upon changes in instruction. I collected qualitative data from multiple sources including classroom observation notes, post observation conversations, CLE artifacts, meeting notes, lesson plans, member checks, and reflective memos. I, as the lead researcher, analyzed the data collected during and after inquiry cycles and with ECPLC members, reflected on data and evidence, and used these to

Table 3

Research Cycle of Inquiry

Research Cycle	Time Period	Activities
PAR Pre-Cycle and Context	Spring 2022	Form ECPLC, Use CLE protocols to analyze FoP, Analyze literature and identify strategies to implement, Observe classrooms, Write reflective memos
PAR Cycle One	Fall 2022	Facilitate ECPLC meetings using CLE protocols, Observe classrooms, Facilitate post-observation conversations, Write reflective memos, Conduct member checks
PAR Cycle Two	Fall 2022-Spring 2023	Facilitate Community Learning Exchange (CLE), Facilitate ECPLC meetings, Observe classrooms, Write reflective memos, Conduct member checks

inform next steps. The ECPLC acts as a CPR or Co-Practitioner research group, who are the central participants for the study. A second group of participants were the other teachers in the school, and we co-facilitated a community learning exchange (CLE) to share what we are learning with them.

Participants

As the lead researcher in the PAR study, I worked with a team of third, fourth and fifth grade upper elementary teachers who were in the ECPLC to work as Co-Practitioner Researcher (CPR) group (n=5 teachers). I invited five classroom teachers to be the participants in the study. I, the principal, was the lead researcher. The group was useful in describing and understanding current math instruction, identifying problems, engaging in the inquiry process, and co-creating the action steps needed to make changes to conceptual math lessons (hunter et al., 2013; Jackson & Wilson, 2012; Morton, 2014). During the Pre-Cycle, I used observation tools to observe the members. After the first full cycle of inquiry (PAR Cycle One), the CPR members assisted in developing and facilitating a school-wide CLE.

I selected participants using purposeful sampling, which involved identifying and selecting individuals or groups of individuals who were especially knowledgeable about or experienced with a phenomenon of interest (Creswell & Plano Clark, 2011; Patton, 1990). I selected participants who were experienced, knowledgeable, and interested in examining and improving conceptual mathematics instructional practices and engagement strategies at the upper elementary school level. The participants signed consent forms and understood the terms of the study (see Appendix D).

The group agreed to meet weekly for professional development utilizing the equity-centered professional learning communities (ECPLC) model to co-design conceptual

mathematics lessons and engage in cycles of inquiry about the implementation of the lesson. As lead investigator, I met with teachers for pre-observation meetings, classroom observations, and engaged in post observation conversations. The CPR team engaged in cycles of inquiry to plan, implement, reflect, and most importantly, share findings back with the community.

As second group of participants included small school of ten teachers. I included three additional participants in the study who are classroom teachers. These persons participated in a meeting with us using CLE protocols to learn about the work we were doing. As CPR members familiarized themselves with the engagement protocols, they facilitated professional development on equity-based engagement protocols and lesson plan design. These participants signed consent forms to participate (see Appendix D). The total number of intended participants in the study was 12.

Data Collection

Qualitative data collection involves investigating a research question and collecting data in order to address that question. In qualitative research, the possibilities for data collection are extensive so that we have multiple sources to ensure that findings are accurate. Creswell and Creswell (2018) group data collection into four categories: open-ended interviews, open-ended observations, documents-like minutes from a meeting, and newly emerging audio/visual materials or videotaping. In this study, I collected data from multiple sources including documents created in co-designing mathematics lessons, lesson plans, classroom observations, one-on-one coaching sessions, ECPLC meetings, professional development sessions, artifacts from CLEs, and member checks. Finally, I wrote and analyzed reflective memos.

Descriptions of the data tools utilized include:

- Project I^4 Calling On Tool: Observation tool used to focus on student access to the classroom discourse so all students have a regular opportunity to talk during classroom instruction (see Appendix E).
- Project I^4 Questioning Form Tool: Observation tool used to assist in collecting evidence on the forms of questions teachers asking students during classroom instruction (see Appendix F).
- Questioning Level Tool**:** Observation tool used to determine the cognitive level of questions, think time for different cognitive levels and evidence authentic responses to questions (see Appendix G).
- Coaching Conversation Protocols are protocols used to guide the conversation about the data collected during the classroom observations; were used to support data reflection toward improving practice.
- ECPLC meeting notes were collected and reviewed to examine how mathematics lessons were designed, planned, and revised.
- CLE artifacts were a key form of regular data collection, and I collected and analyzed these artifacts.
- Reflective memos recorded reflections of experiences; the memos were used for internal growth and planning next steps.
- Member checks gave all participants the opportunity to review the data I analyzed for accuracy.

In Table 4, I describe the research questions and the data sources that I used to triangulate the data. Triangulation refers to the use of multiple methods or data sources in qualitative

Table 4

Research Questions, Proposed Data Collection, and Triangulation

Overarching Question: How do third, fourth, and fifth grade teachers effectively implement lessons focused on conceptual mathematics to support stronger and equitable engagement for African American students?

Research Question	Data	Triangulated With …
1. To what extent do teachers collaborate to co-design conceptual mathematics lessons?	• Documents (lesson plans, meeting notes)	Reflective Memos Member Checks
2. To what extent do teachers effectively implement the co-designed lessons?	• Classroom Observation Tools • Coaching Conversation	Reflective Memos Member Checks
3. To what extent do teachers design and implement instructional practices to equitably engage African American students?	• CLE Artifacts • Classroom Observation Tools • Coaching Conversation Protocol • CLE Artifacts	Reflective Memos Member Checks
4. How does the process of co-designing and implementing math lessons to equitable engage African American students support my growth and development as an instructional leader?	• Reflective Memos • CALL Survey	Coaching Conversations Member Checks

research to develop a comprehensive understanding of phenomena (Patton, 1999). I triangulated the data I collected with other sources for validity.

Observations and Post-Observation Conversations

A major feature of the PAR project included classroom observations of equitable protocols during conceptual mathematics lessons. I used classroom observation tools to collect and record information while observing instruction. I used both pre-established codes and open coding (Saldaña, 2016). I observed classroom instruction during the Pre-Cycle, PAR Cycle One and PAR Cycle Two. During PAR Cycle One, CPR members engaged in peer observations. I debriefed post observations with CPR members.

Reflective Memo

I wrote reflective memos during each PAR cycle and code these memos during each inquiry cycle. Kolb's (1984) Experiential Learning Theory provided the model for reflective memos. I employed the four stages of Kolb's learning cycle: experience, reflect, conceptualize, and apply to reflect.

Community Learning Exchange Artifacts

I collected a variety of artifacts from the Community Learning Exchanges occurring during PAR cycles. The artifacts aligned to PAR topics and documented participant stories, responses to topics, questions, or next steps. I coded all evidence collected.

Documents

Documents included meeting notes, field notes, agendas, and lesson plans.

Coaching Conversations

The teachers participated in collaborative lesson design sessions, classroom observations, and CPR meetings. In CPR meetings, I asked open-ended questions to elicit views, opinions, and

predictions based on observation data. I recorded and transcribed these conversations using Saldaña's (2016) open coding.

Data Analysis

Interpreting and analyzing data collected from various sources involves patience and skill as the researcher must make sense of and compile the data into sections, groups, or themes by coding (Creswell, 2018). In this qualitative research study, I, as the lead researcher, used Saldaña's (2016) coding methodology to collect, organize, analyze, review, and code multiple sources of data collected during the PAR study. I used open coding after organizing the data from data for documents and CLE artifacts. I used provisional coding for classroom observations and coaching conversations, as those codes exist in the protocols I intend to use. I completed first and second level coding using open coding and provisional codes for all raw data. First level or initial coding may develop emerging categories in the PAR Pre-Cycle, and second level coding may solidify emergent themes for PAR Cycle One. By the conclusion of PAR Cycle Two, the data may move from emergent themes to findings allowing for making claims in response to the research questions.

I conducted regular member checks to respond to evidence used at the conclusion of each PAR cycle to ensure the validity standard as described in the data analysis and limitations section (Creswell & Guetterman, 2018; Creswell & Plano, 2011). Data collection procedures for the PAR project also included information gathering through formal and informal qualitative data methods and an established process for recording information (Creswell & Creswell, 2018).

Study Considerations: Limitations, Validity, and Confidentiality and Ethics

As lead researcher, I needed to consider my role in the ECPLC. As the principal, I am considered to have an influential role as the school site administrator. As such, I took special

measures to ensure that all participants give informed consent without any coercion or sense of obligation. If at any time they decide to terminate consent, they could do so without reprisal.

Limitations

While there are many advantages to conducting qualitative research for a school principal, there are some limitations. As the primary researcher for the PAR study, I identified areas of focus prior to engaging with site teachers as well as who I might invite to be part of the ECPLC. As a team, we planned, engaged in CLE processes, developed lessons for implementing, and engaged in cycles of inquiry. I conferred with the team throughout the planned PAR cycles and invited multiple perspectives, reflections, and ideas for refinement and change throughout the implementation of the cycles of inquiry.

Another limitation of this PAR project was the use of only upper elementary teachers from among all other elementary teachers at the school. The participant selection was purposeful and the sample size was small. These limitations provided only preliminary results that should be verified through other studies. There was no randomization to the selection of the co-practitioners, only five third, fourth and fifth grade teachers were selected and invited to be a part of the project. This was a limitation to the generalizability of the findings from this study. I planned to collaborate with a small sample of teachers and observe five teachers over a relatively short period of time, approximately fourteen months. Thus, the sample size, time, and resources limited the study.

A final limitation of the study was that the participants were all from the same school and school district in northern California. The study focused on five third, fourth and fifth grade upper elementary female teachers of color who agreed to be co-practitioners and meet the

requirements in regard to their intent to improve instructional practices for African American students. The results of the study may be useful to this group but may not be generalizable to other contexts. Larger-scale studies may be needed to investigate enacted knowledge that are needed to test and refine the model.

The school district and network superintendent who is my immediate supervisor approved the request to complete the study (see Appendix C). In addition, I completed the International Review Board Collaborative Institutional Training Initiative (IRB CITI) certification in December 2020 to comply with ethical requirements governing human research (see Appendix B). The IRB letter of approval is in Appendix A.

Validity

Validity of qualitative research ensures findings are accurate from the standpoint of the researcher and participant (Creswell, 2003). That is, are we measuring what we think we are measuring? I used data collection tools to determine the validity of the research study, including triangulating data, member checks, and peer debriefing and a prolonged time over three cycles of inquiry (Saldaña, 2016). I engaged members of the ECPLC group in completing member checks at the end of each cycle of inquiry (Creswell & Guetterman, 2018).

Internal Validity

The researcher solely used an urban school district in northern California in the study; therefore, the results might reflect the perceptions of the corresponding teachers in the district, which may not represent the entire teaching population.

The ECPLC group required protected time together throughout the study to begin and continue the work, engage in iterative cycles, and establish credibility of the study. The proposed timeline for the study is fourteen months; this time was needed to establish a relationship with

the group members, complete observations, and review data to determine findings; this timeline and multiple cycles of inquiry support credibility (Lincoln & Guba, 1985). I determined credibility through repeated cycles of classroom observations and feedback, peer observations and debriefs, member checks, and triangulation of data. Transferability and dependability of evidence and data may not occur as a result of the specific context of the study, though the PAR process may be transferable (Gerdes & Conn, 2001).

In participatory action research, reliability, and validity as standards of methodological rigor are critical. I utilized qualitative research methods as a part of the PAR study that hold the following standard of validity: "a built-in test of validity that is much more demanding and stringent than conventional alternatives: Is it comprehensible to, and does it work for, a specific group of people?" (Hale, 2001; Hale, 2008). The questions to consider was: Will the actions of the group, based on the analysis of iterative evidence, begin to change the mathematics teaching practices for the teachers? I used the community learning exchange as both a methodology and a process to ensure usefulness.

The time frame provided the opportunity to gather qualitative data for three inquiry cycles with participants. Extended time provided opportunities to have more accurate and valid findings (Creswell & Creswell, 2018).

External Validity

The value of qualitative research according to Creswell and Creswell (2018) is dependent on the particular description and themes developed in the context of a specific site. To ensure the external validity of this study, I included detailed descriptions so that anyone interested in transferability would have a solid framework for comparison (Creswell, 2018). In addition, I relied on multiple forms of evidence rather than a single data point throughout the study.

Confidentiality and Ethical Considerations

Issues of data collection and analysis can cause concern. Specifically, indicators of trustworthiness involve establishing credibility, dependability, and confirmability (Lincoln & Guba, 1985). The participants in the study are site-based practitioners who have previously expressed a commitment to improving mathematics instructional practices to support the academic and social emotional growth of upper elementary African American students. Thus, the participants were selected based on their expressed willingness to engage in self-improvement and self-reflection as well as my familiarity with their work and existing working relationships. I met with potential participants individually in a private meeting and as a cohort and ask if they would be interested in participating in the research project. My relationship with each ECPLC member is based on trust and the ability to have candid conversations about data generated from the project. Participants signed consent forms approved by East Carolina University's Institutional Review Board (ECU IRB). Participants were informed that their participation is entirely voluntary. Data security and the confidentiality of the participants is a priority for the study. Confidentiality will be maintained through the following measures (Creswell & Creswell, 2018):

1. Data files including important and personal papers were stored in a file cabinet in a locked closet in the administrator's office;
2. All electronic forms for data collection were kept in a password protected file;
3. Data and copies of reports were shared only with the ECPLC; and
4. I will destroy the data after three years.

Conclusion

In this chapter, I detailed the design and methodology used for the PAR study to answer the overarching qualitative research question guiding the study‘s design and approach: How do third, fourth, and fifth grade teachers co-design and implement lessons focused on developing conceptual understanding and academic discourse in mathematics to support stronger and equitable engagement for African American students? The ECPLC participated in PAR methodology by engaging in three inquiry cycles, participating in community learning exchange (CLE) processes, and using CLE axioms, protocols, and pedagogical approaches to improve the mathematics instructional practices of upper elementary teachers. Throughout each cycle, I collected and analyzed data to ascertain patterns and themes and, with the ECPLC, determine next steps. I described and addressed issues of confidentiality, limitations, internal and external validity, and ethical treatment of participants. In the next chapter, I provide a description of the context and Pre-Cycle and the first level of organizing of the PAR.

CHAPTER 4: PAR PRE-CYCLE

In the PAR project and study, I focus on the extent to which third, fourth, and fifth grade teachers co-generate, implement, and adapt conceptual mathematics lessons that support equitable academic discourse to meet the needs of African American students. I investigated teachers' instructional practices that support African American upper elementary students by engaging a Co-Practitioner research (CPR) group (n=5 teachers) in Community Learning Exchanges (CLEs). In this way, I provided opportunities for the diverse community of teachers to come together for engaged learning. In this chapter, I outline the process in which five Co-Practitioner CPR team members and I began the process of co-constructing and co-implementing conceptual math lessons. In the first section, I provide a description of the context, the place, and the participants of the PAR. Then, I discuss the PAR Pre-Cycle process, timeline of events and activities, the CPR group engaged in, and the collection and analysis of data. In addition, I describe the data coding process and codebook. Next, I identify a set of emergent categories. In the final section, I reflect on my leadership and plans for Par Cycle One.

PAR Context

I conducted the PAR study in a small school nestled in a residential neighborhood in East Oakland, California. The school originally built in 1923, was rebuilt three years later after a storm destroyed it in 1928. A local astronomer, Charles Burckhalter, received the honor of the school name change. The small size, school capacity is 225 students, makes the school intimate; all staff members know each and every student, and the students know all staff members and volunteers who support them at the school. The School's motto, "Work Hard, Get Smart", is grounded in the belief that everyone—students, parents, teachers, staff, and the community—is committed to ensure all students are equipped to pursue learning with passion, persistence,

purpose, and pride. The staff members are committed to creating and nurturing an inclusive school environment that reflects the diversity of Oakland including gender, race, ethnicity, religion, physical abilities, learning styles, family structure, and socioeconomics. Diversity is a core part of the school's strength.

School Changes

The school has undergone many changes that caused disruptions in the school's academic progress. Since 2006, after the closing of two elementary schools, the school was reconstituted to include new students. Prior to 2008, the school had been under threat of closure for several reasons including low enrollment and, most recently, low achievement scores in reading and mathematics for African American students, the significant subgroup at the school. As a result, between 2006 and 2008, Burckhalter had three principal changes. Demographic shifts in the school population included an increase in English Learners (9.5%), who speak Spanish and Arabic, 3.2% Asian and 2.3% White. African American students make up the majority of enrolled students, 66% of the student population. Special Education (Autism) students make up another 15.3% of the student population. The National Lunch Program rate is 84.2%. I became principal in 2009, and since then, students have made gains in the core curricular areas, including reading/language arts, mathematics, and science. The California Department of Education awarded the Title I Achievement Award in 2011 and 2012 to the school; this is an award that honors Title I schools that have demonstrated success in significantly closing the achievement gap between high and low-performing students. In the next section, the PAR participants are introduced.

Teaching and Administrative Staff

The school has a total of eleven teachers, eight regular education teachers and three special education teachers. More than half of the teachers began working at the school as a result of a school closure in 2013. Of the eleven teachers, all but one is female; five are African American, one is Senegalese, one is Asian, one Latina, and the remaining three are White. The administrative team consists of three female members; one principal, one attendance clerk, and one administrative assistant, one Latina and two African American. The school has been under threat of closure for several reasons including low enrollment and, most recently, despite overall gains for a Title I school, low achievement scores in reading and mathematics for African American students, the significant subgroup at the school. I invited and selected five upper elementary teachers to participate in the project and study so that we could address this issue. I based the selection of teachers on the grade level taught: two third grade, one fourth grade, and two fifth grade teachers.

The CPR team is a mix of non-tenured and tenured teachers. Their teaching experience ranges from one to twenty-one years. More than half of the teachers have taught upper elementary grades for over a decade (see Table 5). None of the teachers had received specialized training in implementing effective and research-based instructional strategies in mathematics from district coaches. Four of the five teachers attended the Standards Summer Institute hosted by UnBoundEd in 2019. This institute helped school leaders design professional learning for teachers that values the cultural and academic identities of Black and Brown students, by supporting teachers create instructional strategies and protocols so that all students have access to high quality instruction. Each teacher participant is a regular education classroom teacher who is interested in improving teaching practices in mathematics. All of the teachers are interested in

Table 5

Description of Primary Participants

Teacher Gender	Grade Level	Ethnicity	Years at the School	Grades Taught	Teaching Experience	Professional Teaching Credentials
Teacher A Female	3rd	African American	8	(2nd , 2nd -3rd and 3rd grades)	21	Tenured, Multiple Subjects Credential
Teacher B Female	3rd	African American	8	(2nd , 2nd -3rd and 3rd grades)	18	Tenured, Multiple Subject Credential
Teacher C Female	4th	African American	8	(Preschool, 4th , 4th -5th 5th and 6th grades)	15	Tenured, Multiple Subjects Credential
Teacher D Female	5th	Sengalese (African)	5	(4th, 4th -5th and 5th grades)	21	Multiple Subjects Credential
Teacher E Female	5th	Latina	1.5	(2nd)	5	Probationary, Multiple Subject Credential

investigating their instructional practices in mathematics to improve outcomes for the students they serve.

Teacher A is a 60-year-old African American woman. She has 21 years teaching experience and prides herself on her ability to advocate for African American students. Teacher A describes her early experience as enjoyable, "I was good at math" from the first to third grades learning arithmetic facts. Teacher A struggled in later grades when asked to apply mathematics to "real world" situations. As a third grade math teacher, Teacher A would like to ensure her students do not have "gaps" in their learning as she experienced.

Teacher B is a 57-year-old African American woman. She has 18 years teaching experience after enjoying a former career as a legal secretary. Teacher B does not remember learning mathematics as a young student. She describes herself as a studious student who listened and applied what she learned in class. Teacher A states she learned to organize mathematics problems using a "step by step" process while in college obtaining her teaching credential to figure out where she made mistakes when problem solving. Teacher B encouraged her third grade students to work sequentially to pinpoint areas of needed help.

Teacher C is a 67-year-old African American woman. She has over 15 years teaching experience as an upper elementary teacher. Teacher C began her career as an early childhood teacher with a thriving daycare prior to becoming a teacher. Teacher C remembered learning mathematics when playing childhood games, learning to count by jumping rope, playing jacks, and playing cards. She stated the games built a foundation of fundamental mathematics. She looked forward to reciting math facts in upper elementary math class. Teacher C states her love of math continued through college, though she remembers being unengaged by the lecture style of professors. Teacher C's goal is to provide students with multiple access points and create

hands-on learning experiences through games that allow students to “construct knowledge through discussion” with each other.

Teacher D is a 48-year-old Senegalese woman who migrated to the United States as a college student. She taught in Senegal and in the United States and has more than 21 years teaching experience in both elementary and middle school. Teacher D learned math through indigenous songs and games taught at home from parents and elders. She remembers learning mathematics with manipulatives, rods, counters, and tiles, to learn to count mathematically, and as a result described math as fun and exciting. In high school, the hands-on activities and manipulatives disappeared and her enthusiasm waned. The expectation shifted to the use of memorization of facts and formulas rather than critical thinking skills. Teacher D states students need to have their hands-on. “They need to feel it, they need to touch it and they need to use critical thinking to solve the problems and that there are many different ways to solve math problems.” Teacher D wants students to be excited when learning math as they develop the willingness and desire to “do" rigorous mathematics.

Teacher E. Teacher E is a 26-year-old Latina woman who is beginning her teaching career. Teacher E loved mathematics as a student and gave her father credit for igniting her love of math early in her life. She described her pursuit of an advanced degree in mathematics as evidence of that. She recently completed an M.A. degree in Statistics. Not until graduate school did Teacher E begin to struggle with mathematics; she said, “I was so focused on the procedures in math, I was unable to make deeper connections and understand the concepts that I was learning in the quantitative analysis math class I was taking.” As a result, Teacher E failed the class. This experience influenced her current philosophy and instructional practices as a teacher. “I want my students to think outside the box” when it comes to mathematics.

Summary

The context included a description of the school, teaching and administrative staff and detailed descriptions of each of the five upper elementary teachers who comprised the CPR group members. In this overview of the context for PAR project, the participating teachers have the values they need to address rigorous mathematics and the interest and experience to do so. However, I was concerned that all of their values were not necessarily apparent in observations. Because the math yearly tests require conceptual math, we needed to shift some of our practices. Next, I describe the PAR Pre-Cycle Process, the timeline and description of activities, coding process and codebook development, and emergent categories.

PAR Pre-Cycle Process

In the research design process, I focused on improving upper grade math instruction. Math data supported this focus as student outcomes and assessment results show more than 80% of third, fourth, and fifth grade students failed to demonstrate proficiency on standardized tests. As the principal, my direct role with students was limited because only the teachers were involved in direct classroom instruction; thus, in this project and study, I worked with a small group of teachers, met regularly with them to discuss practices, observed their teaching practices, and facilitated individual coaching conversations. I relied on the advice of a comprehensive study on coaching completed in 2004 by the Annenberg Foundation for Education Reform in which several findings acknowledged the importance of effective embedded professional development to promote positive cultural change; the Grissom et al. (2021) Wallace report on the role of the principal concurs with the importance of embedded professional learning that relies on what the school leader observes in classrooms. Thus, I concentrated on coaching

combined with teachers' use of data informed practice and promoted the implementation of learning and reciprocal accountability among teachers that values improvement.

During the PAR project, I engaged the teachers and co-constructed a growth and development model for improving math instruction. Since my primary responsibility as an instructional leader is to support teachers to implement effective pedagogy in their classes, I wanted to examine effective professional development models from a point of deep knowledge and modeled effective teacher observation, conversations, and coaching. I sought to create a school culture that values ways of observing classes and providing support to teachers, and I wanted to work with the Co-Practitioner Researchers to organize it. This was the goal at the start of the project; as we progressed in the PAR Pre-Cycle, this plan influenced teacher practice. In this section, I review the schedule and processes, discuss the development of the codebook, and present the preliminary Pre-Cycle data.

PAR Process

The PAR Pre-Cycle process began in January 2022 after the Internal Revenue Board (IRB) approved the PAR project and study. I invited the third, fourth, and fifth grade teachers, asking for voluntary participation in the research study. Five teachers consented to participate in the PAR. Once participants agreed, I designed the meeting agenda (Appendix M) and invited the Co-Practitioner Researcher (CPR) group to our first meeting on January 19, 2022. During the initial CPR meeting, all group members signed the consent forms (see Table 6).

The initial agenda included a welcome activity, dynamic mindfulness, an overview of the focus of practice, the mathematics journey line activity, and a whole group discussion. Teachers participated in dynamic mindfulness to engage in deep, mindful breathing and centering in order to participate with full attention during the meeting. Next, I asked teachers to share their math

Table 6

PAR Pre-Cycle Activities

Activity	Week 1 1/17-1-21	Week 2 1/24-1-28	Week 3 2/7-2/11	Week 4 2/14-2/18	Week 5 2/21-2/25	Week 6 3/7-3/11	Week 7 3/21-3/25	Week 8 3/28-4/1	Week 9 4/11-4/15
CPR Meetings	X				X				X
PLC Meetings		X		X					
CLE						X			
Reflective Memo			X			X			X

experiences with other CPR members by drafting a math journey line, a protocol used to capture all the positive and negative mathematics events in their lives as students and teachers. All members shared their journey lines and listened to other members as they shared their journey lines.

The CPR meetings provided opportunities to meet with teachers, for members to share personal experiences, for me to better understand teachers, and for them to get to know me; thus, I was hopeful that these experiences provided a way to nurture and deepen relational trust. Bryk and Schneider (2003), in an intensive case study research and longitudinal statistical analyses from more than 400 Chicago elementary schools, highlighted social trust among teachers and schools as a key element of reform. In addition, they found that improving schools demonstrating high degrees of relational trust between teachers, principals, support staff, parent, and students led to a 20% increase in mathematics achievement over a five-year period.

During the meeting, CPR members learned more about the first cycle of the project. Key activities of PAR Pre-Cycle consisted of CPR team monthly meetings; a Community Learning Exchange (CLE) that included an opening circle and CLE meeting protocols; discussion after reading the introduction and chapter one of Culturally Responsive Teaching & The Brain (Hammond, 2015) as an anchor text, defining CLRP and the selection of CRLP teaching strategies; implementing and discussing CLRP strategies; selecting observation protocols; and reflecting on actions to plan next steps.

After the initial meeting in January, we began a book study reading *Culturally Responsive Teaching & The Brain* (Hammond, 2015) and introduced and defined culturally responsive teaching. After reading the introduction, the CPR group members selected this book as the anchor text for our ongoing work. Using the study guide in the book, the CPR group read

and discussed the introduction and chapter one and used the next two ECPLC meetings as opportunities to use share reflections and discuss these questions:

- When you hear the term culturally responsive teaching, what does that mean to you?
- How would you describe its purpose, elements, and features?

During the January and February meetings, CPR members reflected on the questions, wrote responses, talked to a partner, and shared their reflective responses with the whole group. Responses included:

- Students' backgrounds are important in their educational process.
- We need to relate to students and value what they already know; they are not empty vessels.
- Knowing that not all students need the same thing.
- Teachers need to use culturally responsive strategies in math classrooms to ensure students can learn math.

From January to April, the CPR group met three times and participated in a CLE. In the February CLE, I connected all teachers and provided a platform for them to share their knowledge with each other so they can learn from one another and make some changes in their teaching practices. Teachers shared their experiences and perceptions about math discourse and conceptual mathematics. During the coding cycles, I captured experiences through written reflective memos. After the CLE, CPR members reviewed research-based engagement strategies and protocols, question types and instructional strategies and began planning next steps. See Table 6 for the dates and activities that took place during the PAR Pre-Cycle. Next, I describe the coding process that I engaged in during the PAR Pre-Cycle to find emerging categories from the Pre-Cycle activities, agenda notes, journey lines, biographies, reflective memoranda, CPR

group meetings, and CLE artifacts. The codes provided me with insight into the status of the research. In the final half of Chapter 4, I reflect on what I learned from coding data and inductively deciding on categories using the codes.

Coding and Creating the Code Book

In January 2022, I began the qualitative coding process by collecting data from the activities the CPR members engaged in during the PAR Pre-Cycle. I analyzed the mathematics journey lines (personal narratives), biographies, and the data from the CLE and agendas from CPR meetings. Saldaña (2016) outlines different methods for coding. During the PAR Pre-Cycle, I used in-vivo coding, which emphasizes the actual spoken words of participants. During the initial round of coding, I highlighted the text (words and phrases) that seemed significant to the research and initially found it difficult to determine what to code. I repeated the coding process.

By the third and fourth coding cycles, I felt more comfortable with the data I selected to code. After several more iterations, I created the codebook. The attempts to code and develop a codebook were linked to Auerbach and Silverstein's (2003) advice that we should keep the research questions in mind when making coding decisions. Table 7 represents a sample of the initial codebook and early emergent categories aligned to the source of the data. After coding the qualitative data, I tallied teacher responses and began to group codes into categories.

Emergent Categories

Based on initial coding during the PAR Pre-Cycle, grouped into patterns, I determined two emerging categories: (1) Teachers lived experiences as students shaped their current beliefs; and (2) effective instructional strategies support student success. I generated these emerging categories based on data collected from the PAR Pre Cycle, knowing the emerging categories may shift as we analyze the evidence during PAR Cycle One. After determining the emerging

Table 7

Emergent Categories and Codes from PAR Pre-Cycle

Emergent Category	Codes	Frequency
Teachers Lived Experiences as Students (22 instances/24.7 %)	Early fondness of mathematics	12
	Middle school, high school and college mathematics was a difficult	10
Positive Practices (22 instances/24.7%)	Math teachers engaged them in math discussions	8
	Learned different problem solving strategies (e.g.. draw a picture, make a chart, look for a pattern)	7
	Posing open-ended questions	4
	Love learning math songs and games	3
Non-Supportive Practices (29 instances/32.5 %)	Lecture	11
	Teaching algorithms	11
	Rote Memorization of math facts	7
Teacher Perceptions about Effective Math Instructional Practices (16 instances/17.9 %)	Developing conceptual understanding	6
	Use manipulatives	5
	Teach many problem solving strategies	5
	TOTAL	89

categories, I met with the CPR team for input. Figure 7 is a visual diagram of the categories and supporting codes. Next, I provide evidence to support and expand upon the emergent categories.

1. Teachers shared their lived experiences as students that helped shape current their feelings and beliefs regarding mathematics. The evidence from PAR Pre-Cycle suggests teachers' early experiences as students included people and events that either supported or discouraged their learning mathematics and shaped their math identities.
2. Teachers described effective instructional strategies that helped them learn mathematics as students. The evidence from PAR Pre-Cycle suggested that teachers could identify instructional strategies in mathematics that helped them learn mathematics.

During the PAR Pre-Cycle, CPR members responded to questions regarding their early math experiences as students. Teachers shared both positive teaching practices and non-supportive practices that helped shaped their current beliefs as math teachers. As we progressed through the PAR Pre-Cycle one additional categories emerged. Figure 7 is a visual diagram of the categories and supporting codes. Next, I discuss the categories and provide evidence that demonstrated which data are outcomes of the category.

Parent and Teacher Encouragement

CPR members created and shared mathematics journey lines during one of the first meetings, which provided the opportunity for the CPR members to share how they experienced math as students. All five members discussed, at length, their personal stories of the love of learning mathematics and key times when they struggled to learn mathematics. They shared the people, especially teachers, who helped them understand mathematics. One CPR member recounted an early math experience she shared with her father. “At a really young age I became

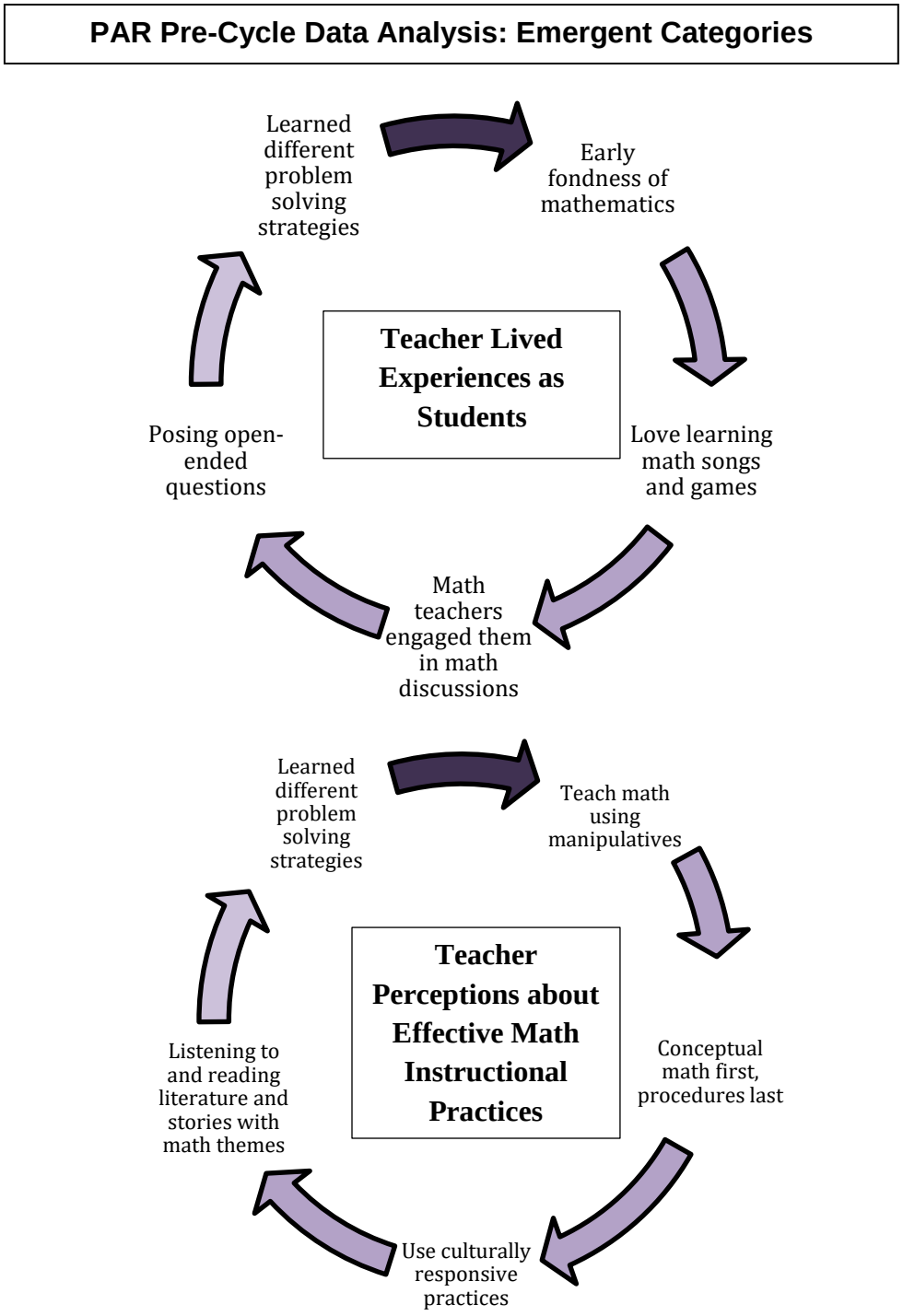


Figure 7. Teachers lived experiences as students and perceptions about effective math instruction.

very fond of mathematics and I owe that a lot to my dad. Every single night my dad and I would practice math facts. After dinner he would have me do 10 to 20 problems on a sheet of paper and from then my love for math just continued to flourish" (Mariana, CLE meeting, January 19, 2022).

Positive Teaching Practices

CPR members recalled key practices of math teachers that were positive math experiences for them: teaching math games, engaging them in math discussions by asking questions and, posing open-ended problems that made them justify their thinking and problem solving strategies. "I remember my fifth grade math teacher giving us math problems and telling us to use problem solving strategies that included drawing a picture, finding a pattern, or making a list. We could NOT use the standard algorithm" (Capuano, CLE meeting, January 26, 2022). Another teacher remembered listening to and reading literature and stories with math themes that connected to what they learned (Williams, CPR meeting, January 26, 2022).

Each CPR member reflected on the importance of incorporating those things that made them love mathematics, specifically the use of manipulatives, learning games and songs, math talks and discussions, asking questions that make students think, teachers posing open-ended questions and, learning different problem solving strategies (eg. draw a picture, make a chart, look for a pattern). Every member shared common goals for students: (a) leaving their classrooms understanding mathematics conceptually; (b) being proficient in grade level mathematics and problem solving strategies, and (c) developing positive math identities and "see" themselves as mathematicians. This aligns with research (Boaler, 2022b, 2022c; Varelas et al., 2012; Wilson et al., 2019) that Black children possess the intellectual capacity to learn mathematics as well as any other group of students; if teachers communicate to students that they

are smart, they can help build positive mathematics identities in early adolescence that last into adulthood. This category came to the forefront later in the data collection process.

Non-Supportive Practices

CPR members shared turning points in their math lives and when they began to struggle. Members cited teachers who did not check for understanding during class, being unengaged in high school and college by the lecture style of professors, and teachers focusing on teaching procedural algorithms and using drill and kill worksheets rather than building conceptual understanding. “Math was not so fun anymore. Teachers lectured and we did not have the opportunity to use manipulatives. Our teachers believed that we did not need hands-on manipulatives anymore. I began to hate math” (Seck, CLE meeting, January 9, 2022). Another teacher reflected that it was not until she took a quantitative math class in graduate school that required her to apply math to real world situations that she began to question her math ability. “I was so focused on the procedure of solving a math problem that I didn't really take the time to dig deeper into the connections and the concepts that I was learning in math” (Mariana, CLE meeting, January 2022). “When teachers reexamine how they were taught math and their perceptions of their ability, student test scores and attitudes about math dramatically improve” (Crawford, 2018).

Recommendations from The National Council of Teachers of Mathematics NCTM (2020) state that when teachers employ questioning strategies that allow students to actively participate in problem-solving processes, students are more highly engaged and they begin to develop a deeper understanding of the concepts as they work to justify the mathematical steps. Too many times, this active engagement was not present in the lived mathematical experiences of the teachers.

Teacher Perceptions about Effective Math Instructional Practices

During the PAR Pre-Cycle I facilitated a community learning exchange, conducted a gallery walk, and posed questions aligned to effective math teaching practices. Based on the data collected and analyzed from the CLE, I highlight a second emergent category: teachers have perceptions about effective math instructional practices. CPR members reflected on practices and identified what they believed teachers could do to ensure student success in mathematics. The identified math practices included: using math manipulatives, focusing on conceptual math not an over-emphasis on procedures and algorithms, incorporating culturally responsive practices, teaching routines and expectations, using of higher level questions that encourage multiple problem solving strategies, and creating and modeling equitable engagement strategies. One participant said, "If teachers provided students with math manipulatives when problem solving, then they would do better" (Lillie S., CLE meeting, March 9, 2022). Another CPR member added, "I think the most important thing is to teach math concepts, not just the step-by-step algorithms. That way students will understand major math concepts, not just memorize math facts" (Lillie M., CLE meeting, March 9, 2022). She stated at another meeting, "Procedural fluency is important but that there needs to be balance" (CLE meeting, March 9, 2022). These data connected to the shared reflections from the teachers' early math experiences.

In *Principles to Actions* (2014), the NCTM identified eight mathematical teaching practices that should be present in every math lesson to support student success. These include establishing mathematics goals to focus learning, implementing tasks that promote reasoning and problem solving, use and connect mathematical representations, facilitating meaningful mathematical discourse, posing purposeful questions, building procedural fluency from conceptual understanding, supporting productive struggle in learning mathematics, and eliciting

and using evidence of student thinking. These data showed a common understanding shared among the teachers regarding instructional strategies, teacher moves, and teaching tools that support teaching math. Teachers' responses aligned to the NCTM principles. These understandings meshed with what teacher attributes support students to engage in conceptual mathematics. Principals and teachers need a common understanding of good teaching practices. According to NCTM (2014) *Principles to Action*, student achievement improves when educators who hold themselves and their colleagues accountable for the mathematical success of every student and for their personal and collective professional growth toward effective teaching and learning of mathematics.

In sum, the evidence I analyzed informed the emergent categories indicated that CPR members' beliefs and perceptions about mathematics shaped their early experiences as students. Teachers discussed teacher moves that supported them while learning math. CPR members identified effective instructional strategies that supported student success. During the CLE, teachers' reflections regarding students developing conceptual math understanding demonstrated a focus for further professional development. As the lead researcher, I concluded that a goal for PAR Cycle One was to provide CPR members with professional learning opportunities to collaborate and build their collective capacities to engage students in conceptual understanding per their collective understanding its importance in their early learning. However, despite their knowledge of effective practices, at times, I was still concerned about teachers' beliefs specifically related to African American students, how African American students learn, and effective teaching practices for African American students in order to teach mathematics through an equitable lens (Jackson, 2013). I conclude the chapter with a description of the findings and

reflections for the next cycle; I detail what we would continue to do and what activities and data collection we planned for PAR Cycle One.

Reflection and Planning for PAR Cycle One

During the PAR Pre-Cycle the participants formed a CPR group. The CPR meetings created opportunities for members to strengthen personal relationships between and among the co-practitioners. We met once a month, shared personal narratives, read literature on culturally responsive classroom and school practices, discussed participation protocols aimed at increasing academic discourse during mathematics, and reflected on our practices. As I collected and analyzed data generated during the PAR Pre-Cycle and used the data with teachers to guide and measure the progress toward the FoP and the overarching research questions. As the lead researcher, I analyzed the data and looked for important patterns to form emergent categories.

Reflections on Leadership

My goal as a practitioner researcher included improving the quality of classroom instruction by supporting teachers. The vision of this PAR project and study was to provide the necessary supports to members of the CPR group to examine their current instructional practices, skills, and competencies and use the knowledge gained to build their capacity to become practitioners and researchers in their classrooms to better serve students, particularly African American students. I continued to meet with the CPR team members weekly in professional learning community meetings. Because equitable access is the first step for student learning in the classroom (Boykin & Noguera, 2011), I created a calendar for classroom observations for PAR Pre-Cycle One to conduct observations during mathematics. I intended to focus data collection and analysis on classroom observations and the implementation of the Question Types

protocol, engage in post observation conversations about practice with CPR members, and conduct member checks to ensure accuracy.

The PAR Pre-Cycle provided the opportunity to engage deeply as a school leader. As a principal, I wanted to work with teachers who expressed a desire to get better at improving their practice. The PAR Pre-Cycle provided the opportunity for me to deepen my relationship with the CPR members by creating opportunities for the CPR members to share, reflect and engage with each other. I practiced data collection and analyses, coding and looking for patterns to identify emergent categories. Teachers' responses to questions in CPR meetings and during the CLE helped to surface early math experiences and beliefs that I believe impact current teacher practices. During the PAR Pre-Cycle I hoped to deepen my understanding of influences on teacher practice and use this information to create a coaching model to best support them in their classrooms. I am especially interested in deepening the CPR team's understanding of culturally responsive teaching practices, as the majority of the students served at the school are African American.

I reflected on how to balance being an active participant in the work and my role as the site leader and evaluator. I needed to keep the research questions at the forefront as we launched PAR Cycle One and a newly adopted mathematics curriculum. One question included how best to integrate district led math professional development with onsite professional development. Another question centered on how keep the work of the CPR group focused on the FoP and the research questions throughout the school year.

Planning for PAR Cycle One

I intended to begin PAR Cycle One by sharing the data from the PAR Pre-Cycle with the CPR group to engage them in understanding the data and using the data to inform the work of

PAR Cycle One. I planned to continue the activities we started in the PAR Pre-Cycle: weekly CPR meetings on Wednesdays to collaborate in a PLC, monthly CPR meetings for professional development to help teachers to become better at math instruction and, a facilitated community learning exchange to provide opportunities for CPR members to openly examine their practice, exchange best practices and, learn how to use the collective leadership framework to engage with each other. I planned to read and discuss *Principles Into Actions* as a supplement to district professional development. We planned to implement the first cycle of instructional practices related to teaching conceptual mathematics in the upper grades. As stated in Chapter 3, I planned to facilitate the group members' praxis-reflection in the CPR meetings. I am relatively inexperienced in leading this cycle and in my role as a praxis facilitator. Becoming better at both will be part of my leadership journey in effectively leading professional development. I am hoping to gain skills that will help me become a better facilitator.

In conclusion, I have outlined the PAR Pre-Cycle process in which the CPR team members and I engaged in. During the PAR Pre-Cycle, we formed the CPR team and met monthly, and I facilitated a Community Learning Exchange. I collected data and then analyzed and coded evidence that identified a set of emergent categories. I concluded the chapter with a discussion of leadership reflections and calendared planned activities for PAR Cycle One.

CHAPTER 5: PAR CYCLE ONE

According to the California Department of Education's 2021-2022 DataQuest report, Burckhalter Elementary School is one of only three elementary schools in Oakland, California with a majority African American student population. Students who identify as African American are the majority (52.7%) of Burckhalter Elementary School student population and are present in every classroom. Focusing on the mathematical needs of African American students includes adapting teaching practices and implementing instructional strategies to better serve them. Based on PAR Pre-Cycle data analysis, teachers' lived experiences informed their current instructional practices and their desires for different experiences for the students they teach. To serve African American students, schools must engage teachers in professional learning that explicitly identifies effective techniques to engage those students. However, teachers do not always put their beliefs or knowledge into practice, and identifying the barriers to teacher practice in service of student learning is part of what I address in this cycle of inquiry. Teachers need to model risk-taking to change their practices if they want their students to take risks to learn.

As detailed in the previous chapters, I focused the PAR on the extent to which third, fourth, and fifth grade teachers co-generate, implement, and adapt conceptual mathematics lessons that inform practices and support equitable academic discourse to meet the needs of African American students at Burckhalter Elementary School in Oakland, California. The purpose of the PAR was to develop a professional development model with a team of teachers to improve their mathematics teaching practices and enhance student engagement in classrooms. In PAR Cycle One, the CPR team and I focused on

classroom observation, post observation conversations, CPR group reflections, and member checks to assess teacher effectiveness in classrooms.

In PAR Cycle One, I focused on the processes and activities in which CPR members generated ideas and decisions about how best to serve third, fourth, and fifth grade students in mathematics. The overarching question was: How do third, fourth, and fifth grade teachers co-design lessons focused on developing conceptual understanding and academic discourse in mathematics to support equitable engagement for African American students? In the PAR Pre-Cycle, I worked with the CPR team to understand how their math experiences as students shaped their beliefs and fostered or inhibited their ability to implement academic discourse structures for African American students. During PAR Cycle One, CPR meetings, and a schoolwide CLE, I engaged members in activities to collect data on our professional development and provide a coaching model of effective mathematics instructional practices. As a result, I determined emerging themes and reflected on my leadership practices and the implications of moving into PAR Cycle Two. Through this focused project and study, we have maintained a relentless focus on ensuring that students in the third, fourth, and fifth grades are in classrooms that promote their knowledge, skills, and dispositions as math students. We focused on developing each student's ability to persevere; in so doing we hope to help students become better at mathematics and solving problems in classrooms, traits that support success in life beyond the classroom.

First, I identify key actions in which we engaged with a brief description of the activities. Then, I present emerging themes supported by evidence from multiple sources. In the third section, I analyze the implications of the PAR project by revisiting the focus of practice and my leadership. By connecting the implications to the research questions and to the literature review, I situate the current project in a larger context. I conclude the chapter with a description of how

the data and reflections are generating revisions for the next cycle; I detail what we continued to do, what we changed, and what activities and data collection we implemented for PAR Cycle Two.

PAR Cycle One Process

I describe key activities related to the PAR and the work with the CPR members. I collected evidence from CPR meetings, a facilitated CLE meeting, reflective memos and notes from the four third, fourth, and fifth grade teachers in the Co-Practitioner research group. In addition, I describe my daily presence in the classrooms and school in which I engaged teachers in informal conversations about practice and supporting individual students. As a school team, we are firmly committed to the social and academic success of students. Finally, I discuss how I collected evidence and engaged in analysis.

Key Activities

In PAR Cycle One, I collected data during unscheduled and scheduled classroom observations and facilitated CPR meetings focused on engagement protocols with teachers; we had post-observation conversations to discuss the evidence I collected. In addition, I facilitated a culminating CLE to share what we were learning with the entire school staff. Finally, I conducted member checks with the CPR team to share the data analysis (see Table 8).

Co-Practitioner Researcher Meetings

During PAR Cycle One, the CPR group met four times. Every CPR (EC-PLIC) meeting agenda included dynamic mindfulness and a closing reflection. I facilitated the team in dynamic mindfulness to build social trust and foster social exchanges among teachers to talk honestly, as they learned from one another (Bryk & Schneider, 2002). The team members discussed their understanding of equity at the classroom and school levels, the difference in solving math

Table 8

PAR Cycle One Activities

Date	Activities	Learning Activities	Data Collection
August-December 2022	CPR Meetings	● Dynamic Mindfulness ● Gracious Space ● Personal Narrative ● Journey Lines ● Jam board ● Anchor Charts ● Jigsaw ● Gallery Walk	● Agenda ● CPR Artifacts ● Notes ● Artifacts ● Reflective Memos ● Anchor charts
September-December 2022	Unscheduled and Scheduled Observations	● Question Form and Level Tools ● Calling-On Tool ● Effective Practices supporting African American students	● Notes related to observations ● Analysis of data from tools.
September-December 2022	Post-Observation Conversations	Effective Conversation Guide Processes	● Notes from conversations ● Notes from reflections
December 2022	CLE	● Dynamic Mindfulness ● Gracious Space ● Video showing discourse practices ● Revisit the gallery walk questions ● Whole group discussion ● Define effective math practices	● Agenda ● CLE Artifacts ● Notes Reflective Memos

problems aloud and engaging in meaningful discourse, the use of questions and problems that Emerged, and made decisions about next steps. One participant identifies as Senegalese, one as Mexican American, and three as African American. I captured how their experiences as students of color may have influenced their current teaching practices. CPR members used anchor charts to reflect how they were taught math and their experiences as students of color. During the reflection, one teacher discussed how she loved math as a young girl and began to struggle in math when she reached eleventh grade in high school because, until then, math was memorization and procedural which she found easy (see Figure 8). She remembered math teachers' lectures about following procedural math and using specific formulas to arrive at the correct answers. When she began studying pre-calculus, she realized math was more than procedures and algorithms. "In pre-calculus, we were lectured to by our teachers and could not use manipulatives. The emphasis was on rote memorization of formulas" (Teacher F, CPR meeting notes, October 19, 2022). Classes were mostly teacher-led, with few opportunities for group work or academic discussions (Teacher C, CPR meeting notes, March 10, 2022). This exchange prompted other CPR members to reflect, share, and realize how their educational experiences heavily influenced their current classroom practices. "Today, as a teacher, I realize and I understand that there were gaps in my learning and because of that, I didn't want my children to experience the same thing" (Teacher L, CLE artifact, October 19, 2022). After each meeting, CPR members reflected on individual google docs, which helped to guide the focus for our next meeting. We determined that CPR members needed to develop a working definition for equitable academic discourse in mathematics. To support our definition, I shared a weekly newsletter with strategies and math discourse opportunities.

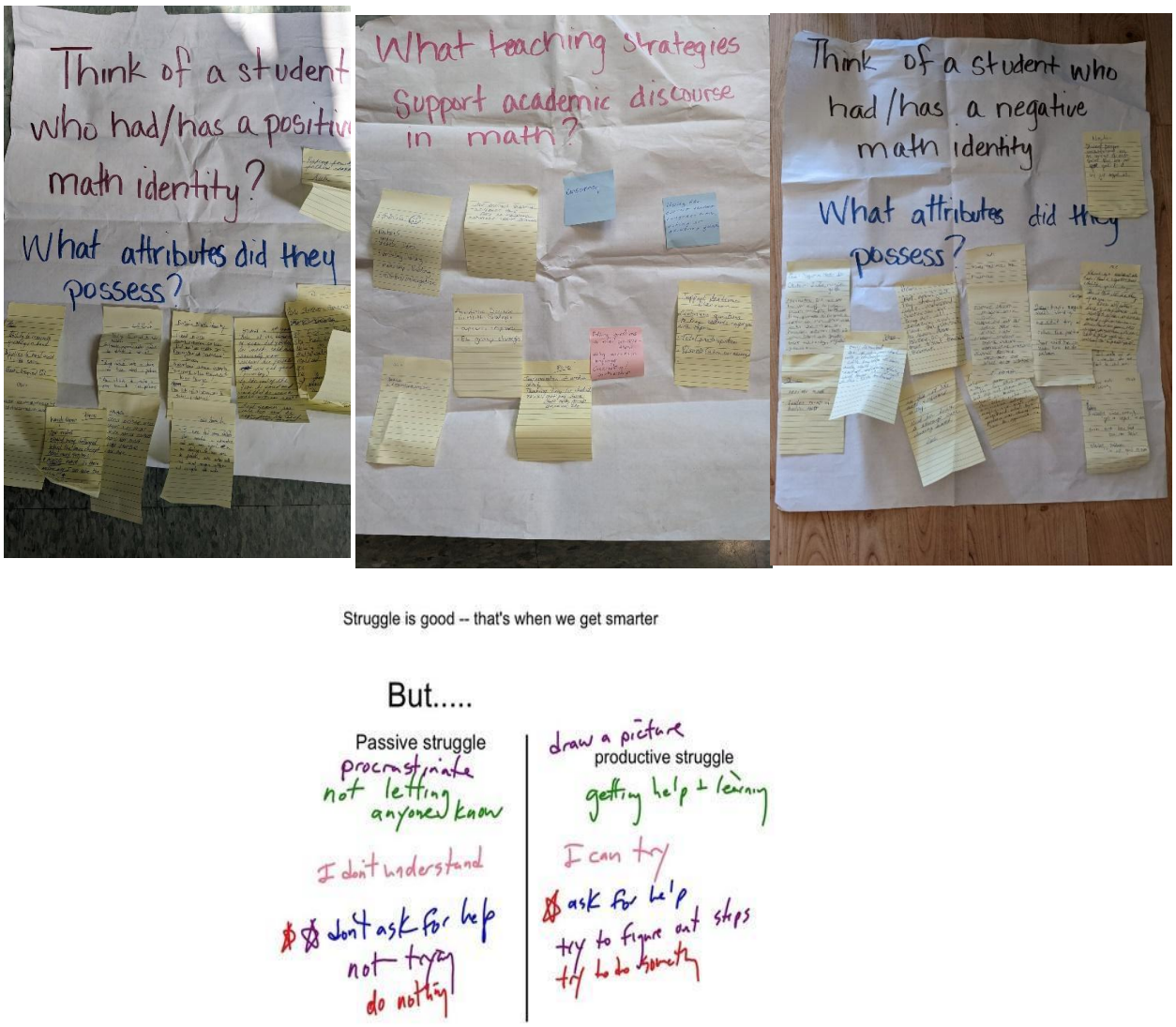


Figure 8. CPR Meeting anchor charts reflect beliefs of CPR members in mathematics.

meaningful mathematical discourse, and the role of the teacher in all of these areas. As a result, the group reached a consensus on the definition of equitable academic discourse in mathematics:

Providing multiple opportunities for students to discuss mathematics by providing tasks that encourage multiple access points, asking questions that encourage students to show what they understand using different representations, and using tools to explain and develop math academic language developing African American students' positive math identity (Berry et al., 2014). With this common understanding and working definition, I introduced two protocols: the Question Form and the Calling On tool for conducting observations.

During the second CPR meeting, we reviewed the protocols. Teachers remembered the tools from the PAR Pre-Cycle and connected readings, instructional strategies, and data collection tools. I reiterated that I would share observations, conversations, and next steps with them as individuals and as a CPR group through the PDSA framework to inform teaching practices and my role as an instructional leader. During professional learning community meetings with CPR members, we discussed how noticings and wonderings reflected on the observation tools.

Classroom Observations

The first week of PAR Cycle One, I conducted one unscheduled classroom observation to assess the current status of math instruction. After analyzing and sharing the data with the CPR group, I scheduled observations using the question form and the calling on tool. During the next three weeks, I conducted scheduled observations each lasting 30-45 minutes. Using selective verbatim, I coded the evidence. Coding the data immediately after each observation supported the CPR team in determining the extent to which the data presented evidence of implemented practices. I conducted post observation conversations either the same day or the next day.

In early October 2022, I conducted two classroom co-observations with my dissertation advisor for the purpose of calibration and learning how to code. Then, I met with both teachers to have conversations about observation data, conduct member checks to ensure the observation notes were accurate, and discuss next steps. As a result of the observations and post-observation conversations, we clarified teachers' current understanding and implementation of academic discourse and student engagement strategies that support mathematical conceptual learning for African American learners. I found that the CPR members' had dissimilar responses to similar student situations and that their understanding of effective engagement strategies needed further clarification; teachers' reflections focused on student discourse patterns and the level of student engagement during whole-group instruction rather than one-on-one exchanges. Initially, teachers did not know how to shift the typical practices to coach students to trust the process. However, at a CPR meeting—after using the questioning tool—one teacher stated, "Although I am using the questioning protocol and calling on specific students to explain their problem-solving process, students are still looking to me for the 'right' answer. They don't trust their peers, even when they're right" (Teacher S, Observation, November 9, 2022). In response, another teacher shared, "After I began asking students to talk to their partners, academic discourse increased; even quiet students began to talk to their table partners" (Teacher L, Observation, November 9, 2022). Thus, we needed to clarify that as teachers change, students need adjustment time. If students have experienced a classroom discourse pattern of teacher-to-student with a focus on right answers, they will need time to adjust to discussions of multiple solutions and talking to each other about those solutions (Hufferd-Eckles et al., 2004). The shift in teacher practice to trust the process is not a straight line of improvement and, as a coaching principal, I must assess the

teacher's level of readiness to make important shifts and problem-solve with them about strategies to make the shifts.

Evidence-Based Observations and Conversations

Evidence-based observations and conversations (O-C) provided a backbone for the PAR process. Teachers used the O-C process, examining data and having post-observation conversations, to identify a specific practice for improvement. Then, I provided support through an evidence-based observation and conversations, including both a post observation one-to-one and the multiple informal conversations I had with individual teachers.

In addition, using evidence-based observation data, CPR members had one-to-one conversations with me and with each other about how and why they make their instructional decisions. The observations provided a shared platform for CPR members to have conversations about practices. During these conversations, we identified what we could jointly work on, which aligned with the recommendations that Grissom et al. (2021) provide; specifically, that leaders engage in instructionally focused interactions with teachers, build a productive school climate of teamwork and engagement with data, and facilitate productive collaboration in professional learning communities.

Throughout the cycle, participants chose when each observation would occur. The iterative observations and conversations helped to ensure that the observations focused on growth in equitable academic discourse and that group dialogue was essential in their change efforts. One participant said, "I sometimes do not like to hear feedback from classroom walkthroughs because it feels critical; however, since we all are receiving feedback, I feel better about it" (Teacher A, CPR meeting notes, December 7, 2022). Another participant said, "I feel like when I say things, the team listens and offers suggestions that I can implement immediately

in my class" (Teacher M, CPR meeting notes, December 7, 2022). Aguilar (2018) identifies indicators to help leaders create conditions for effective teams to thrive. Effective teams share their experiences and expertise to enhance team productivity and development; understand and agree on the team's purpose and goals; and build trust by keeping commitments, asking for feedback, and regularly reflecting.

As a leader, I focused on collecting evidence from the precise actions of teachers during classroom observations. Throughout PAR Cycle One, we agreed to use the questioning type protocol, and participants received observation data aligned to the observation tool. During CPR meetings, participants discussed observation data, which helped participants identify common patterns of useful practices and practices they needed to improve. When a team focuses on what the team does well, they are more likely to use assets to address improvements (Aguilar, 2018). Teacher F said, "We all have seen more dialogue between students as a result of focusing on questions. We need to see if this carries over into their understanding" (CPR meeting notes, October 19, 2022). Another participant added, "students definitely talked and discussed more, but they continue to not demonstrate understanding [place value] (Teacher A, CPR meeting notes, October 19, 2022). Finally, Teacher L reflected, "Using the questioning type protocol allowed me to really focus on what I needed to focus on after the lesson because of how the students answered… they were my exit ticket for the lessons; they helped me plan going forward" (CPR meeting notes, October 19, 2022).

During post observation conversations, I shared data and patterns with the team. Afterward, the team identified areas of improvement. We then worked out a specific goal and decided on instructional strategies to achieve the identified goal. As a leader, I believe that if we share ideas and knowledge, the teaching will improve and provide stronger student growth across

all of the classrooms. For example, during a post-observation conversation after a scheduled evidenced-based observation, CPR members identified three examples of math discourse practices that would be useful during an observation: questioning, wait (think) time for students to gather their individual thoughts to prepare for turn-and-talk strategies, and other total participation protocols. Teachers could articulate types of math discourse practices and how effective these practices are in engaging African American students in academic discourse practices; however data from the observations did not support consistent implementation in classrooms. Frequently, the transfer from beliefs to practice is uneven, and teachers often resort to familiar methods rather than risk making what they consider mistakes as they experiment with new strategies (Cuban & Tyack, 2018).

Aguilar (2018) found that leaders can support an environment to cultivate leadership in others; when members feel valued as individuals and everyone is treated with respect, they are likely to share their experience and expertise. To enhance team productivity and development, CPR members demonstrated an openness and willingness to discuss with the group, reflecting that a safe space can strengthen change. When facilitated thoughtfully by teachers, the instructional practices for equitable math instruction can position African American students as capable and competent. Identifying and implementing practices are essential when providing opportunities for conceptual mathematics and math discourse practices for students. Effective questioning, wait time, evidence-based observations and conversations, and feedback are practices that strengthen teachers' knowledge. Consistent implementation of these practices provides students with opportunities to practice discourse in mathematics. As the instructional leader, I needed to be aware of the patterns that emerged from the data and use these data to effectively guide the teachers in their instructional practices.

Community Learning Exchanges

In December 2022, I facilitated a Community Learning Exchange (CLE) for all teachers, including CPR team members. The purpose of the CLE was to connect CPR members and the other teachers and provide a platform for them to share their knowledge, learn from one another, and make some changes in their teaching practices. Teachers shared their experiences and perceptions about student engagement, question types, wait time, lesson planning, teacher collaboration and professional development, and effective math strategies that support student dialogue and learning. Everyone participated in a gallery walk, and I captured notes and reflections, which I coded after the CLE. This form of data collection supported the teachers and me in seeing how the data presented evidence of practices that we could discuss. As a result of these activities during PAR Cycle One, I triangulated data from multiple sources. Then I analyzed those data to determine specific themes.

Evidence Collection and Analysis

I collected and coded data from observations, CPR meetings, the gallery walk, anchor charts, and reflective memos. Employing a qualitative coding and analysis approach was beneficial in the early stages of coding. As I continued to analyze the qualitative data, coding passages according to topics, I utilized descriptive coding (Saldaña, 2016). After examining the codes' frequency of occurrence, I identified specific themes (see Table 9). As I conducted three iterations of coding, two emerging themes came into focus: Influences on math teaching and Strategies that support effective math instruction. I analyzed how similarities in the data were consistent across activities. Table 9 represents the codes from the activities I analyzed and these codes determined the emerging themes.

Table 9

Influences On Math Teaching and Strategies Supporting Effective Math Instruction

Theme	Category	Codes
Influences on Math Teaching (n=62/55%)	Teachers' Instructional Styles (n=19/12%)	Lecture Rote Memorization Algorithms Application Focused on right answer Mathematical concepts
	Classroom Environment (n=25/15%)	Student-centered Positive Encouraging
	Relationships (n=28/17%)	Efforts to know students/families Warm Demanders
Strategies that Support Effective Math Instruction (n=38/45%)	Promoting Rigor for Students of Color (n= 21/21%)	Conceptual Thinking Multiple strategies Manipulatives Procedural Fluency Application
	Engagement (n=17/13%)	Question Types Wait Time Student ownership of discussions

Emergent Themes

According to Saldaña (2016), thematic analysis is a method of analyzing qualitative data usually applied to a set of text or transcripts that closely examines the data to identify common patterns or themes of meaning that come up repeatedly during research. In this study, the themes that emerged support the overarching question: How do third, fourth, and fifth grade teachers co-design lessons to support academic discourse in mathematics for African American students? Based on initial codes, grouped into categories, I determined two emerging themes: Influences on math teaching and strategies that support effective math instruction. CPR members shared lived experiences as students of color and the influence of teachers' instructional styles, classroom environments, and relationships that shaped them as teachers and their current instructional practice. Teachers experienced supportive and non-supportive teaching practices and shared how both informed their beliefs about teaching. As a result, they identified teaching strategies for African American upper grade learners in math based on the teachers' own beliefs. Two categories emerged aligned to identified practices that supported effective math instruction: Increasing rigor and improving engagement through questioning and think time (see Figure 9).

Influences on Math Teaching

According to Darling-Hammond (2021), culturally responsive teaching creates changes in teachers' instructional practices that increases students' cognition and supports brain activity to prepare for rigor so that they can carry more of the cognitive load. However, in addition to understanding math content, curriculum, and pedagogy, teachers of African American students must support students culturally. As I analyzed the data, I observed how the two categories were interrelated; the CPR members' lived experiences as students influenced classroom instruction and implementing math protocols supported African American student learning.

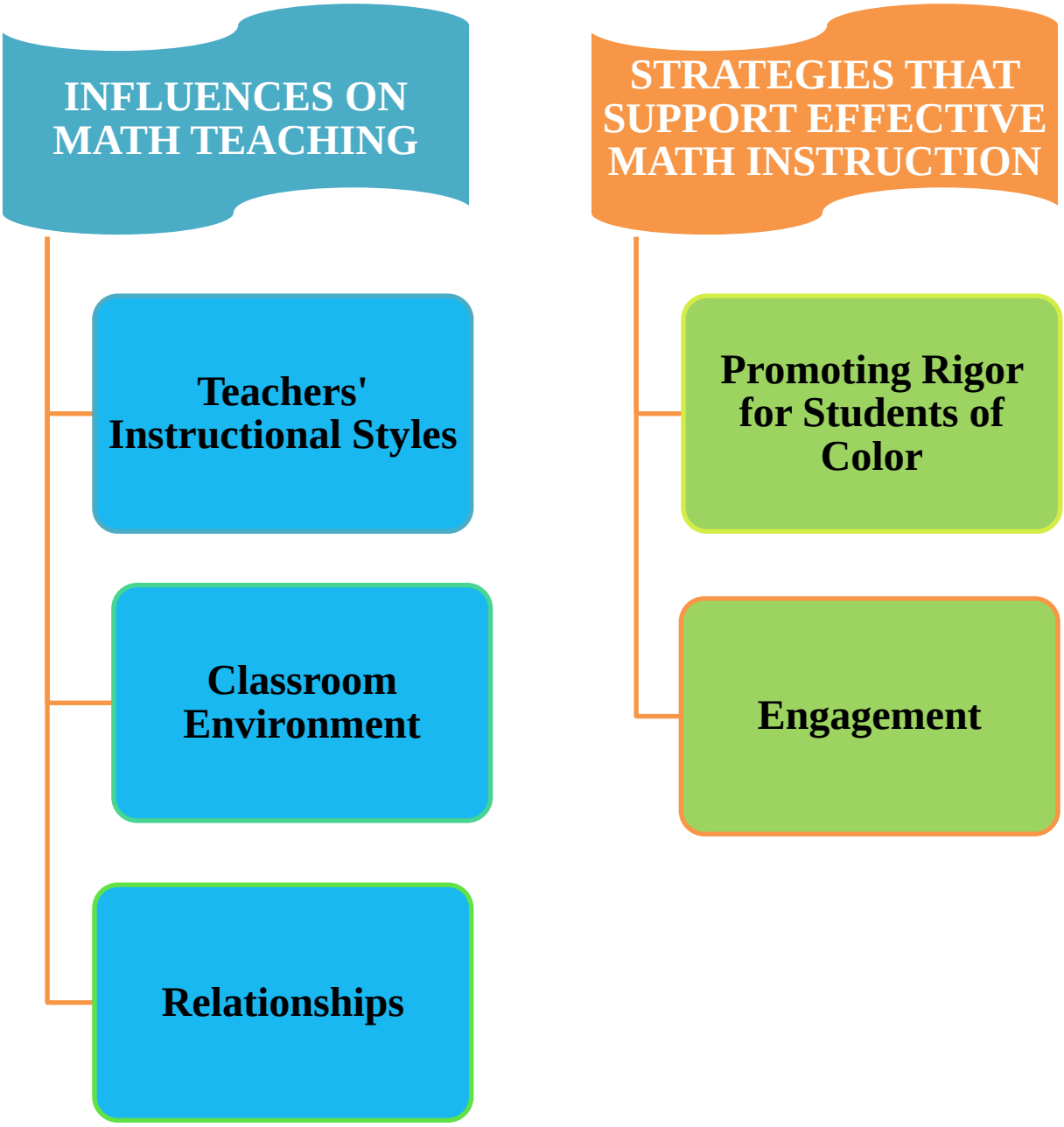


Figure 9. Two emerging themes with categories.

CPR members identified teachers' instructional styles (12%), classroom environments, (15%), and relationships with teachers (17%) as supports for them as young math students. The members recalled the effectiveness of teachers' instructional styles and methods, described learning environments, and recalled the importance of relationships with teachers. CPR members reflected on how these early experiences influenced structures in their current classrooms, including making classrooms safe spaces, student-centered, positive, and encouraging.

Teachers' Instructional Styles

The emergent category, teachers' instructional styles, resulted from the data collected from the math journey line activity, CPR, and CLE meetings. In examining their journey lines, personal narratives, and reflective memos, the teachers identified a high degree of negative, non-supportive experiences as students of color in math classrooms. Teachers' reflections highlighted traditional teaching styles: whole class lectures, teaching algorithms and procedures, and the focus on getting the "right" answer using one teacher-taught strategy. When asked to recall how they were taught mathematics, all CPR members recalled engaging in traditional activities during math. Teacher L described math as, "the rote memorization of mathematical concepts focused on finding the one right answer as the teacher demonstrated the procedures to solve certain problems on the board using an algorithm." The CPR members indicated that teachers who stressed rote memorization of math facts and algorithms without understanding taught them through lectures. Math tasks were at the procedural level with little focus on application of mathematics. For example, one teacher commented, "My math teacher taught us the step-by-step method to learn division. I never got it and I felt left behind" (Teacher F, CPR meeting, October 19, 2022). While analyzing the data, four of the five CPR members commented that their math teachers focused on getting the "right" answer. Only Teacher C shared that her teacher taught

math concepts and encouraged students to work with each other in small groups so no students were left behind. Other participants shared similar experiences.

The positive experiences of the teachers' lived experiences included learning math concepts using a variety of strategies to make connections between concepts. For example, one CPR member remembered how her math teacher engaged students by using a hundreds chart to count by fives and tens and then the students discussed the pattern created with classmates in small groups. Although the majority of the members did not experience participating in discourse in math class, they agreed that student talk was critical for instruction—especially student thinking about multiple ways to solve math problems. Teacher L reflected,

> I realize that when teachers lectured, or when we had to complete problems by ourselves, I didn't like mathematics because I didn't always understand what I was learning. I was told I was good at math because I scored well on tests but I didn't really understand the math concepts until I began teaching. (CPR meeting notes, November 16, 2022)

Participants agreed that they wanted to teach differently than they were taught. Teacher H-S reflected in a memo that she wanted students to understand math concepts and have many strategies to solve problems. Other teachers agreed listing what they wanted to include as part of their math instruction: teaching concepts, not just procedures; giving students opportunities to talk to each other to make sense of math; and making sure students had opportunities to grapple with rigorous, grade level tasks. "I want to be sure I give students what I didn't get to be successful as a student of color" (Teacher L, CPR meeting notes, November 16, 2022).

Observations during PAR Cycle One provided evidence of the supportive classroom practices in which CPR members guided instruction. Teachers focused on learning about their students and their families, especially at the start of the school year. After sharing their math

journey lines and reading excerpts from *Culturally Responsive Teaching & the Brain* (Hammond, 2015), teachers engaged in discussions about the attributes of students with positive math identities and those without. I charted responses and teachers participated in a gallery walk to read each other's responses. CPR members reflected on practices that supported them and identified practices they would implement to make students feel welcomed, seen, heard, and confident (CPR meeting chart, August 4, 2022). As a result, teachers focused on building relationships with students and designing classrooms for academic discussions; they placed desks in groups of four to six to ensure more effective dialogue, they made student materials more accessible, they aligned lesson objectives with standards written in grade-level language, and they scaffolded learning by using anchor charts for student reference.

At the beginning of PAR Cycle One, participants taught students collaboration norms and provided feedback for improved discussions. During observations, teachers called on students by name and used calling on and questioning strategies, and by the end of PAR Cycle One, every CPR member regularly used wait time to ensure students had regular opportunities to engage with each other, deepen their understanding of the mathematics concepts, and explain their reasoning during mathematics. However, at times, teachers regressed and used non-supportive practices. In three of the four classrooms, teachers' main teaching method was delivering some whole-class lectures. At this point in the study, teacher talk often dominated math instruction, and discussions began with prompting from teachers and followed the teacher-student-teacher discourse pattern (Greeno, 2015).

Classroom Environment

CPR members shared their experiences with various instructional styles, and despite the fact that some were non-supportive to conceptual mathematics, the members agreed on the

importance of the classroom environment in supporting their engagement in math class. Each of the five female CPR members of color reported elementary classroom environments felt safe and supportive. In the data (15% of total data) on classroom environment, CPR members' lived experiences as students were generally positive. For example, four of the five CPR members reflected on being *seen* as a girl in the math classroom. They reported that their teachers frequently called on them to answer questions and explain their problem solving; as a result, they felt safe and supported in the classroom. The teachers' reflections spurred more conversation among the other CPR members: "I only had African American female teachers in elementary school. They had high expectations of everyone, including the girls, often asking them to lead small group discussions and check other students' work. This gave us confidence in math class" (Teacher C, CLE notes November 9, 2022). One CPR member stated that their learning occurred in a student-centered math class with many opportunities for engagement in discourse (Teacher C, November 9, 2022). However, another CPR member reflected that two of her elementary teachers rarely called on her. She wondered if it was because she was only one of five Black girls in the classroom. Teacher M reflected on the classroom environment:

> Classroom environments must be safe, inviting, and encouraging and it's my responsibility to create the conditions for that. I know how it feels when the classroom is not safe and I want to make sure none of my students feel ignored or not valued or seen. (Reflective memo, October 22, 2022)

When teachers build trust and confidence, their students feel understood and valued and can learn without worry. Establishing a nurturing classroom environment that supports mathematics discourse begins with creating classroom environments that are warm and inviting, build relationships between the students and the teachers, encourages learners to ask questions,

to take risks, and learn from each other. CPR members identified strategies to create these environments including greeting students at the door in the morning, engaging students through morning meetings and closing circles, and ensuring teachers communicate that students are seen and valued for their contributions in the math classroom.

At the beginning of the school year, teachers engaged in activities aimed at getting to know their students and building positive and trusting relationships with them and their families. All CPR members scheduled and hosted family visits during the first two weeks of school. The visits provided teachers with opportunities to know students and their families. Teachers asked parents about their children's likes and interests; they wanted to know parents' hopes for their children. Teachers repeated the process with students in the classroom using student surveys and questionnaires. Then teachers shared about themselves. These early conferences helped build trust.

Throughout PAR Cycle One, teachers continued activities to engage students and families. Teachers created classroom norms at the beginning of the school year with their students. These classroom norms helped teachers explicitly state an expectation of collaborative and respectful behaviors in their classrooms. Students discussed the behaviors among themselves and revisited the norms as new students joined the class or when students had disagreements. Teacher H-S stated, "My class has behavior expectations, not rules. We discuss them, we co-create them, we agree to them, and students learn to hold themselves and each other accountable" (CPR meeting notes, October 26, 2022). This helps set the tone for the classroom. Teachers created small groups and provided individual feedback on student work; they displayed student work on bulletin boards, held tutoring sessions at lunchtime and afterschool for students to ask questions or complete unfinished assignments, and wrote positive notes and student

progress reports to families. Throughout the school year, both students and families received feedback. Positive relationships with the student and the student's family/caregivers are essential for student success; positive relationships decrease behavioral problems and promote academic success (Bondy et al., 2007).

When students believe that teachers see them as learners, they develop positive relationships with that teacher and then learning improves. When teachers establish positive interpersonal relationships with students, students feel safe, supported, and they feel the classroom environment is fair (Hattie, 2012). For African American students in particular, building trusting relationships is especially important because of the presence of systemic racism, historical biases, and the possible prior negative experiences the students and their families may have had in school (Brewster & Ralisback, 2003).

Relationships

CPR members reported they had positive relationships with their teachers in elementary school and cited building and maintaining strong relationships with students as central to the learning process. Two teachers, Teacher C and Teacher F, stated that their elementary school teachers made efforts to get to know them as people outside of the classroom. "I had the same elementary school teacher from kindergarten to second grade. By the end of the second grade, my teacher knew my interests, which included singing and dancing, and came to several of my recitals and performances" (Teacher C, November 9, 2022). Another CPR member stated her teacher wrote positive notes and called her parents often to speak with them regarding her progress. CPR members stated teachers who built positive relationships made them feel safe and seen and instilled them with confidence allowing them to take risks learning mathematics.

During the CLE, teachers reflected on the positive social-emotional learning (SEL) activities during their elementary school experience, including teachers facilitating community circle time for students to share personal issues and get support. Multiple studies underline the need to bridge the gap between school and home life in order to meet students' social, cognitive, and linguistic needs (Au, 2014; Dunlosky et al., 2013; Gay, 2018; Hogg, 2011; Paris, 2012; Rodriguez, 2013; Yosso, 2005, 2006).

Participants decided that the practice of establishing positive relationships in math classrooms was an essential component of teacher practice that supports students of color. Teachers shared that incorporating morning meetings and closing circles helped build social skills and positive relationships with and among students. Teacher S, the fifth grade teacher, shared how she begins establishing relationships at the beginning of the school year:

> During the first few weeks of school, I learn all of my students' names, I share things about myself, and ask students to do the same. I then tell students that the classroom will be a place where they should feel safe to share and learn together. Our morning meetings are focused on them, not academics. (CPR meeting notes, October 22, 2022)

Other teachers shared a similar sentiment. Creating positive relationships between teachers and students in classroom environments which are safe and orderly and in which teachers set high standards supports students to grow and make smart choices developmentally, emotionally, and academically (Darling-Hammond, 2019).

Teachers must build relationships with students and help them build relationships with each other. Positive and collaborative relationships within the math classroom, focused on collaboration, can be a critical component of math learning. As teachers cultivate relationships among and with students in their classroom community, getting to know them, their families,

personal stories, and cultural backgrounds, students are seen as assets and not deficits. When students feel safe and welcome they can concentrate on learning.

Strategies that Support Effective Math Instruction

During the PAR Pre-Cycle, an emerging category was teachers' descriptions of instructional strategies that helped them learn mathematics as students of color. The CPR members recalled key practices of math teachers including, (a) opportunities to struggle productively with rigorous math tasks; (b) to actively engage in math discussions by responding to open-ended problems with multiple solutions, and (c) to justify their thinking and problem solving strategies. Participants perceived that promoting rigor for students of color (21% of responses) and engagement (13%) in the classroom would increase African American student engagement in mathematics.

During the October 26th and November 9th CPR meetings, the group delved deeply into *Principles to Actions* (NCTM, 2012) and reviewed the recommendations from the research After analyzing the research and recommendations, the CPR members began to generate questions aimed at improving classroom practices. For example, Teacher A asked, “Are there any protocols and routines that we already use that can be used in math to engage our students?” As the discussion continued, CPR members agreed to focus on ensuring students have practice with rigorous math tasks and have opportunities to share thoughts, ideas, and strategies with each other during classroom discussions.

As we progressed through PAR Cycle One, question types and levels and use of wait time were the primary categories for examining how implementation of math structures promote student academic discourse. Next, I discuss the categories of promoting rigor and engagement.

Promoting Rigor for Students of Color

Teachers discussed classroom strategies that meet the needs of African American students and ensure that teachers use practices that promote higher cognitive level; 21% of the data represent instances of rigor that build conceptual understanding, procedural fluency, and application. Participants stated that students must have experience with rigorous tasks that are culturally relevant, reflecting authentic experiences the students have in their lives. Allen and Boykin (1992) stress the importance of communal learning and conversation; they demonstrated that when African American students could engage in math discussions with other students; their learning improved

During both the November and December CPR meetings, the group read and discussed NCTM (2012) recommendations. As a result, the CPR members examined their instructional practices and the practices of the team members. The teachers questioned their practices. Teacher F asked, "How do we engage our African American students while teaching them mathematics?" As the discussion continued, the teachers decided that an essential component was to provide all students multiple and regular opportunities with all aspects of rigor. As defined by the National Research Council (2001), rigor in mathematics entails a focus, with equal intensity, on conceptual understanding, procedural skill and fluency, and the ability to apply the learned math. Teachers should target each aspect of rigor with equal intensity over the course of the school year.

Conceptual Understanding. One aspect of rigor, conceptual understanding, refers to understanding mathematical concepts, operations, and relations rather than knowing isolated facts and methods (National Research Council, 2001). Teachers need to be effective in teaching conceptual understanding to ensure that students can make sense of why a mathematical idea is

important, can connect prior knowledge to new ideas and concepts, and decide the kind of context in which that idea is useful. “We should start by making sure everyone teaches key grade level concepts using drawing, pictures, and manipulatives like number lines and hundred charts so students have lots of problem solving strategies instead of just algorithms” (Teacher F, CPR meeting, November 9, 2022). Another teacher emphasized the importance of making connections between concepts to help students build mental models.

Procedural Fluency. Teachers’ conceptions of mathematical fluency are highly dependent on their personal beliefs formed through life and educational experiences. Teachers’ knowledge of mathematics and of how mathematics is learned influences their current conceptions (Borg, 2003; Melketo, 2012). Students have acquired procedural fluency when they have “skill in carrying out procedures flexibly, accurately, efficiently, and appropriately” (National Research Council, 2001, p. 116). For example, teachers shared their experiences about how they learned math facts. One CPR member recalled the focus her teacher placed on quickly reciting facts, equating speed with intelligence. “We stood in front of the class and recited our multiplication facts. The ‘smartest’ students got stickers next to their names on a chart” (Teacher A, CPR meeting notes, October 19, 2022). Another CPR member stated, “When students are able to add, subtract, multiply, and divide numbers without using fingers or manipulatives then they are fluent” (Teacher L, CPR meeting notes, October 19, 2022).

While observing mathematics instruction of CPR group members at the beginning of PAR Cycle One, I noted that math fluency was synonymous with timed math facts. Three of the four teachers used timed math fact worksheets for fluency practice. The worksheets usually included 20 subtraction, multiplication, and division math problems. When the timer stopped, the teacher collected the worksheets. Teachers would correct and return the sheets during the same

lesson or the next day with problems marked either correct or incorrect. Two teachers posted student progress with math facts and displayed the chart in the classroom. Post observation conversations focused on whether this strategy was effective in helping students retain the information. Teachers stated the results were mixed. “Some students have mastered some math facts; others have not and cannot seem to pass the timed tests, especially the 6s, 7s, and 8s. They get stuck and I stop testing them” (Teacher L, Post observation meeting notes, October 5, 2022).

As a result of this practice, teachers redefined fluency for themselves. Teachers indicated that fluency is accurately using numbers to solve problems; fluency is not rote memorization of math facts. One CPR member stated that fluency involved making sure answers were reasonable. “I have seen students solve problems correctly but the answers they got were unreasonable. For example, students added correctly but the problem required them to subtract…so they did the math correctly but the answer was not reasonable” (Teacher S, CPR meeting, November 9, 2022).

Teachers engaged in professional development using the adopted math curriculum, Eureka Math 2.0 that includes fluency practice for each lesson. CPR members incorporated other fluency activities: oral and choral drills, activities that included the use of manipulatives, charts, number lines, and whiteboards. The data from PAR Cycle One indicates that teachers were using more of the fluency activities. When students use a procedure they do not understand, they are more likely to make errors and fail to notice when the answer does not make sense (Kamii & Dominick, 1998; Narode et al., 1993). Fluency decisions have a major impact on equity and access. Equitable mathematics ensures African American students learn multiple strategies. Thus, teachers shifted from the time-honored math facts to more complex definitions of fluency, reflecting a major shift in their thinking and actions as well as student thinking and actions.

Application. Application provides valuable context for learning and the opportunity to solve problems in a relevant and meaningful way. Through real-world application, students learn to select an efficient method to find a solution, determine whether the solution makes sense by reasoning, and develop critical thinking skills (NCTM, 2012). CPR group members believed that teaching students how to apply mathematics learned in the classroom to real world situations was the hardest of the three aspects of rigor.

During classroom observation in PAR Cycle One, I looked for examples of teachers posing problems and students using math concepts in problem-solving contexts. I used the questioning tool to collect data on the type of questions teachers asked to help students apply mathematical concepts. Teachers stated they believed students should have more practice applying rigor. The questions CPR members asked were depth of knowledge (DOK) level one questions usually with one correct answer. Typical problem types were "What is 10x5?" Post observation conversations focused on ways to recreate problems to make them open-ended. Teachers began to adjust the problem types to make them more rigorous. Instead of asking "What is 10x5," they shifted to "The product of 10x5 is 50. What could be the factors?" CPR members noted that these problem types created equitable opportunities for math discourse; however, the teachers did not consistently recreate problems or investigate problem-solving strategies to get students to apply previously learned mathematics. Teachers acknowledged they needed support in providing opportunities for students to practice the application aspect of rigor. They made comments such as, "It would help if we got professional development and coaching in teaching students how to apply math outside of the classroom" (Teacher L, CPR meeting notes, October 19, 2022). Another teacher stated, "I didn't learn to apply math outside of the

classroom as a student. It was not until I began to teach mathematics that I learned it and not very well" (Teacher F, Reflection, October 19, 2022).

Teachers need to know what strategies to use to support African American students to apply the math they are learning. If African American students have opportunities to practice solving complex application tasks, they become independent learners and deepen conceptual understanding as well as procedural skills and fluency. Through classroom observations, post observation conversations, reflections, and other artifacts, the lived experiences the CPR members shared provided insight into their current beliefs and practices as teachers. Thus, when they became teachers and began examining their teaching styles and methods, they developed clearer ideas about the importance of socio-emotional learning, student engagement, and rigor: the focus, with equal intensity, on conceptual understanding, procedural fluency, and application. As students, participants were not challenged in math class. As teachers, they want to ensure students have opportunities to engage with rigorous math tasks. Teachers agreed that one of the important ideas of rigor is that students should have to engage in productive struggle, figure out how to think about the problem by themselves, and communicate their understanding. However, because prior experiences often have a strong residual effect on teacher choices, I found that teachers repeated many of the unsupportive instructional practices they had in their lived experiences—even when they could state that certain practices were not helpful. Upper elementary teachers continued to focus on using algorithms to teach procedures with limited attention to conceptual understanding and insufficient attention to application.

Teachers would benefit from professional development in understanding the aspects of rigor and how to implement conceptual understanding and application into current practices. The experiences, thoughts, and feelings of teachers of color who were once in the same position as

their students gave a perspective on what can be done to enhance instruction and foster excellent student achievement.

Engagement

Krause and Coates (2008) argue that engagement as a phenomenon is both academic and nonacademic and the social aspects of engagement are critical. Engagement is influenced by factors internal to the classroom such as interactions with peers and teachers in learning contexts, and by external influences such as parents, out-of-school experiences, and school culture (Reschly & Christenson, 2012: Skinner & Pitzer, 2012). Student engagement in mathematics requires students to grapple with tasks, leads to deeper learning, and should be culturally responsive. Culturally responsive teachers employ instructional strategies in which students are engaged in productive struggle in ways that affirm them as learners (Hammond, 2015). The data for engagement (13%) indicated that three variables influence engagement: varied question types and levels, use of effective wait time, and supporting student ownership in discussion.

Varying Question Types. From the beginning of the project, I aimed to identify math practices that would promote student engagement and discourse. Asking questions in mathematics is a necessary component for helping understand what students know, do not know, and need to know. During the PAR Pre-Cycle, teachers reflected on the types of questions they asked during math class. Teacher L commented that she began the school year asking only the questions in the newly adopted math curriculum. “The questions in the math curriculum were mostly surface level questions that were easy, with only one answer, and required students to use a procedure to solve. The problems did not give the students opportunities to discuss different strategies and neither did I” (Teacher L, CPR meeting notes, October 26, 2022). During the

discussion, other teachers agreed that their focus on learning the math curriculum blinded them to the types of questions they asked.

After analyzing data from classroom observations during PAR Cycle One, CPR members examined and analyzed the question types and levels they posed. Members concluded that they needed to ask questions that engaged students to think about different ways to solve problems—questions that were more conceptual and not procedural. They needed to ask students to share the strategies they used to solve the problem and defend their answers, giving the students a more rigorous cognitive load. The reflections helped the teachers to become more intentional and strategic with their use of questioning. Teacher L reflected,

> You know, I find I asked questions with the intent of helping students connect past math concepts to current math tasks, but I think what I may be doing inadvertently is spoon feeding students answers instead of letting them "think." I'm thinking that I have to let them struggle with the math and also use wait time as a way of stopping myself from asking leading questions (Reflective memo, October 26, 2022)

Teacher L noticed that her sequence of easier questions at a low cognitive level did not align with her stated belief that students should engage in productive struggle. "I say I believe in students… but giving students easy tasks and not letting them figure stuff out suggests I don't hold high expectations of them" (Teacher H-S, Reflective memo, October 26, 2022). CPR members noticed from their collective observation data that they all asked a lot of thumbs up/thumbs down questions that focused on memorization of math facts, did not allow for much elaboration, or push further thinking. The data spoke for itself. Teacher H-S reflected,

Questions like five-thousand plus three-thousand is blank requires students to add and are procedural mostly at depth of knowledge one. Instead, I can ask students, "What does five

thousand plus three thousand look like?" Use pictures or drawings to show the total. Then call on students to post their solutions on whiteboards and compare different ways students solved the problems" (Teacher H-S, CPR meeting notes, October 26, 2022).

Data from observations prodded the teacher to change what kinds and what level of questions she asked, from simple arithmetic to asking students to *show what you know* using conceptual models that pushed the rigor and shifted the cognitive load to the students as they made sense of the lessons and shared their thinking with a partner. The opportunity to reflect on her lessons through observation data helped her to identify the need to work on her questioning strategies to allow students to construct their own understanding of concepts. Teacher S, the fifth grade teacher, reflected more, "If I begin to ask students to explain their thinking by writing in their math notebooks, then ask them to share with a partner, it encourages discourse and an opportunity to explain their thinking" (Teacher S, Post observation conversation notes, October 5, 2022).

The evidence from the observations, post observation conversations, CPR meetings, and discussions in the form of dialogue and reflection suggested that teachers require further professional development on the importance and process of asking higher-level questions to engage students and promote student thinking (13%). Teachers defined student engagement in math as talking with their peers, asking and answering questions, and sharing and explaining solutions and reasoning. When teachers planned the type of questions they would ask, identified the purpose for asking the question, and planned when they would ask questions throughout the lesson, the quality and variety of questions engaged a higher percentage of students. For example, during a classroom observation during math, the fifth grade teacher began the lesson by asking students, "What do you notice? What do you wonder?" as a way to engage students and

set the stage for discourse between students (Teacher S, Observation notes, November 14, 2022). During the post observation conversation, the teacher shared that every partner group she listened to shared noticings and wonders. After discussing the increased level of student engagement, the higher-level question protocol became a norm. As a result, the teacher focused on improvement, which ultimately led to change because of the creation of a collaborative safe space. Posing purposeful questions is an important component of facilitating meaningful discourse in mathematics. Establishing this as a norm in math classrooms is imperative if we wish to change what happens within the classroom; and wait or think time is critical before students engage with each other in dialogue.

Wait Time. In a classroom that supports academic discourse, wait time or cognitive processing think time is the key to maximizing effective questioning. Rowe's (1974) research states that when teachers ask students questions, they typically wait less than one second for a student response. After a student stops speaking, teachers typically react or respond with another question in less than one second. This is defined as wait time 1, pausing after asking a question; and wait time 2, pausing after a student response. When teachers allow some students to answer questions immediately without wait time, often blurting out responses, those students who need more time to mentally work out answers are excluded from classroom dialogue. When students instantly call out the answer, they deny others sufficient processing time. Questions that require recall require one to three seconds of wait time, whereas questions that require computation require 4 to 6 seconds of wait time (Lyman et al., 2023; Rowe, 1974; Tobin, 1980). Teachers of all students, but particularly African American students who have often been categorized as less competent, should use wait time to support the learning of all students. In addition, this supports

learning as a collaborative enterprise in classrooms so that all students have an equitable opportunity to participate.

During the November 9th CPR meeting, members identified effective practices that support African American students in mathematics. These included "teachers incorporating the use of wait time during math lessons" and "questioning to develop a deeper understanding of mathematics concepts" (Teacher L, Reflective memo, November 9, 2022). One teacher said, "When I began to ask questions and wait for a response rather than calling on the student with the raised hand, I began to hear from more students" (Teacher F, CLE notes, December 2022). Another teacher commented, "Teacher wait time challenges students to think and teachers to listen for the level of understanding students have" (Teacher A, CLE notes, December 2022).

During PAR Cycle One, when conducting evidence-based observations using selective verbatim, I witnessed teachers implementing wait time when asking questions using the Question Level tool. When the teacher waited from five to ten seconds after posing a question, student engagement increased. Teacher H-S, one of the fourth grade teachers, demonstrated the use of appropriate wait time while teaching place value (Classroom observation, October 18, 2022). “I’m going to write a number on the board. Who can read the number? Think first.” During this interchange, the teacher provided at least ten seconds of wait/think time after asking the question (wait time 1). She asked students to share their answers with their elbow partners and then called on a student to share. After sharing, she paused (wait time 2), asking students to consider the student answer. Data collected during the observation showed the teacher asked 24 questions in 36 minutes, the teacher used wait time throughout the observation, and the typical think time was eight to ten seconds. The combination of varied question types and wait time created a classroom

climate that supported all students. More students responded when provided at least ten seconds of time to think.

During the October 26, 2022, CPR meeting, I shared data from classroom observations. Teacher H-S reflected on how the implementation of wait/think time increased discourse and engagement between her students. The teachers reviewed their post observation conversations and reflections and observation data, and identified three examples of engagement practices that would be useful during an observation: planning and asking a variety of questions, using wait/think time, and providing opportunities for students to Think-Pair-Share and Solve. As they articulated types of engagement practices and their effectiveness in engaging students, the teachers became more confident of their teaching of African American students in mathematics. However, change is complex, and too often we revert to our established patterns—what Cuban (2012) calls dynamic conservatism. In later classroom observations, the instructional practices that had been identified as useful were not consistently implemented across the four third, fourth, and fifth grade classrooms. Without the consistent use of effective engagement practices students struggle to access mathematics content and comprehend concepts.

Student Ownership of Discussions. Student engagement and student ownership are terms often used interchangeably. Student engagement can be defined as students being interested in and eager about their learning. Engagement reflects what students understand and are doing about their learning. Student ownership takes learning a step further; when students own their learning, they know how to apply what they are learning in different contexts and take responsibility for their progress (National Institute on Excellence in Teaching, 2021). If students do not own their learning, they struggle to accelerate their learning.

I captured evidence of teacher use of instructional practices aimed at moving students toward student ownership in both third grade classrooms. Teacher L consistently communicated clear expectations for student collaboration when working with others. These expectations were posted in the classroom and repeated prior to students working together. “Remember, each person in your group must share their thinking prior to solving the problem. Everyone in the group must agree with the answer and be able to explain how you got it. Then write your answer on your whiteboard” (Teacher L, Classroom observation, November 9, 2022). The expectation is that all students participate in the discussion and carry the cognitive load by sharing their strategies and ideas with each other. Teacher H-S consistently provided opportunities for students to think and reflect during math. After introducing and discussing the lesson objective, posted both on the board and on an anchor chart, the teacher asked students to think about what they already know about the problem or to think of questions they want to know prior to solving the problem. “I want you to think about what you already know about the problem or ask a question you think might help you solve the problem. I’ll give you one minute to think. Go!” (Teacher H-S, Classroom observation, November 16, 2022). A quick check-in provided the opportunity for students to tell what they knew or to ask a question. The teacher encouraged students to repeat understandings and questions. These examples highlighted the belief that students, through practice, could begin to take ownership of their learning when provided with clear expectations, modeling, and practice.

CPR members agreed that they were not adept at creating opportunities for students to take ownership of their learning in math class; they said they needed professional development and practice to ensure these strategies became a regular pedagogical practice in their classrooms. Teachers were concerned that, without opportunities to practice and strengthen thinking, oral

discourse, and problem solving skills, students of color would lack the ability to fully engage with their peers, which, in turn, would limit their ability to become owners of their learning. The teachers agreed that to foster meaningful discussions, they needed to have conversations with their students about the purpose and importance of discussions during math— sharing and communicating their thinking, asking questions and restating other's ideas, and listening to and learning from classmates. Students need to know why teachers are changing practices and teacher explanations can help students be more metacognitive about their learning (National Academy, 2018). As a leader, I needed to support teachers in deepening their understanding of effective instructional practices to help all students take ownership of their learning, especially students of color.

In summary, the two emergent themes of influences on math teaching and strategies that support effective math instruction provided a foundation for supporting educators to provide students of color with quality instruction in mathematics. Teachers reflected on themselves as students and how those experiences shaped them as teachers. Participants shared how teachers' instructional styles, classroom environments, and relationships influenced their math learning and current teaching practices. As indicated by the first emergent theme, teachers' instructional styles are influenced by their early experiences as students; even when they say they believe differently and practice new ways of teaching, they may revert to practices that are non-supportive for student learning. Teachers stated that traditional methods like lectures and rote memorization left them feeling unengaged and left out in math classes, and the CPR members wanted to use instructional styles that invite students to learn and love mathematics. Teachers reflected that they learned best when they were seen and valued in class, when teachers created challenging and rich mathematical experiences, when teachers were warm demanders with

expectations that students could do the mathematics, and when teachers provided students with opportunities to think and share ideas and strategies with other students.

Leadership Reflection and Action Steps for PAR Cycle Two

I collected data from classroom observations, CPR meetings, and CLE during PAR Cycle One. I further developed my ability to code and analyze the collected data. The preliminary data I collected and analyzed reflected changes and progress made in PAR Cycle One. To fully understand and make meaning of the data, I engaged in several iterations of coding and analyzing the data. The coding and analysis of the data revealed the evidence was insufficient and more needed to be collected and analyzed to be relevant. After carefully reviewing the data, the overarching questions, and the focus of practice, I needed to engage in an extensive and robust data collection process that would provide the information needed to answer the research questions, analyze teacher performance, and understand leadership skills needed to ensure that incremental changes would lead to incremental, sustained improvement. Incremental change makes reform manageable for teachers as it does not require teachers to make sense of entirely new ideas about instruction, but rather to understand small innovations in practices that they already rely upon heavily (Cohen & Ball, 1990; Spillane & Zeuli, 1999; Star, 2016; Tyack & Cuban, 1995).

The goals for PAR Cycle One were to conduct classroom observations using the questioning tool, collect and analyze data, engage in post observation conversations, reflect on learnings, and build a stronger relationship with the CPR members. By the end of PAR Cycle One, I reflected on the numerous conversations about improving math instruction, the ideas generated during the conversations, and the data collected and analyzed during the cycle. Those reflections, along with the learnings from the CPR meetings and the CLE, brought about a

change in both my thinking and leadership moves. I focused on listening to the reflections of the CPR members throughout PAR Cycle One. I especially focused on requests for professional development and coaching in math. In describing how my capacity to lead and evolve as a leader was critical to the success of our inquiry, I realized that enhanced teacher practice necessitated continuous professional development, coaching, and support (Yurkofsky et al. 2020). Therefore, I shifted my leadership role to that of a coach, guiding the CPR group through this process as they collaborated with me and supported the work through classroom practices. Additionally, I was concerned about whether the protocols would continue to be implemented.

I planned changes to help the research project move forward. As the lead facilitator, my role was to help the team build a strong foundation from the research and move forward with learning and implementing protocols. To do this, I included readings from chapters in *Principles To Action* (NCTM, 2014) on the weekly staff bulletin and planned time on CPR meeting agendas to discuss the readings and deepen understanding. After several meetings, I found the CPR team needed more than what had been allocated to revisit relevant research. I thought it was necessary for the team to find ways to incorporate findings from the research into their classroom practice. I wanted to find time to revisit *Culturally Responsive Teaching and The Brain* (Hammond, 2015) to continue to focus on equitable math practices especially for African American students.

Conclusion

As we moved into PAR Cycle Two, I took a step back to reflect on learnings from PAR Cycle One. I found the CPR team grappled with the relevant research regarding question types and wait time, asked clarifying questions, reflected on learnings, and made connections to classroom practices that support African American students in mathematics. During the reflection process, the members shared that making time to read and discuss research helped to

revive positive practices for early math learning and allowed them to create a working definition for equitable mathematical academic discourse.

I wanted to continue collaborating with the CPR team to strengthen their knowledge, understanding, and implementation of equitable academic discourse practices. During the reflection process, the members shared how going back to the research put things in perspective and filled gaps in their understanding. By engaging in reading studies about math, they created a working definition for equitable mathematical academic discourse. I planned to continue classroom observations and provide opportunities for teachers to observe one another to expand their understanding of how the implemented practices look in each other's classrooms. We continued to use post-observation conversation data individually and collectively to discuss implementation of shared practices. As we discussed the data I analyzed, our goal became to continue improving instructional practices to support upper elementary students in mathematics. In addition, the themes from the next cycle should reinforce what we have learned about the conditions that enhance equitable instructional practices to support African American students in mathematics.

CHAPTER 6: PAR CYCLE TWO AND FINDINGS

In the PAR project and study, the Co-Practitioner Researcher (CPR) team and I focused on the extent to which third, fourth, and fifth grade teachers co-generate, implement, and adapt conceptual mathematics lessons that support equitable academic discourse to meet the needs of African American students. We sought to develop a professional development model to improve our teaching practices in mathematics and enhance student engagement in classrooms. In the PAR Pre-Cycle, I engaged the CPR group members in activities to improve the quality of classroom instruction by providing the necessary supports to CPR group members to examine their current instructional practices, skills, and competencies and use the knowledge gained to build their capacity to become better practitioners and first person researchers in their classrooms to better serve students. In addition, during the PAR Pre-Cycle, I sought to better understand the CPR group members' beliefs about teaching mathematics and how personal experiences as female students of color impacted current teaching practices. In PAR Cycle One, I determined two emerging themes: influences on math teaching and strategies that support effective math instruction. Moving into PAR Cycle Two, I analyzed data to support the emerging themes further to substantiate the emerging themes and determine the findings. After collecting, coding, and analyzing data from PAR Cycle Two, the findings are:

1. Teachers' lived experiences, attitudes, and knowledge influence their current instructional practices, and
2. Principal and teacher collaboration support incremental changes in instructional practices

My primary responsibility as the school leader was to support teachers in improving classroom instruction for upper elementary students. I accomplished this by observing their

teaching and engaging in post-observation conversations about their practices, with a focus on how to support student engagement on rigorous tasks so students could develop confidence in participating in classroom discussions (Sullivan & Glanz, 2013). Because this was an iterative process, teachers could adapt teaching practices and consistently implement incremental instructional strategies that better serve our students. During PAR Cycle Two, the CPR members continued to improve their teaching practices.

In this chapter, I outline the activities in PAR Cycle Two. I collected observation data as teachers implemented instructional strategies during mathematics to support students of color. Based on the data analysis, I substantiated the emergent themes from PAR Cycle One and determined the findings from the three inquiry cycles.

PAR Cycle Two Process and Analysis

PAR Cycle Two (January 2023-March 2023) included several activities (see Table 10). The CPR group met four times and reflected on learning from the fall 2022 semester. I conducted two rounds of observations for each CPR member, totaling eight observations; facilitated two post-observation conversations at two monthly CPR meetings during February and March; and our CPR team hosted a Community Learning Exchange (CLE) during April for the school staff. At these convenings, participants engaged in personal narratives, dynamic mindfulness, and reflection. The activities in which they engaged continued to foster collaborative responsibility for teacher improvement.

Activities

I began PAR Cycle Two by reflecting on the professional development provided during PAR Cycle One. During the PAR Cycle Two January meeting, I met with the CPR team. We reflected on the inquiry process, and CPR members reflected on their experiences beginning with

Table 10

PAR Cycle Two Activities

Meetings	Date	Learning Activities	Data
Mid-Semester Meeting	January 18, 2023	Data Review Member Checks	Reflections
Observations (n=8)	February 13, 2023 February 14, 2023 March 8, 2023 March 9, 2023	Question Tool Calling on Tool Post-Observation	Field notes Reflective Memos Coded Observations
CPR Meeting	February 22, 2023	Dynamic Mindfulness Data Dive/ Observations Jottings	Agenda Artifacts Field Notes
CPR Meeting	March 15, 2023		Reflective Memos
Post-Observation Conversations (n=8)	February 15, 2023 March 15, 2023	Individual Conversations	Field Notes

the math journey lines to document meaningful learnings. We reviewed PAR Cycle One data and discussed instructional strategies to be continued during PAR Cycle Two. During the discussion, I guided CPR members in utilizing data from PAR Cycle One observations to set individual targeted goals to change classroom practice. The CPR members reflected on their progress in PAR Cycle One and discussed their current understanding of equitable instructional practices. We analyzed emerging themes from PAR Cycle One and reflected on the first round of observational data as a group. Finally, and significantly, the CPR group set goals and reviewed commitments for PAR Cycle Two. We decided to co-facilitate a Community Learning Exchange to share equitable instructional practices with all classroom teachers in the school community.

In January, I began the final round of classroom observations utilizing the questioning tool. The CPR team created the observation schedule, which I followed. I continued to build upon and honor the safe space created throughout the inquiry process. After each observation, participants engaged in post-observation conversations focused on question types and engagement strategies. These final observations provided data that supported incremental changes in teacher implementation of instructional practices. CPR members articulated the need for me to focus on the engagement strategies. Specifically, CPR members sought data about the effectiveness of question types (level of cognitive demand), the use of wait time, and how many and which students were engaging in academic discussions during the observations. For example, one teacher requested, “We would like more data on questioning and forms of questions now; I would also like to know how implementing wait and think time has changed math discussions in my class” (Teacher F, CPR reflection notes, January 18, 2023). I continued to record the questions during these observations. During the post-observation conversations, I talked with teachers about rigor in the classroom through questioning and equity of voice.

During February and March the focus in classroom observations was question types, use of wait time, and increased student talk during mathematics. I continued to document which students were speaking in class. By documenting question types and student responses during classroom observations, I provided CPR members with evidence that addressed the level of engagement and rigor in the classroom through question level and equity of voice. After this round of observations and post-observation conversations, we had the final CPR meeting.

The final CPR meeting, held in March 2023, was an opportunity to reflect on and discuss the changes in teaching practices as well as a time of celebration and reflection. The group discussed the study's final round of observations, overall reflections from participation in the PAR study, and the next steps as we moved forward as a group and a school. We reflected on the value of taking part in the study, the inquiry process, and the next steps needed to continue improving practices. While the CPR meeting constituted our final meeting of the formal CPR group, all members acknowledged the need to continue to use observations, post-observation conversations, and reflections to collect and discuss classroom data to make incremental changes.

Analysis of PAR Cycle Two Data

In analyzing the data for PAR Cycle Two, I substantiated these emerging themes, which informed the study findings:

1. Teachers' lived experiences, attitudes, and knowledge influence their current instructional practices; as students of color, teachers’ experiences shape their current instructional practices.

2. Principal and teacher collaboration supports incremental changes in instructional practices; that is, co-practitioners who are willing to engage in cycles of inquiry demonstrate continuous and incremental improvement in classroom instruction.

This data collection, analysis, and advancement throughout PAR Cycle Two aided in deepening our learning from previous cycles and informed how the Co-Practitioner Researchers evolved and influenced each other's learning and practice. In general, we carried out the process sequentially over three cycles of inquiry leading to the first finding that focused on our earlier experiences and foundational activities. These informed the second finding related to changing teacher practices.

In PAR Cycle Two, CPR members shared methods for planning for and developing equitable engagement strategies, including planning for questions that required analysis that helped increase math discourse between students. CPR members shared how focused observations followed by post-observation conversations helped them examine and reflect on their practices. By the end of PAR Cycle Two, the CPR members consistently planned and reflected collectively as a group about what steps to take to improve equitable academic outcomes in the classroom for students of color.

During this final round of observations, I noted the occurrences of teaching practices that supported the emergent themes from PAR Cycle One (see Figure 10). The data in this cycle provided evidence to strengthen the theme from PAR Cycle One: teachers used equitable engagement practices. Teacher practices supported structured discourse opportunities in mathematics for their upper elementary students. I organized these practices into two categories to collect data on discourse patterns: question type (form) and talk moves strategies. I observed CPR members using question forms and talk moves 158 times during the eight

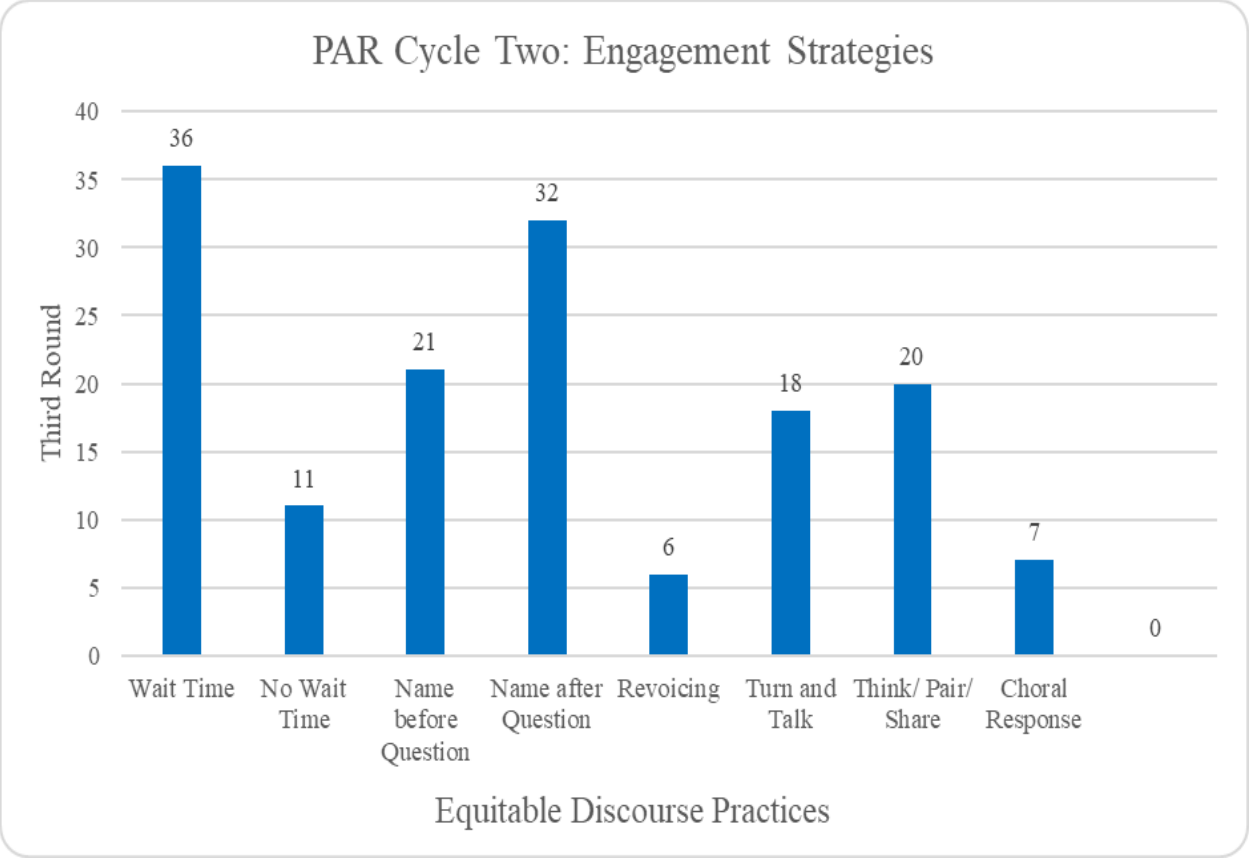


Figure 10. PAR Cycle Two: The frequency of using equitable discourse practices increased.

observations. During this PAR Cycle round, there were 38 student-to-student interactions and 20 teacher-to-student interactions during the lessons. This constituted an increase in student-to-student talk and a decrease in student-to-teacher dialogue. Most student-to-student interactions collected during the observations were turn-and-talk or think-pair-share. Wait (or think) time occurrences increased during this round as I noted 36 instances compared to no-wait time occurrences of 11 from PAR Cycle One.

The CPR members and I worked to examine current practice, plan lessons aligned to data, and practice and implement strategies to promote math discourse and engagement. Previous observational data aligned to increasing discourse and planning questions that supported student participation in discussions; to activate student talk, teachers incorporated and used questions and talk moves during math lessons. Teachers across the four classrooms used a variety of engagement strategies and tools throughout this cycle. I noted teachers changed the way they asked students questions. During PAR Cycle One, teachers used students' names before asking questions on 21 instances. During PAR Cycle Two, teachers asked questions then called on a student afterwards 32 times. By reversing this process, teachers provided think time and increased student engagement, as students did not know who would be called on and thus had to remain attentive until the name was called. 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; however, this was not done consistently and could not be termed institutionalized. Teacher A expressed the

difficulty in consistently implementing these changes in their teaching practices (CPR reflection, February 22, 2023).

Ultimately, although teachers began to implement engagement strategies more frequently during PAR Cycle Two, they continued to teach in the manner they were taught even though they professed believing in different practices. Those long-held practices continued to influence their teaching, making shifts slow and uneven. In a single observation, I would note progress, but then the teachers might revert to prior practices despite their intentions. Cuban (2021) refers to this phenomenon as dynamic conservatism as teachers change and often return to prior practices In this case, those practices strongly correlated with how they experienced teaching practices when they were students.

In this research project and study, I observed and examined teacher practice and what is required to change the entrenched practices, what Cuban and Tyack (1998) term the grammar of schooling. To effectively support teacher change, principals need to systematically observe classroom instruction and have conversations to address the persistent drift to prior practices that are not supporting student learning (Cuban, 2021).

Findings

In the PAR project, I was seeking a potential model of professional development and collaborative planning to support teachers in implementing incremental changes in their instructional math practices. Making incremental changes to instructional teaching practices that are sustained requires intentional support from an instructional leader who is knowledgeable in providing support for teachers.

I began the PAR project focusing on deepening relationships with the teachers who agreed to participate in the research. I sought to understand how their lived experiences and

knowledge about instructional practices offered a foundation for changing their practices. To change practices, as the leader, I focused on targeted professional development aimed at supporting teacher efforts to transform instructional practice and calendared and facilitated CPR meetings that focused on building a collaborative space for participants to work as a team to implement classroom engagement strategies and make changes. In addition, I collected data from evidence-based observations and post-observation conversations. The evidence supported CPR members' efforts to implement strategies that showed promise of more opportunities for equitable academic discourse in the classroom. Because of the PAR project and study, I can assert two findings:

1. Teachers' lived experiences, perceptions, and knowledge influence their current instructional practices.
2. Principal and teacher collaboration supports incremental changes in instructional practices.

These findings developed over the course of three cycles of inquiry and contributed to promoting equitable engagement in upper elementary classrooms. I support these findings by providing evidence from CPR meetings, community learning exchanges, observations, and post-observation conversations. Both the influence of teachers' lived experiences and co-practitioners' willingness to engage in cycles of inquiry supported the efforts of teachers committed to making continuous and incremental improvement to classroom instruction.

Lived Experiences Shape Teaching

Teachers' early lived experiences are one aspect of their current teaching practices and can act as a foundation for changing instructional practice. However, in order to change teaching practices (Kowalski, 2006) and to affect student learning, teachers need to forge newly shared

beliefs and behaviors. Teachers in this study believed that their lived experiences and perceptions as students of color directly influenced their desire to implement effective engagement strategies in the mathematics classroom. The teachers wanted to support equitable academic discourse; their lived experiences and deepening understanding of effective instructional practices contributed to their pedagogical knowledge. However, change requires time and consistency; sustained change requires initiating, implementing, and maintaining the desired change for it to become common practice, and to create supportive conditions for others to do so (Hord et al., 2013). While teachers had strong beliefs based on positive and negative experiences in classrooms, they often reverted to practices that did not match their beliefs.

Teachers' Early Experiences and Beliefs

During the PAR Pre-Cycle and PAR Cycle One, teachers reported they did not generally have positive or supportive experiences in their math learning. They described their teachers' practices as not conducive to their learning and reflected on the ways they were treated as students of color. In 55% of their comments, collected from math journey lines, CPR meeting notes, anchor charts, and reflections, teachers discussed experiences they had as students that made them feel invisible, incompetent, and unsure of their ability to learn mathematics. For example, one participant said, "Teachers lectured to us during high school…math was not so fun anymore. The result was that we dealt with rote memorization of algorithms more than procedural steps when solving math problems. We did not use critical thinking and analytical skills" (Teacher F, Math Journey lines, October 22, 2022). In only 15% of the data did participants describe their experience with mathematics as student centered, positive, and encouraging. Converting negative experiences to positive experiences for their current students

takes a consistent application of observations and conversations as teachers teach the way they were taught, instead of the ways they often believe they should teach (Cuban, 1984).

Because of their experiences, members reflected on the need for more training and professional development opportunities that support effective teaching practices for their students. CPR members wanted their current students to have different experiences from the ones they had. Collectively, their goal was to be better teachers than those they had themselves.

Throughout the PAR research project, CPR members consistently stated their desire to create nurturing classroom environments that recognize and celebrate the cultural backgrounds and experiences of the students they serve. CPR members expressed a desire to create for students what was lacking for them—learning environments that are nurturing, inclusive, and engaging. Because the teachers reported that they felt invisible to their school communities and felt devalued and unmotivated during math class, they were clear about wanting different experiences for their students. Teachers understand the importance of creating and sustaining nurturing learning environments. Their belief that creating classroom environments that valued students' cultural identities resulted in teacher actions that build students' ability to persevere and not engage in what I term "*give-up-itus"* when students are struggling to learn or relearn key math concepts and teachers are trying to teach differently.

As the school leader, I was interested in increasing the use of math protocols across all classrooms. I believed that encouraging an inquiry teaching and learning stance that focuses on initiating student ownership for generating learning through academic discourse opportunities was paramount to the goal. We identified three critical actions: helping support teachers to create safe classroom environments for students to share their thinking; encouraging teachers to model thinking practices focused professional development and planning; and moving teachers'

participant stance from hierarchical—teacher designed and controlled—to teacher-facilitated to move toward student-to-student discourse and responsibility (Blanks, 2010). However, this shift would require more time to institutionalize the practice across all classrooms.

Beliefs Become Actions Through Intentional Planning

Throughout the entire PAR project, teachers' instructional practices changed; however, the changes have not become institutionalized. While the teachers voiced strong beliefs in not repeating the non-supportive practices they experienced as students, they remained inconsistent in the transfer from beliefs to actions. Though teachers identified inclusive and engaging practices as supporting students of color, they did not always practice what they valued. Data collected across all cycles of inquiry indicated that teachers did change some practices; these changes were particularly informed by data from the observation rounds in PAR Cycle Two. However, unlearning some beliefs takes time, and some practices are resistant to change. Teachers continued to use traditional practices while engaging students in math including continuing to rely too heavily on direct instruction for math procedures rather than providing opportunities for students to engage with conceptual models. In other words, teachers continued to teach as they were taught. However, when they planned more intentionally, they taught differently.

During the implementation stage of the PAR Cycles, participants articulated the importance of ensuring that math lessons included strategies for supporting students of color. Teachers understood that they needed to plan lessons that included activities to help students fully engage and participate in mathematics discourse and small group discussions. Collaborative teacher planning focused on increasing talk moves, calling on strategies, questioning form and

level, and analyzing observation data to determine how teachers used selected strategies during instruction.

In observations during the PAR Pre-Cycle, I documented teaching practices that were varied and lacked uniformity. For example, some upper elementary classrooms were arranged in traditional rows and engaged students in whole-group instruction throughout the entire classroom lesson. In one of the four classrooms (25%), there was no student-to-student engagement and no turn and talks through mathematics activities; in the other classrooms, on average, there were fewer than three opportunities to engage in peer-to-peer math discussions. The only talking students engaged in was when the teacher asked questions to individual students and they responded, or questioned the entire class; at times, a choral response was expected. Sharing the data with teachers after observations led teachers to reflect on teaching practices and explicitly plan instruction that included more opportunities for student-to-student talk and limited teacher-to-student talk. According to Teacher A, “After discussing the selective verbatim notes I could see in black and white, I actually asked and answered questions and never let students talk” (Teacher A, October 29, 2022). She did not realize that she was dominating her classroom talk, not asking questions or posing math problems that students could discuss, and not giving the students time to think (Reflection notes, October 29, 2022). One-way teacher-to-student engagement represents the traditional classroom of the past; teachers ask a question, receive a response from an individual student or students, and the teacher evaluates the response. This pattern is a common dialogue structure coined by Cazden (1988) as the initiation/response/ evaluation (IRE), a default pattern of classroom interactions. This teacher-student interaction marginalizes students' opportunities to engage mentally and orally in understanding mathematics deeply.

Teachers realized they needed to plan for more rigorous questions to engage students in academic discourse and discussions. To address the limited occurrence of authentic student-to-student engagement during the first round of observations, I guided teachers to familiar strategies from teaching reading. However, to migrate these practices to math lessons required a reset for teachers and students. I reintroduced the Project I^4 framework to ground our discussions in increasing student dialogue (see Figure 11). Teachers expressed interest in understanding the importance of revoicing, a term with which they were unfamiliar. Revoicing is not repeating what students say. Revoicing occurs when a teacher paraphrases a student response and then uses that response to form the next question. Because the teacher does not repeat what a student says (unengaging), revoicing increases the likelihood that students engage with each other because the teacher poses another question for students to consider.

Teacher L reflected,

> I recognized I was revoicing just about everything students say, and I began to think about why. It's easy to slip into the habit of repeating… and I think I do this because I want to make sure students have heard each other's ideas. I know sometimes revoicing is a powerful talk move for that purpose but I'm also starting to think about how revoicing can rob students of their voice. If the goal is to get students to talk to, listen to, and value each other's ideas and thoughts then I need to plan for when I should use revoicing. (Teacher L, Reflection, February 13, 2023)

Another CPR member reflected, "It can be like saying, your idea isn't good enough, until it's come through me, the teacher. That's what we want to minimize, right?" (Teacher F, Post-observation conversation, February 13, 2023).

ACADEMIC DISCOURSE (AD) Teacher-Generated----------Teacher Initiated and Facilitated----------Student Generated			
Academic Task	• **Designer:** Teacher-designed, directed & controlled • **Cognitive Demand:** Typically low	• **Designer:** Teacher-initiated & facilitated • **Cognitive Demand:** Medium to high, teacher-facilitated	• **Designer:** Teacher and student collaboratively-designed & facilitated • **Cognitive Demand:** High cognitive demand
Protocols and Questioning	• **Teacher Role:** Teacher-designed questions; teacher-controlled protocols • **Underlying focus:** Often compliance & behavior-driven; concerned with pacing & fidelity • **Primary interaction relationship**: Teacher-to-student; often pseudo-discourse • **Calling on strategies**: Typically raised hands; limited use of strategies for equitable access • **Level of questions**: Often recall and the application questioning levels with few questions at higher cognitive levels	• **Teacher Role:** Teacher-initiated, including encouraging student-to-student dialogue • **Underlying focus:** Student understanding and teacher use of student experiences • **Primary interaction relationship**: Teacher-to-student, with teacher encouragement of student-to-student & small groups • **Calling-on strategies**: Designed for equitable access of all students • **Level of questions:** Attention to higher cognitive level questions, including synthesis and creativity	• **Teacher Role:** Coaching students as facilitators; warm demander & strong student relationships • **Underlying focus:** Encouraging more student-facilitated groups • **Primary interaction relationship:** Student-to-student • **Calling on strategies:** Primarily student-generated questions & student-to-student interaction • **Level of questions:** Higher level questions that elicit creative responses & authentic problem-solving
Dialogue	• **Teacher role in questioning:** All questions by teacher; posed for short responses; teacher often looking for right answers • **Teacher-to-student dialogue**: Typically one-way dialogue and with a subset of students • **Student responses:** Inaudible and short; often repeated by teacher or ignored if "wrong answer"; teacher often repeats student responses	• **Teacher role in questioning:** Most questions generated by teacher; questions range: recall to analysis • **Teacher-to-student dialogue:** Focusing on extensions ▪ Teacher asking for elaboration & clarification ▪ Teacher requesting support for ideas ▪ Student paraphrasing encouraged ▪ Student questions encouraged • **Student responses**: Often recorded by students or teachers; equitable access for student responses; complex thinking and interactions in teacher-student interchanges; multiple student ideas or solutions considered; paraphrasing of student responses encouraged	• **Teacher role in questioning**: Collaboratively generated • **Teacher-to-student dialogue:** Primarily coaching; focusing on probing questions for deeper learning • **Student responses**: Student-to-student dialogue, often initiated by students; student-driven conversations; built on and challenging ideas of other students; ideas supported with evidence, often co-generated

Note. (Source: https://education.ecu.edu/projecti4/resources/).

Figure 11. Agency participant stance for engaging in academic discourse.

Though not consistent across all classrooms, when teachers planned for and implemented protocols, teachers engaged students in academic discussions during mathematics instruction which was a shift in their practice.

Wait or Think Time Increases Student Engagement

Teacher talk moves, coupled with meaningful wait time for students to think about their responses to questions, which should be longer for students of color, provide more opportunities for engagement. Teachers must create a safe environment for students to share their thinking. Teachers must model wait/think time and provide questions and opportunities for students to practice (Blanks, 2010). Data from each cycle indicated an increase in the use of wait time as well as increases of student-to-student talking. Therefore, as indicated in the framework, our planning focused on moving teachers' participant stance from hierarchical —teacher designed and controlled— to teacher-facilitated to move toward more student-to-student discourse and responsibility. In other words, I was interested in incorporating wait/think time and marrying it with talk moves, thereby moving academic discourse and inquiry teaching and learning from teacher control to the students to generate learning through discourse opportunities. After post-observation discussions, modeling, and a commitment to implementation, this shift appeared in classrooms. For example, I documented the shift in think time use in two ways. I tallied occurrences for the number of times teachers gave students time to process and respond (positive think time) and the number of times no think time occurred (negative think time). In the first observation for the three teachers, I documented fewer than seven instances of think time across the four classrooms. By the third observation with the teachers, they increased the number of instances for think time to 36. Think time is a fundamental process for supporting equitable student dialogue (Budd, 1986; Lyman et al., 2023).

Wait/Think Time is a valuable vehicle as it provides students time to process, formulate ideas, and consider strategies. In addition, as culturally responsive practitioners, implementing wait time sets high expectations for student math discourse (Blanks, 2010; Budd, 1986; Lyman, 2022). In the first set of observations, a teacher stated, “I thought I didn't have time to add wait time into lessons. I feel pressured to get through as many lessons as possible and wait time was a commodity I did not have” (Teacher L, February 13, 2023). When teachers plan for partner and small group sharing after think time, student engagement increases because the student has an opportunity to rehearse a response with a peer. Wait time is a best practice and a strategy that teachers must explicitly incorporate into classrooms to give students processing time to consider the questions and mentally rehearse (Hammond, 2015).

After participation in regular month CPR meetings, observations followed by post-observation conversations, and professional readings on wait time, evidence from three cycles of inquiry suggested that most teachers in this study began to implement wait and think time to increase students’ academic discourse as a part of their daily instructional routines. Collaboratively, teachers planned and asked questions or posted math problems then asked students to think about their responses. Blurt outs and quick responses decreased significantly and thoughtful responses from more students increased. For example, during PAR Cycle One, Teacher M (October, 2022), asked questions and called on students who raised their hands, waiting an average of two to five seconds. By the end of PAR Cycle Two, Teacher M reflected on the value of think time, increasing student discourse:

> I realized that if I asked a question and called on the first student who raised their hand, I would let the other students off the hook, they would wait on the students to answer and not engage in the learning process. I began to talk to my fourth graders about giving them

> time to think and I modeled it aloud for the students. Little by little, blurt outs were minimized and more students began to participate. At first I felt like no one was going to say anything. I had to learn to be ok with "awkward silence." That doesn't happen so much now though. As soon as one student starts talking, the floodgates seem to open and then everyone begins to volunteer. Then the problem becomes allowing all responses…that's a good problem to have. (Teacher M, Post-observation conversation, March 2023)

By the end of PAR Cycle Two, evidence from classroom observations showed that in each of the five teachers' classrooms their instructional practice increasingly included wait and think time. Implementing this protocol supported equitable teaching and learning which, in turn, supported culturally responsive practices that more fully engaged African American learners to engage in discussion (Boykin & Noguera, 2011).

Collaboration for Changing Classroom Practices

Grissom et al. (2021) substantiates that the role of the principal as the lead teacher who fulfills the responsibilities of instructional leadership is crucial. The principal sets the conditions for shifting practices through conducting evidence-based observations and using data for post-observation conversations and establishes the conditions for a collaborative role with teachers. The process empowered CPR members to decide what changes to make. As a member of the CPR team and as the principal, my role was to observe math instruction, engage in post-observation conversation with teachers using coaching strategies, and support teachers to decide on actionable next steps. Since these observations were non-evaluative, teachers were encouraged to reflect candidly on their practice by taking ownership of the data, asking questions, seeking advice, and making strategic decisions about improvements.

When teachers take ownership of data, they decide what to change and act on the instructional changes needed in their classrooms. They learned that from each observation and decided what I should focus on for the next observation. Narrowing the focus for the observations provided teachers with a baseline for improvement. Data from the PAR Cycle One suggested that teachers focused on engagement strategies and question forms to increase student talk and promote classroom discourse. Evidence from PAR Cycle Two suggested that when teachers engaged in conversations with each other and with the principal, teachers supported and helped each other better understand current practices, make changes to classroom instruction, and create the conditions for more equitable outcomes for students. Evidence-based observations and post-observation conversations were contributing factors to refining practices to improve equitable academic discourse in the classroom.

Evidence-Based Observations

CPR members were familiar with low inference observations and data collected using selective verbatim to document teacher and student moves. What was significantly different in this study was evidenced-based observations during mathematics. Before conducting observations, we reviewed the specific focus of the observation. Teacher reflections of the process indicated that participants were overwhelmed by the amount of data but were encouraged by the objectivity the selective verbatim protocol provided and thus saw the value in using the protocol.

Baseline data collected during the PAR Pre Cycle provided the focus of PAR Cycle One observations; we specifically looked at the types of questions that were asked in the classroom as a whole CPR group. The data indicated a lack of rigor in our question level to students. During PAR Cycle One, I conducted three observations per teacher and focused on question level as a

vehicle to improve equitable academic discourse. Although the observation focus was on question level, the selective verbatim technique captured data related to rigor. During PAR Cycle Two, I conducted two rounds of observations, both focusing on question level, wait/think time and uses of turn and talk or think, pair, share discourse strategies. The CPR members' stated goal was to make sure that every student had the opportunity to talk to another student and answer rigorous math questions. By analyzing question levels, I could determine the level of rigor of the questions teachers asked students.

Post-Observation Conversations

Post-observation conversations were designed to be coaching sessions. While in the coaching conversations, I offered ideas, but the teachers determined the decision about next steps. The timeliness of the conversation was important, and I calendared each conversation to occur the day immediately after the observation. These conversations respond to two of the four recommendations in the Grissom et al. (2021) meta study on instructional leadership: "Engaging in instructionally focused interactions with teachers [and] facilitating productive collaboration" (Grissom et al., 2021, p. xiv) enhances teachers' professional learning by using data to improve their practices.

During the January 2023 CPR meeting, we decided to continue our focus on question level and calling forms to capture teacher strategies to engage students. The CPR group agreed that, by using the question-level tool, we could examine which students answered questions and engaged in discourse, whether students had opportunities to think and talk with each other, and how to ensure that students answered rigorous questions. The purpose of the conversations was to review the data and develop a plan that reflected any adjustment the data suggested. CPR

members discussed the levels of questions asked, the amount of wait time after asked questions, and if the questions provided students the opportunity to formulate thoughtful responses.

As the principal, I wanted to make teachers feel comfortable discussing their classroom data and reflecting on their practice. I asked open-ended questions both to encourage narratives and reflections by participants as well as to seek agreement on further actions and future directions. For example, in this post-observation conversation between a third grade teacher and me as the observer, the teacher reflects on what she learned from her targeted use of questions. Teacher L reflected,

> Having you read back the notes from the selective verbatim was eye-opening. You caught a lot of my questions and student answers. Your questions about student engagement helped me think about the questions I asked and the student responses. I really do appreciate your ideas and helping me think through my action plan and I'm really excited to implement these strategies in my classroom. (Teacher L, Post-observation conversation, February 13, 2023)

The reflection highlights the importance of collecting and discussing what Shane and Dugan (2021) term street data—the daily data available in all schools that we can use to make changes. Using the street data method allows teachers, principals, students, and school communities to look at on-the-ground data to inform iterative decisions about change efforts. What distinguishes PAR from other inquiry methods is the focus on teachers and leaders collecting and using iterative data through observations, gathering evidence and artifacts, and discussing classroom practice, as core practices are necessary steps in supporting teacher change. The changes are decidedly incremental; they represent a gradual shift in classroom practices, but,

as discussed, the change effort is not a straight line as teacher practices take time and integrating new practices—however committed teachers are to them—may be inconsistent.

However, the regular iterative conversations promote teacher shifts in practices toward increased rigor and thus build teacher skills and student engagement (Boykin & Noguera, 2011). School leaders intentionally and systematically help strengthen teacher practices into their instructional leader repertoire through focused interactions with teachers using evidence-based observation tools, engaging in reflective conversations, and facilitating productive collaboration and professional learning communities.

Rigor: Conceptual Understanding and Application

Between PAR Cycle One and PAR Cycle Two, teachers used the question form observation tool to examine ways to increase conceptual understanding and application, two aspects of rigor. All members agreed their teaching needed to include more opportunities for students to engage with conceptual models and to apply concepts to math problems. Evidence from both PAR Pre-Cycle and PAR Cycle One revealed teachers taught students procedural steps to solve math problems more than the other aspects of rigor. The focus was to plan math lessons to include more conceptual models to build students' problem solving repertoire.

Data collected during PAR Cycle Two indicated an increase across the four classrooms. During the first of the two observations, teachers used conceptual models seven times. In the second round of observations, there were nine occurrences of the use of conceptual models. For example, in Teacher L's classroom, she used three different conceptual models to teach multiplication: arrays, equal groups, and number lines (Observation, February 22, 2023). These data show a beginning improvement in practice.

I observed evidence for opportunities for students to apply learned concepts during PAR Cycle Two. In the eight observations, I observed one opportunity to solve problems using previously introduced math concepts. Teacher reflections indicated that they planned math assignments and types of questions asked on assignments that aligned to the application aspect of rigor. Teacher M reflected and said:

> I wanted to include opportunities for students to apply what they learned to math problems or two-step problems. I modeled a problem today in class with the students then gave them one to solve with their table partners…we didn't finish it but at least we started. (CPR meeting notes, March 15, 2023)

The CPR members decided that meeting once a week was a goal for continuing this work. By using evidence-based observations, we determined that we needed to continue to plan more opportunities for students to apply math learnings.

Conclusion

In detailing the PAR process, emergent themes, and study findings, I supported the intention I had for the theory of action: *If teachers participate in a professional learning community and effectively implement protocols during conceptual mathematics lessons, then teachers will equitably engage African American students in academic discourse to learn conceptual mathematics*. School leaders support teachers by creating conditions for teacher inquiry and facilitating communities of practice that lead to effective teacher collaboration and learning.

Through three cycles of inquiry in the PAR, I provided protected time and created the conditions for teachers' engagement through collaborative conversations focused on data collected during observations. Evidence to support claims began with asking teachers to reflect

on, share their early lived experiences as students of color, and discuss their beliefs about teaching math to the students of color we serve. While teacher practice is influenced by lived experiences, their teaching and learning practices do not consistently match their beliefs; however, we have developed a model of planning, observations, and post-observation conversations that supports teachers to change. During the PAR Pre-Cycle and PAR Cycle One, CPR members collaborated to use the positive and supportive aspects of their lived experiences, their beliefs, and their knowledge as a foundation for improvement. Teachers began to incorporate equitable engagement strategies and teaching practices to support student engagement in math, though this was inconsistent across the CPR members' classrooms.

I based the second finding—principal and teacher collaboration supports incremental change in instructional practices—on analysis of evidence-based observations and post-observation conversations. The school leader must conduct regular and iterative observations and engage in supportive conversations regarding improving practice if teachers are to shift and expand their teaching repertoires. Changes, even incremental changes, in teacher practice require that school leaders engage in intentional, focused, and intensive observation and conversations. Through this process, incremental shifts in teacher practice are possible.

In Chapter 7, I describe the implications for practice, policy, and research and reflect on my leadership and what I have learned as a leader

CHAPTER 7: DISCUSSION AND IMPLICATIONS

I have spent 34 years in education as a teacher, coach, and school leader, and I am still concerned about the same issue – how do we ensure the success of African American students so that they gain the necessary academic knowledge and skills that ensure a successful life as family members, citizens, and workers. The children I have encountered these many years live with stereotype threats that challenge their human potential (Steele, 2010) and too often think of themselves as inadequate and "not smart". Because I had the benefit of strong teachers who supported me as a child, I now claim agency and authority as a successful African American woman committed to ensuring the same possibility for the students in our schools. As I gained entry to the doctoral program and investigated the literature and re-committed myself to understanding the question of how we support our students, I grew in my understanding of how to systematically support teachers and the challenges they face. The teachers in our school have the same goals as I do for students. Through the PAR project and study, we collectively understand the kind of diligence required to fully support student learning, encourage perseverance, and not accept what I term "give-up-itis" from students.

In the PAR study, I examined the extent to which third, fourth, and fifth grade teachers implemented equitable instructional practices to engage African American students in academic discourse during conceptual mathematics instruction. I wanted to develop a professional development model to improve teaching practices in conceptual mathematics so that teachers would increase student engagement for African American students. By deepening teachers' understanding and use of equity-based protocols, the teachers developed their knowledge and skills in planning and implementing math lessons that provided more opportunities for access and rigor in their classrooms. I designed and facilitated the PAR process based on this theory of

action: If teachers participate in a professional learning community and effectively implement protocols during conceptual mathematics lessons, then teachers will equitably engage African American students in academic discourse to learn conceptual mathematics. The theory of action was essential to the school, our students, and the district's focus on equitable outcomes in mathematics for African American students. In Chapter 1, I identified the assets and challenges to focusing on conceptual mathematics, equitable instructional practices, and academic discourse.

Through an iterative process that involved creating conditions for teacher inquiry, supporting collaborative planning, developing a common understanding of equity-based instructional strategies, piloting and implementing methods for improving equitable academic discourse, observing classrooms using evidence-based protocols, conducting post observation conversations with teachers individually and as a group, and facilitating communities of practice we made incremental progress toward the intended outcome. To accomplish these goals we relied on the Community Learning Exchange protocols and processes that have substantially changed the way I approach my role as a school leader.

The context of the PAR project and study was an urban northern California elementary school. The school’s vision is linked to reframing the question -- "how smart is the child?" to "how is the child smart?" The school’s mission is to implement programs that are academically rigorous and ensure that all students are thriving - academically, socially, emotionally, and physically. To support the goals, the teachers in the PAR study agreed to investigate ways to improve math instruction, open their classrooms to observation, collaborate with each other, learn in public, and reflect on their practices. Consequently, teachers in the study leaned into the moral imperative of improving teaching and learning and access and rigor in their classrooms

(Boykin & Noguera, 2011; Kajander, 2020), reprivatized their teaching practices (Stoll & Seashore Louis 2007) and shared their learning with other teachers in the school to build collective capacity (Grissom et al., 2021). As a group, they exemplified the attributes of a professional learning community (PLC) -- a focus on learning, collective inquiry into best practice and current reality, a commitment to continuous improvement, and an action orientation to learn by doing (DuFour et al., 2010; Yurkofsky et al., 2020).

I completed the PAR research project over a 16-month period, which included completing a Pre-Cycle and PAR Cycles One and Two. In Table 11, I summarize the PAR activities that supported efforts to improve teacher practice to co-design conceptual mathematics lessons and implement instructional practices that promote equitable access and rigor in math classrooms. In the Pre-Cycle, I focused on engaging CPR and CLE members in activities that deepened collegial trust, supported collaboration and cooperation and encouraged teacher reflection. Activities during the Pre-Cycle focused on understanding and applying equitable strategies to support students of color in mathematics. I engaged the CPR members in activities that helped provide a protected, safe and public space to share and learn and facilitated the professional development activities for the CPR members.

Throughout the study, participants' shared experiences and reflections fostered change. Teachers are more likely to trust one another to participate in genuine conversation, promote equity through collaboration, decide on the adjustments they need to make, and implement those changes in their classrooms if they have substantial experience in the procedures required for changing classroom practices. As a leader, I wanted to create conditions to support the successful implementation of classroom protocols and practices in math. I focused on building teachers' individual and collective capacity. In my role as an equity leader, I provided space for

Table 11

Key Activities: Three PAR Cycles of Inquiry

Activities	PAR Pre-Cycle Spring 2022 (Jan-Apr, 2022)	PAR Cycle One Fall 2022 (Aug-Oct, 2022)	PAR Cycle Two Spring 2023 (Jan-Apr 2023)
Meeting with CPR members (n=9)	**	***	****
Community Learning Exchange (n=3)	*	*	*
Classroom Observations (n=12)	**	**	********
Coaching Conversations with CPR members (n=9)	*	****	****
Conversations with ECU Professors (n=14)	***	*****	******

conversation at a deep level of reflection and action. In our meetings, we used CLE protocols to provide direction for our conversations with each other. Secondly, I maintained consistent CPR meetings, classroom observations focused on implementing equitable protocols, post observation conversations, and reflections to check all teachers' levels of understanding throughout the PAR study. In summarizing the PAR findings, I connect the findings to the extant literature. Then, I share conclusions to connect the findings to the research questions. As a result of the findings, I developed a framework for helping upper elementary teachers shift their practice by implementing equitable instructional strategies including varying question types, using wait time to increase student responses, and fostering student ownership of discussions to change teacher practices for upper elementary students of color. Then, I discuss the implications of the PAR project on practice, policy, and research. Finally, I reflect on my professional growth as a school leader.

Discussion

In examining PAR findings, I reviewed sources from the original literature review and new sources that expanded my understanding of the emerging themes and findings. The PAR findings are:

1. Teachers' lived experiences, perceptions, and knowledge influence their current instructional practices.
2. Principal and teacher collaboration supports incremental changes in instructional practices.

After examining the two PAR findings in relation to the extant literature, I present a framework for change that consists of five key components to change mathematical teaching practices.

Lived Experiences Shape Teaching

Throughout three iterative cycles of inquiry, CPR members engaged in a professional learning community (PLC) that supported their individual and collective experiences, beliefs, and teaching practices for engaging upper elementary students of color in equitable mathematics practices. The PAR project and study focused on teachers who were female learners of color as students. I believe the influence of teachers' social, academic, and accumulated life experiences or funds of knowledge play a significant role in shaping their current instructional practices and are thus an important part of the findings (Moll et al., 1992; Monzó & Rueda, 2003).

The evidence supports the findings that teachers' early learning experiences—positive and negative—as students of color, shaped their pedagogical methods when structuring learning for students. Based on their experiences and their knowledge about teaching practices, CPR members identified their beliefs about teaching in CPR meetings, observations, post observation conversations, and reflections. Their teaching practices often demonstrated what they had learned from their experiences and provided a common understanding for the teachers. However, at times during the observations, their traditional experiences shaped what they did in classrooms, despite their knowledge and beliefs about good teaching and learning.

The collective teachers' ecology of knowing (Guajardo et al., 2016) defined them as female students of color in their educational settings. Their personal experiences, educational journeys, individual upbringings, cultural backgrounds, and interactions with students and colleagues spanned the micro, meso, and macro and shaped them as teachers. Each CPR member noted unsupportive and negative math experiences throughout their educational career. They reflected on how their teachers often overlooked their funds of knowledge; they often felt invisible in math classrooms. CPR members shared their desire to create math classrooms

responsive to the needs of their diverse student populations. They could state definitively that they believed in the opportunity for all students to succeed and were particularly interested in ensuring that students of color had access and rigor (Boykin & Noguera, 2013). As a result, the team collectively identified goals for their students that match what we know about strong teaching for math (Boaler, 2016; Smith & Stein, 2011; Stein et al., 2009) and culturally responsive practices for African American students (Berry, 2020; Delpit, 2012).

1. Teachers should provide opportunities for students to engage in discussions with each other when learning mathematics.
2. Teachers should teach students engagement strategies and incorporate them into their classrooms. The strategies include wait/think time, varying question types and question stems, think-pair-share, and partners and small groups.
3. Teachers should ensure students have multiple opportunities to engage with conceptual models and design tasks that are rigorous and engage students in productive struggle.
4. Teachers should provide students of color with the opportunity to explain and justify their math reasoning.

CPR members' beliefs and experiences about effectively engaging students of color emerged in the PAR Pre-Cycle and were apparent throughout the study. For example, after completing the math journey line activity, participants clearly identified effective instructional practices that supported them as early learners and others that did not support them and they wanted to change for their students. They noted these strategies as necessary: use culturally responsive practices that promote and teach routines and expectations, model and create equitable calling on strategies, use question types that encourage multiple problem solving

strategies, and teach math conceptually using manipulatives (CLE artifact, November 2021). During our final CPR meeting, Teacher L reflected,

> I have learned a lot, about myself and about how to help students learn math. Thank you for you sticking with the project, giving us books and articles to read we were able to discuss together with each other and that opened me up…you never told us what to do even when we asked you what to do. At the end of the day, we learned with and from each other and I think I know more about math instruction in my tenth year than I ever learned (Teacher L, March 22, 2023).

During CLE activities, I recognized CPR members' different beliefs, experiences, and knowledge. Each member exhibited a combination of unique cultural experiences and what each had learned by navigating the culture of the American education system. The teachers' experiences were representative of others educated in traditional public schools—classrooms with students seated in individual rows, teacher-centered whole group instruction, Eurocentric curriculum, and limited opportunities for student discourse. CPR members wanted to disrupt the "grammar of schooling" a concept that refers to the traditional and structured approach to education, often characterized by standardized curricula, rigid classroom routines, and hierarchical teacher-student relationships (Tyack & Cuban, 1995). However much they wanted to disrupt the established practices and methods that have been ingrained in the educational system for many years, at times they reverted to the very practices they disdained.

As we progressed through PAR Cycle One, teachers began to enact practices based on their beliefs and knowledge. Each teacher transferred learning to classroom instruction based on what we discussed in our CPR meetings and post-observation conversations; however, at other times, they reverted to practices that were more traditional. Cuban (2012) terms this process

dynamic conservatism; for a time teachers do change, but they often relapse or go back to the entrenched practices they experienced as students and used as teachers. During PAR Cycle Two, the teachers' practices became more consistent as they engaged in both site-based and district-mandated professional learning for the newly adopted math curriculum. However, the district-led virtual professional learning reinforced the banking method of education and modeled traditional pedagogical strategies that were not productive for learners. I facilitated site- based professional learning to provide a counterbalance and incorporate the best practices teachers had identified. Although the meso and macro factors were in alignment with the local school initiatives, the professional learning opportunities provided to teachers were lacking in the necessary protocols required to effectively implement best practices for students. Though teachers' practices began to shift, the changes were incremental and uneven across all classrooms. Teachers often make sense of reforms differently from researchers which can adversely affect the quality of implementation (Cohen & Ball, 1990; Spillane & Zeuli, 1999) Incremental change makes reform manageable for teachers, even when organizational structures of district, school, and classroom contexts under which they work are constraining. Incremental change does not require teachers to make sense of entirely new ideas about instruction but rather to understand small innovations in practices that they already rely upon heavily (Star, 2016). Daily teaching practices in schools, along with external pressures such as societal norms and cultural beliefs, do not always value teachers' of color unique experiences nor utilize their funds of knowledge, and they are not listed in any teacher manuals for them to use (Moll et al., 1992; Ralabate & Nelson, 2017; Tyack & Cuban, 1995). These experiences influence how teachers respond to changes, how the changes materialize in their classrooms, and how their knowledge of and skill for implementing culturally responsive teaching practices (CRT) manifest.

First, the CPR members were students of color and had substantial experiences with teaching practices that did not include culturally responsive teaching (CRT) (Tredway et al., 2019). As a result, they felt strongly that they wanted to include practices that valued the culturally diverse identities of their students; they discussed how they could better incorporate the essential aspects of CRT in classroom instruction to support equitable teaching practices. CPR members were committed to implementing changes that were resistant to the standard "grammar of schooling," including any mandates deeply rooted in the political agendas and state and local mandates (Bolman & Deal, 2009; Tyack & Cuban, 1995).

Rather than revert to familiar teaching habits, the teachers demonstrated the ability to actualize their beliefs about how to teach and what strategies support students of color. They viewed their experiences of being taught in traditional rows, lectures, and *drill-and-kill* methods as ineffective. During initial observations conducted during the PAR Pre-Cycle, I noted that teachers' classroom environments were organized in 1 group of four to six students for small group discourse. However, though the organization of the classroom supported a student-student discourse stance, instruction was heavily teacher-led which stifled students' ability to "share ideas, clarify understanding, construct convincing arguments, and develop language" (NCTM, 2014; Tredway et al., 2019). Teachers were exhibiting behaviors of culturally responsive behaviors toward students (see highlighting on Figure 12). They had deep relationships with students and families and used their knowledge of African American culture to interact with students and develop curriculum that was responsive to the cultural experiences of the students. While they were not yet fully inclusive in their level of practice, they were, at minimum, moderately inclusive. They affirmed students' identities and were aware of cultural lenses as they "created an environment that is socially safe for learning" (Hammond, 2015, p. 17).

CULTURALLY RESPONSIVE PEDAGOGY
Highlighted elements represent teacher practices

	Minimally Inclusive----------Moderately Inclusive----------Fully Inclusive		
Culturally Responsive Practices	• R**elationships:** Superficial and focused on work completion and behavior modification • **Personal identity of students:** Superficially recognized although generally not connected to culture • **Teacher disposition:** Focus on treating all students the same • **Content: "**Neutral"; limited attention to culture and language • **Background and prior knowledge:** Limited and surface level use of student experiences & background. • **Cultural view/use:** Attention to food, flags & festivals • **Culture and classroom:** Culture of the classroom norms - white middle-class behaviors and learning processes • **Culture and community** : Often seen as deficits for students of color; instruction designed to overcome deficits	• **Relationships:** Intentional relationships built & sustained with some students but not all • **Personal identity of students:** Cultural & linguistic identity celebrated but infrequently integrated into learning context • **Teacher disposition:** Relationship often determined by teacher's level of empathy for particular student situations. • **Content:** Conscious of CRP content and processes • **Background and prior knowledge:** Tapping prior & background knowledge support for learning; cultural & linguistic prior knowledge activated • **Cultural view/use:** Diversity celebrated in general but sometimes viewed as a challenge. • **Culture and classroom**: Cultivated to use as starting points for students to engage • **Culture and community:** Culture & community often celebrated but seen as a challenge; connections with community focused on overcoming challenges	• **Relationships** Deep relationships with students and families • **Personal identity of students:** Identities validated as unique perspectives on content; integrated into the learning experience • **Teacher disposition:** Warm demander; fully accommodating individual learning profiles • **Content:** Community-focused with intentional connections to student experiences • **Background and prior knowledge:** Content & practice internalized/embedded in relationships; student knowledge socially constructed • **Cultural view/use:** Fully integrated into classroom; students viewed as social activists with important roles in their communities • **Culture and classroom:** Multiple perspectives integrated in learning experiences as students engage with deeper and more complex content • **Culture and community:** Culture and community identity of students seen as assets

Note. (Tredway et al., 2019).

Figure 12. Elements of culturally responsive pedagogy exhibited by teachers.

However, in terms of creating the conditions for equitable academic discourse, most teachers were in a teacher-generated stance at the outset of the study, and most moved to teacher-facilitated (see highlighting on Figure 13), but that movement was inconsistent. The teachers exhibited balanced care and push for students, but they did not always fully embrace the tenets of Hammond's (2015) Ready for Rigor recommendations: "make space for student voice and agency, build classroom cultures around communal (sociocultural) talk, [or] teach students cognitive routines to process content" (Hammond, 2015, p. 17). While teachers practiced some strategies to address inequitable access, typically these lessons were teacher-facilitated and provided ineffective student access and limited rigor; the students answered teacher-generated questions when asked with little thought or wait time. While these practices may have a place in teaching, overall, they inhibited the implementation of effective instructional practices. CPR members' experiences as students of color were helpful in identifying what to do; however, their actual practices initially hindered the implementation of effective students' access to mathematics content (NCTM, 2014; Rabalate et al., 2017). I am reminded of how difficult change is and how teachers can articulate what to do, but consistently implementing new practices and cognitive and accountable talk routines is difficult. They engage in what Cuban (2011) terms dynamic conservatism—teachers will try something new for a while, but often return to practices that are long embedded from their schooling and teaching experiences CPR members wanted their strong beliefs and knowledge to automatically transfer into culturally and linguistically responsive teaching practices that support math discourse. However, change is rarely that simple. The evidence suggested that the teachers needed support from the school leader for them to consistently change practices. As a result, the teachers did shift toward the end of PAR Cycle One. Although the changes were incremental and at times inconsistent, they did

ACADEMIC DISCOURSE (AD)

Source: Tredway et al. (2019) *Framework of Classroom Learning and Practice.* After more consistent leader observations and conversations, teacher shifted some practices, represented by green highlighting

	Teacher-Generated----------	**Teacher Initiated and Facilitated--------**	**Student Generated**
Protocols and Questioning	• **Teacher Role:** Teacher-designed questions; teacher-controlled protocols • **Underlying focus:** Often compliance & behavior-driven; concerned with pacing & fidelity • **Primary interaction relationship**: Teacher-to-student; often pseudo-discourse • **Calling on strategies**: Typically raised hands; limited use of strategies for equitable access • **Level of questions**: Often recall and the application questioning levels with few questions at higher cognitive levels	• **Teacher Role:** Teacher-initiated, including encouraging student-to-student dialogue • **Underlying focus:** Student understanding and teacher use of student experiences • **Primary interaction relationship**: Teacher-to-student, with teacher encouragement of student-to-student & small groups • **Calling-on strategies**: Designed for equitable access of all students • **Level of questions:** Attention to higher cognitive level questions, including synthesis and creativity	• **Teacher Role:** Coaching students as facilitators; warm demander & strong student relationships • **Underlying focus:** Encouraging more student-facilitated groups • **Primary interaction relationship:** Student-to-student • **Calling on strategies:** Primarily student-generated questions & student-to-student interaction • **Level of questions:** Higher level questions that elicit creative responses & authentic problem-solving
Dialogue	• **Teacher role in questioning:** All questions by teacher; posed for short responses; teacher often looking for right answers • **Teacher-to-student dialogue**: Typically one-way dialogue and with a subset of students • **Student responses:** Inaudible and short; often repeated by teacher or ignored if "wrong answer"; teacher often repeats student responses	• **Teacher role in questioning:** Most questions generated by teacher; questions range: recall to analysis • **Teacher-to-student dialogue:** Focusing on extensions ▪ Teacher asking for elaboration & clarification ▪ Teacher requesting support for ideas ▪ Student paraphrasing encouraged ▪ Student questions encouraged • **Student responses**: Often recorded by students or teachers; equitable access for student responses; complex thinking and interactions in teacher-student interchanges; multiple student ideas or solutions considered; paraphrasing of student responses encouraged	• **Teacher role in questioning**: Collaboratively generated • **Teacher-to-student dialogue:** Primarily coaching; focusing on probing questions for deeper learning • **Student responses**: Student-to-student dialogue, often initiated by students; student-driven conversations; built on and challenging ideas of other students; ideas supported with evidence, often co-generated

Note. (Tredway et al., 2019).

Figure 13. Elements of academic discourse exhibited by teachers.

confirm our collective understanding of how we can become more coherent in our approaches to achieve more consistent results.

Collaboration to Shift Classroom Practices

Principal and teacher collaboration that supported incremental changes in instructional practices was a vital component of teachers' ability to shift practices. As principal, I conducted regular observations and post-observation conversations and facilitated CPR meetings for groups of teachers; as a result of these leader-facilitated experiences, teachers incrementally changed their practices. However, some changes were more complex than others for teachers, and I noted that teachers often reverted to prior and largely ineffective practices. Change requires that teachers are intentional and reflective over time until a new practice is "second nature;" therefore, teachers often need extended time to feel as if the change is permanent. Because we discussed these instances of reverting to past practices in post-observations and in CPR meetings, we developed a collective awareness of the practice and made strides in addressing the inconsistency; but we will need to remain committed and intentional if we want the practices that were more effective for student learning to become a part of the teachers' permanent repertoire.

We learned in the initial finding that CPR members' experiences as female students of color deeply influenced their teaching behaviors. During the course of the PAR project and study, teacher beliefs about how to effectively teach students of color aligned to changes in math instruction. These changes were supported at the institutional level. With consistent principal support through affirming their beliefs, professional development, observations, CPR and CLE collaborations, and equitable discourse strategies, CPR members made incremental changes in planning and implementing equitable instructional protocols and math discourse opportunities, turning their beliefs into actions (Stein et al., 2008).

The principal's role as an instructional leader is indeed essential in shifting teaching practices within a school or educational institution. The meta-analysis of Grissom et al. (2021) on effective instructional leadership posits that the role of the principal as an instructional leader can be delineated into three distinct components. First, the principal must redirect the emphasis of instruction from teaching to learning. Second, the principal must establish collaborative structures and processes that facilitate teacher cooperation and enhance instructional quality. Finally, the principal must ensure that professional development is continuous and aligned with the school's objectives within a professional learning community (Lunenburg & Irby, 2006). These recommendations comport with recommendations from Yurkovsky et al. (2020) for managing continuous and effective improvement:

- Grounding improvement efforts in local problems or needs;
- Empowering practitioners to take an active role in research and improvement;
- Engaging in iteration, which involves a cyclical process of action, assessment, reflection, and adjustment; [and]
- Striving to spur change across schools and systems, not just individual classrooms (p. 404).

This leader's role involves actively guiding, supporting, and shaping the instructional methods and approaches used by teachers to improve student learning outcomes by working individually and in professional learning and translating the learning to the full school. For example, during my observations in PAR Cycle Two, I noted that teacher practices shifted from fixed and ingrained practices to equitable practices that supported students to access culturally responsive instruction.

Principal Support for Observations

When I changed the ways I conducted observations—shifting from checklists and general feedback to evidence-based observations and post-observation conversations—teachers improved practices (Tredway & Militello, 2023). I observed teachers in their classrooms using selective verbatim (Gall & Acheson, 2013) and had conversations with them about their practices using the tenets of the effective conversation guide: use evidence, develop an opening question, avoid feedback and coach, and support teachers to decide about change based on the evidence (Tredway et al., 2019). During post observation conversations, CPR members discussed how to improve practices based on evidence from the classroom observations. I guided them to make decisions about incremental changes. CPR members stated that they were more likely to transfer beliefs into practice when supported by the school leader. "Having a collegial relationship with the principal and engaging in observations that are non-evaluative is better than having PD and then being sent off by myself to figure stuff out and get it done" (Teacher L, CPR reflection, October 27, 2022).

While teachers may draw on their educational experiences to some extent to inform their teaching, they need to be aware that, despite their desires, they may teach in the same way they were taught. Cuban's (2011) research suggests that even when new approaches are introduced, teachers' deeply ingrained habits and past experiences can influence how they ultimately teach in the classroom. Principals, as instructional leaders and equity warriors, play a crucial role in evidence-based observations and effective post-observation conversations. In previous years, my observations and conversations focused on observing student behaviors; for the CPR project and study, I shifted to observing and improving teacher practices as teacher practices often are predictors of student behaviors. In addition, I realized that past observations were subjective,

filled with conjectures, opinions, and judgments that did not lead to sustained changes in practice (Tredway et al., 2021).

Throughout the PAR Pre-Cycle and PAR Cycles One and Two, I engaged in evidence-based observations. I collected low-inference or observable data using selective verbatim that focused strictly on what was said and heard in the classroom. We used the data from those observations to collaboratively engage in conversations about practice. As Grissom et al. (2021) confirmed, one of the four domains of leadership that informs teacher practice that leads to improved student learning is "engaging in instructionally focused interactions with teachers" (Grissom et al., 2021, p. 58), including observations and data-driven instruction. I used evidence-based observations specifically designed to foster equitable access, rigor for determining calling-on practices, and questioning levels. By collecting data through selective verbatim evidence on teachers' questioning levels and calling on practices, we addressed teaching practices, access, student engagement, and rigor throughout the process. These tools are useful in meeting teacher needs as they improved teachers' questioning and equitable calling on skill levels. With the tools, we examined the classroom activity using specific evidence from the classroom observation to assess rigor (type and use of question level) or access (calling on and other engagement strategies). When we focused on the question type and calling on strategies, we intentionally refined techniques used in the classroom to provide a more equitable environment that promoted discourse and engagement. After the observations, the teachers and I discussed the qualitative evidence collected; each teacher decided on a change that she wanted to implement, and I repeated the observation and conversations process. These observations became the substance of our collective learning.

Principal Support for Collective Teacher Learning

Just as the research acknowledges the role of beliefs and life experiences teachers bring into the classroom, it further confirms that the leader can shape them into the teachers they will become by attending to adult learning principles (Drago-Severson, 2009; 2012; Knowles, 1990) and holding space for teacher collaboration that is non-judgmental and encourages teachers to learn in public. To sustain change over time, teachers need to engage in teacher social networks over extended periods. As Coburn et al. (2012) found in their study of teacher networks, "social networks with combinations of strong ties, high-depth interaction, and high expertise enabled teachers to adjust instruction to new conditions while maintaining the core pedagogical approach" (p. 137). A supportive network facilitated by a school leader can lead to continuous improvement and sustained change. To mitigate teacher missteps during the improvement process, I used CPR meetings to facilitate teacher support of each other, aid in developing the social network of mutual accountability, and shift practices. Principals impact student achievement by improving teacher effectiveness (Coburn et al., 2009; Yurkofsky, 2020). To improve instruction in the classroom, highly effective principals must engage in conducting classroom observations, lead professional development sessions, and create opportunities for teachers to learn from one another (Branch et al., 2012; Louis et al., 2010; Supovitz et al., 2010).

In this PAR study, while I focused on collecting, analyzing, and reflecting on teacher instructional practices in mathematics through evidence-based observations designed to assess equitable access in observed classrooms, I also recognized that a critical factor was sharing the observations in the CPR group. Waters et al. (2003) outlined leadership practices and the work of principals that influence teacher and instructional quality—fostering shared beliefs and a sense of community, cooperation, and collaboration involves teachers in the design and implementation

of important decisions and provides teachers with professional development necessary for the successful participation in co-learning. I provided opportunities for teachers to share beliefs and collaborate on classroom observation data, increasing teacher commitment to implementing equitable instructional strategies.

For example, based on the observation data, teachers observed the immediate effects of their changed classroom instruction by identifying the type and level of questions they were asking in the classroom and the length and depth of student discourse generated during the observation. By being specific about what we wanted to improve and measure, we co-identified teacher areas of improvement and discussed strategies that teachers could implement based on the observation data and post observation conversations. As a CPR group and individually, we collectively identified the inequities in classroom instruction, such as lack of student engagement, lack of think time, and lack of rigor in the question level. For example, during my initial observation in Teacher A's classroom, only four out of 29 students spoke; three boys and one girl answered questions. Two boys and the girl were not African American, though the total number of African American students was 25. In other words, only one African American student spoke. After viewing the data, Teacher A made the decision to intentionally plan assignments in class that required all student voices. Teacher A began to regularly use the notice and wonder protocol to allow students individual think time, then she used the think-write-pair-share to ensure that all students in the class were talking to each other. When Teacher A asked students to share, she paired students at their table groups using a numbering system to make sure all students had the opportunity to speak to another student, while she circulated and listened before calling on a student to answer a question. I regularly observed this instructional

strategy in three of the four CPR members' classrooms and, when they shared their experiences as a group, the discussions fortified them to continue.

Thus, using common tools supported co-constructed teacher learning which was mediated by social and material factors—interactions among teachers and common tools (materials) for use and discussion (Ahn et al., 2021; Gromoll et al., 2022; Wong et al., 2021). Common tools act as material and social mediators of learning. As teachers became familiar with the tools, they had new materials or technical approaches that supported their learning and, as the teachers co-constructed meaning socially, the common tools gave them a focus for conversations. The professional conversations we had helped the CPR team build a professional vision of equitable instructional practices that would support students of color in classrooms. The focus on common practices led to dialogue and collaborative learning. For example, CPR member Teacher L. used observation data and post observation conversations to reflect on the types of math problems she asked students to solve. Teacher L realized through the observation data and conversation with peers that they relied heavily on problems that did not require students to demonstrate their thinking or problem solving strategies. She asked recall questions during instruction that focused on rote memorization. To change her practice, she intentionally planned rigorous math problems for students to solve and provided conceptual models to assist them in their problem solving.

These examples provide evidence of what Boykin and Noguera (2011) emphasize about the intentionality necessary for planning and implementing equity, access, and rigor for all students. As I facilitated the meeting and discussion, I was practicing the CLE axiom "conversations are vital and central to pedagogical strategies" (Guajardo et al., 2016, p. 30). Learning becomes meaningful when staff utilize protocols during professional learning; stay

focused on teaching and learning; and have open and honest conversations with each other to improve their practice. Wise and Jacobo (2010) describe how teachers can change when leaders change the format of meetings, attend staff development with teachers, and become co-learners by observing and engaging in conversations with teachers. In this way, they are modeling exactly what they want to occur in classrooms—student and teacher reciprocal learning.

A principal can foster the conditions for deep reflection and learning—praxis—in which a teacher can take risks to change their practice; powerful conversations can occur when we establish collaborative agreements, recognize a need to change, and celebrate growth. By utilizing protocols—personal narratives, reflecting on practice, and setting the meeting "table" —each CPR member had an opportunity to discuss, feel valued, and feel heard, invaluable when showing how pivotal these conversations are with each other (Drago-Severson, 2012). Any real effort to make substantive, systemic change must begin with conversations in schools that blame no one and deconstruct established practices. Change must have leadership that asks smart questions and leadership that creates opportunities for conversation (Smith, 1994).

Leaders who trust teachers to use street data to make informed decisions are working from within (Grubb & Tredway, 2010; Safir & Dugan, 2020). I changed as a leader, and teachers built their capacity to improve practice, making a commitment to change individually and collectively. When leaders act in ways that engage teachers as collaborators in addressing dilemmas of practice, they fully engage in the change work. Teachers must be key contributors in the design process of new instructional practices (Woo & Henriksen, 2023). If teachers are told what to do and are excessively monitored, there is little improvement (Ingersoll, 2003). As a result, the CPR team developed a more coherent approach to teaching and learning, our meetings became focused, and our goals became clear and aligned (Elmore, 2004).

Framework for Change

As a result of this PAR project and study, I developed a framework for supporting teacher change and the implementation of equitable instructional protocols and practice changes. Figure 14 represents the framework for changing teaching practice based on the PAR project and study. To address teacher practice and promote equity, we engaged in focused learning. In this case, the focus was on equitable practices in the classroom. As an equity leader focused on improving teacher collaboration and equitable practices in the classroom, I used improvement sciences, specifically the PDSA cycle of inquiry, to structure a collaborative learning environment for the CPR members and change teaching practices to become more equitable (Bryk et al., 2015). I engaged in leadership moves that occurred through intentional planning, use of data, and publicly reflecting and sharing experiences.

The first goal was to provide support in uncovering teachers' funds of knowledge (Moll et al., 1992). Understanding how their experiences and beliefs could connect to their teaching practices provided an anchor for our collaborative team to draw on assets, diagnose, and co-design a support system (Spillane, 2013). As members of the CPR group, we shared common goals, supported each other, learned together, and deepened trust. Furthermore, encouraging transfer to classroom practice required incremental support to teachers through data-driven observations and post-observation discussions (Grissom et al., 2021b). Teachers were able to increase access and rigor by using observation data which guided teachers to make changes to equitable practices, math instruction, and academic discourse in the classroom. Teachers also co-constructed equitable engagement strategies that pushed them to intentionally plan and facilitate math learning for students.

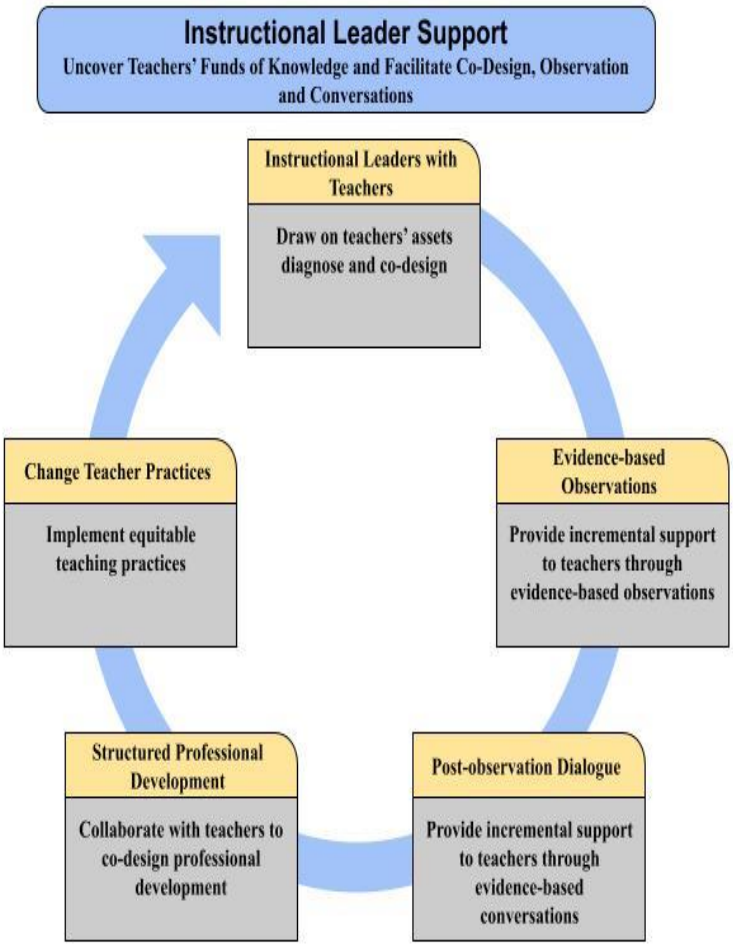


Figure 14. Framework for changing teacher practice to promote equitable academic discourse.

I concentrated on equitable practices, teacher learning, and reflection as a leader who sought to create culturally responsive upper elementary school teachers. The low inference notes and observational data helped CPR members examine their practices more clearly and critically and thereby decide to use practices that are more equitable and modify their engagement strategies, calling-on, talk-move strategies, and classroom structures. As a result of the classroom evidence, we co-created professional development that addressed the needs of the teachers as they implemented best practices and improved instruction, another of the Grissom et al. (2021) recommendations.

The framework takes advantage of being grounded in interactions of the CPR members and creating a community to uncover their experiences and beliefs to help anchor the work. Having an instructional leader that is equipped with tools to conduct effective evidence-based observations is the stimulus. The post-observation conversation supports the leader and the teacher to analyze and reflect on the data to determine the assets and challenges of teaching practices. Furthermore, post observation conversations were critical to promoting transfer to classroom practice. The combination of leadership, professional learning, and examining teacher practice led to changed practices in the classroom to improve equitable instructional practices and increases in academic discourse.

Re-Examining Research Questions

The overarching question guiding this study was: How do third, fourth, and fifth grade teachers effectively implement protocols during conceptual mathematics lessons to equitably engage African American students in academic discourse? The sub-questions were:

1. To what extent do teachers effectively collaborate and plan the use of protocols during conceptual math lessons for African American students?

2. To what extent do teachers implement culturally responsive instructional practices to equitably engage African American students during mathematics?
3. To what extent did the process of engaging in collaborative observation and post observation conversations support changes in instructional practices during math?
4. How did the process of facilitating the development of classroom teachers to build their capacity to implement culturally responsive instructional practices in math class affect my role as an instructional leader?

Over eighteen months, a group of Co-Practitioner Researchers (CPR) met regularly and engaged in professional learning. We read and discussed *Principles to Action: Ensuring Mathematical Success for All,* a publication from the National Council of Teachers of Mathematics (NCTM, 2012) as an anchor text. In our professional learning community, CPR members reflected on practices and research. Teachers needed to co-construct their collective understandings in this group. While they can often describe what to do, they do not always know how to implement what they know about best practices. I facilitated professional development (PD) through cycles of inquiry using the PDSA improvement science (Bryk et al., 2015). I supported professional learning with post observation conversations and reflective memos to create understanding and generate meaning regarding culturally responsive strategies to support academic discourse in mathematics. I facilitated monthly CPR meetings by establishing gracious space, cultivating relationships, and reflecting on teaching to change practices. Through low inference, selective verbatim observations and post observation conversations, we co-created meaning and understanding of how to implement equitable instructional practices in teachers' classrooms. The focus on question type and level and engagement strategies increased the number of higher-level questions in classroom observations.

Secondly, the influence of how teachers' beliefs and experiences affect the implementation of equitable teaching practices adds to Cuban's (2013; 2021) work on school reform. He describes what happens in classrooms as a "black box," largely unknown and lacking documentation and transparency about the complex mechanics and inter-relationships that occur daily in schools and classrooms and thus make it tough to unpack and understand. Cuban (2011) suggests that reform efforts are introduced to advance what teaching should be without initially comprehending how teachers teach and have been teaching. We have found that teachers' lived experiences combined with funds of knowledge as students of color directly influence how they teach in their classrooms. These teaching practices are a combination of traditional methods and practices they were exposed to as early learners, such as teacher-centered whole group instruction. These experiences became a part of the funds of knowledge, shaping teaching practices. According to social cognitive theory, learning occurs in a social setting with a dynamic interaction between the learner, their environment, and their behavior. In this study, we know that teacher collaboration works, participants are shaped by their environment, and when they are active participants they can become agents of change. What still needs to be researched is how leaders facilitate and make teacher collaboration possible and how teachers decide to lean into and commit to reform work and persist in change efforts (Cuban, 2011).

Implications

The findings and conclusions are specific to the context of BH Elementary School, in an urban Title I district in the bay area in Northern California. However, the study may offer implications for other districts, educators, policymakers, and researchers in similar areas. The framework offers a systematic way for the school leader, as equity leader, to promote teacher change through establishing a collaborative professional learning model that focuses on the

attention to the learning for teachers and building teacher capacity. A strong professional learning model, coupled with evidence-based observations that provide specific data for teachers about instructional practices and meaningful post observation conversations, can lead to teacher practices that improve equitable engagement and increased academic discourse; this outcome is possible if the school leader facilitates the process in a way that supports teachers as learners and decision-makers. The importance of the process should not be understated and was crucial to the PAR project and study. Even if teachers agree on what needs to be done, they do not always apply it to their work. In addition, being told what to do rarely works for adult learners (Drago-Severson, 2012). For incremental change to occur, every group needs to engage in this research process and invest in the preparation work necessary to build collegial trust and define common practices and, though the changes are sometimes slow, the durable results are worth the time.

The study has specific implications for instructional practices, both teachers' equitable instructional practices for students of color and the school leader's role. Secondly, the study has implications for policy, particularly at the district level. Finally, more research on the connection between teachers' lived experiences and how they teach is necessary.

Practice

The PAR findings highlight promising implications to practices for leaders, teachers, and schools. As a result of participation in this PAR, CPR members developed their skills and understanding of equitable instructional and academic discourse practices in math classrooms. The findings emphasize what influences teachers' decisions about instruction, how they actually improve teaching practices, and the pivotal role of the school leader. The CPR members' abilities and knowledge of equitable instructional practices to address conceptual mathematics knowledge and involvement in math discourse opportunities for upper elementary students of color have

improved due to their participation in this PAR. By grounding the conversations in what the teachers knew to be best practices based on their lived experiences as students of color, they could recognize the connection between their beliefs and their classroom practices. As a result, they began to restructure the classroom environment to be more conducive to student-to-student interactions. Thus, the school leader's role is significant as the leader must create and maintain a practice of iterative observations and post observation conversations that help teachers as they transfer their beliefs into intentional effective practices (Sullivan & Glanz, 2013). The leader needs to facilitate professional learning based on the readiness levels of the teachers.

The PAR findings offer a framework for changing teacher practices that leaders and teachers can adapt to their school and district levels. The findings demonstrate that teachers have lived experiences, beliefs, and knowledge about practices that influence their teaching. The improvements in practice are a result of the consistent involvement of the instructional leader in drawing out teacher funds of knowledge and experiences as an anchor for change, evidence-based observational practices, frequent collaborative post observation conversations, and facilitated professional learning. The framework that delineates the four components of changing mathematics teaching practices could influence teaching practices. In particular, it is critical to use of evidence-based observations, post-observation dialogue that includes leader coaching and guidance coupled with teacher decisions, and structured professional development.

Policy

The PAR was designed to address a specific equity challenge—the lack of opportunities and access to equitable engagement with conceptual math models, rigorous math tasks and academic conversations in the classroom for African American students. These concerns for equitable instructional practices and academic discourse opportunities for students of color are a

national, state, and local district challenge. District policy implementation recommendations include providing professional development at the administrator level in evidence-based observations, using data from observations to inform practice, listening to and engaging in post observation conversations with teachers from a coaching stance about changing practice, and implementing an effective professional learning model to strengthen teacher learning. The district regularly engages in administrator walk-throughs, and closely monitors instructional and observation data, which have not been identified as useful to improving student outcomes (Grissom et al., 2013); however, the use persists. The district provides little professional development to administrators in mathematics and typically the form of professional learning does not include attention to equitable academic discourse. The district does not provide input to administrators on how to use data from observations to guide teacher changes. Districts must establish protocols for principals to use that are evidence-based and grounded in low inference data about teacher instruction rather than in opinions and judgments. Principals need professional learning in how to use observation data to guide teacher change. These recommendations support changes at the meso level and can alter the way teachers view observations and professional learning from administrators.

Secondly, local schools and districts must provide the necessary resources to implement an effective professional learning model that allows teachers to have time to collaborate, observe, converse, and reflect. When schools and districts put structures in place to support teacher learning and collaboration, teachers build their capacities and the capacity of their colleagues, which in turn supports them all to make intentional changes to their practice. Districts and schools can support teacher efforts to change by providing suitable structures for success.

Research

As a result of this PAR study, I introduced practitioners to a hands-on approach to making decisions and improving teachers' implementation practices. During the study, I engaged participants in Community Learning Exchange (CLE) axioms and activist research using improvement science principles to develop a qualitative study that tested the following principles: make the project problem-specific and user-centered; accelerate improvement through networked communities of practice (CoP); develop an iterative improvement process and respond to teacher understandings; believe in the power of conversation; and honor local wisdom. Through the use of CLE axioms and processes, we used improvement science to facilitate learning and anchor our practice improvement in inquiry (Bryk et al., 2015).

The research project and study contributed to the literature in all these areas through a school-based project with a small group of teachers. A PAR approach that uses iterative evidence to make decisions can help practitioners collect, analyze, and improve school and district practice through this process. We can act as activist researchers committed to including others to solve challenges with equitable instructional practices and increasing academic discourse for students of color at the school level by engaging in inquiry cycles focusing on observation data and reflecting on data to determine instructional next steps (Hale & Napier, 2013; hunter et al., 2013). More school level research by practitioners who are closest to the work is necessary to better inform school communities.

A second research recommendation would be to look more closely at the relationship between how teachers' funds of knowledge from their educational experiences as students of color influence their teaching practices. In this study each teacher's funds of knowledge contributed to their evidence-based practice. There are multiple studies on students' funds of

knowledge and their importance in the educational setting; however, we need more research focused on how education systems influence the funds of knowledge of teachers of color and how those funds transfer into teaching practices. Additionally, a research recommendation would be to look more closely at how utilizing post observation conversations supports teacher change to practice. Administrators have long been urged to give feedback to teachers, but that feedback has not consistently resulted in changed practice. Still, more studies on using evidence-based observations and using observation data to have conversations are necessary so that those practices become the standard.

Some additional research questions that I would offer to future researchers because of this study include:

1. How can teachers capitalize on students' funds of knowledge for improving student engagement while reflecting on their own?
2. How do you prepare administrators to provide evidence-based observations to teachers to provide specific data for improvement?
3. How do post observation conversations affect teacher practice when teachers receive evidence-based observation data?
4. To what extent can a group of Co-Practitioner Researchers promote change for an entire school community focused on the implementation of equitable instructional practices including academic discourse in mathematics?
5. How can practitioners create a professional learning model that results in more equitable teaching and learning practices?

Limitations

Several limitations may have impacted the study. First, I acted as both the lead researcher in the study and the co-practitioners' evaluator in my role as the principal and instructional leader of the school where the research was conducted. 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 three improvement cycles spanned eighteen months, yet we needed additional time to see the full effects of observation conversations on practice. During PAR Cycle Two I had difficulty in observing and conducting CPR and CLE meetings effectively because of a teacher strike, which halted the study temporarily, and the exigencies every school faced because of COVID.

Another limitation was the size of the study. I focused on the practices of four female upper elementary teachers of color whose classrooms were majority African American. Thus, the findings are not specifically replicable. Other limitations include biases the CPR team or I held. I combated this through research with the help of the CPR team. As a team, members planned, implemented, and reviewed the CPR/CLE agenda and actions, allowing multiple perspectives and voices to inform the CPR work.

A final limitation of the PAR was the selection of participants for the study. The selection of participants was not random. I wanted to partner with the upper elementary teachers and, because I have an influential role within the school as principal and lead evaluator, I needed to ensure that all participants gave informed consent without coercion. The CLE methodology builds on the belief that all participants have the wisdom to share and deserve a voice in solving the problem of practice (Guajardo et al., 2016). Thus, while these data were helpful to

participants and the school, the generalizability is perhaps only useful for similar schools (Lincoln & Guba, 2000).

Leadership Development

As I reflect on my growth as a leader through this PAR project, I return to the summer of 2019 when I became a part of the first Project I^4 Cohort. As a member of the cohort, I learned about researcher-practitioners and their role in research. I learned about the CLE axioms which provided a foundation for my leadership work as I set out to complete the PAR study. The CLE axioms provided a foundation for my understanding as I embedded them in the PAR work. I understood them more clearly as a foundation of my leadership work. These became my values as I learned to enact them in new ways throughout the PAR study (Guajardo et al., 2016):

1. Learning and leadership are dynamic social processes; the CPR group participated in a community of practice, building on each other's strengths through personal narratives and authentic listening.
2. Conversations are critical, and central pedagogical processes became evident as participants shared stories and understandings of promoting equitable instructional practices to increase academic discourse in the classroom.
3. The people closest to the issues are best situated to solve problems and uncover answers; the CPR group collaborated to figure out how to incorporate conceptual models and increase rigor in mathematics classrooms across the school.
4. Crossing boundaries enriches development and the educational process as we co-construct knowledge to address equitable practices.

5. Hope and change are built on the assets and dreams of locals and their communities; teachers, over three iterative cycles of inquiry, made incremental changes to their practice.

I came to this research as principal, knowing the CPR and CLE members would have to adjust to my role as the lead practitioner. In addition, I started this research as someone who understands the principles of conducting adult professional development. While these were both assets to my research, they did not prepare me for the authentic, collaborative process I engaged in or the personal and professional growth I experienced throughout the process.

As a result of this learning and research project, I became a stronger practitioner-researcher and a better school leader. Through the adoption of these axioms, I became a better teacher facilitator. Although I had learned to conduct classroom observations and give teachers feedback about what I thought they needed to do, this did not always result in changes to teacher practice. Throughout this process, I learned the power of engaging in conversations to guide teachers as they reflected and decided on changes. The incremental process was, at first, a challenge, but, as I observed the changes in their practices, I found that the teachers were then proponents and leaders of change in the school. This is the definition of distributed leadership—harnessing the knowledge and skills already distributed among the teaching staff to diagnose and design reform efforts (Spillane, 2013).

In the PAR process, I re-examined my leadership. In working with teachers as a co-practitioner, I have become better at meeting people at their readiness levels and providing the tools and support to stretch their ideas, strengths, weaknesses, and dreams rather than providing answers (Drago-Severson, 2012; Vygotsky, 1978). The PAR taught me to collaborate with those closest to the problem, ask tough questions, and co-construct solutions. Letting those who are

committed to the work do the work is a CLE axiom, and now I more fully understand the meaning of *those closest to the issue are best situated to solve their local concerns*. Even though the CPR and CLE members agreed to be a part of the project and believed in improving mathematics instruction for students of color, I quickly learned that beliefs do not equate to change in practices. As the leader, in my first meeting, I thought the CPR members would be comfortable talking, collaborating, brainstorming, and learning. I realized that even though the teachers and I interacted daily, they were unsure of the time commitment and whether it would interfere with their day-to-day teaching and planning.

Over the 18 months, I noticed that I did less talking and more listening and notetaking and acted as a facilitator of teacher learning, modeling exactly what teachers should do in the classroom. This was a major shift in my leadership because, as a professional developer, I am used to doing most of the talking and problem solving and fixing. However, as the participants initially continued to look to me for answers, I realized I needed to assure them that they were the experts in their classrooms and that I was a practitioner working with them to improve practice. These shifts in my practice changed the dynamics from a leader to a collaborator. Through active listening and understanding, I learned to ask reflective questions that lead the CPR and CLE members into deeper discussions. As a practitioner, I was guided by data, not opinions, judgments, or subjective perceptions. In this process, I took an active role in changing myself as a leader and the conditions in which I lead.

As I began this process, I already realized the value and importance of relationships and believed that good relationships were sufficient in changing teaching practices. Socio-emotional learning has been a strength of mine. However, I soon realized that to have a successful CPR group willing to make changes, I had to deepen the relationships I had already established with

teachers. I utilized strategies from gracious space, personal narratives, and protocols I learned from district-mandated monthly principal professional learning. The challenge for me was to avoid letting the friendships I had already established with the CPR members color my ability to observe objectively and ask reflective and probing questions to hone in on improving math instruction. Aguilar (2018) describes the importance of leaders to "cultivate connections, understanding, and relationships for members of a community" (p. 34). Principals and teachers working together as a team are better positioned to identify areas for improvement and implement effective strategies for school development and growth. I used these ideas as a baseline for establishing relationships among the group members. I knew what I wanted to see from the PAR project, but I also knew that, in working with a group of co-practitioners, I needed to bring them to a level of common understanding that would result in change for their practice. I did not want to move too quickly, believing that teachers were ready when they were not. The PAR process required me to slow down, reflect, and take my time to ensure the next step was the right step for the team. Expediency may be easier, but moving slowly to go far is more effective

Through this PAR process, I have found my voice as a leader, as a true change agent, and as an equity warrior. This journey taught me that although we could know the research behind teaching practices and effectively identify best practices, we still found it difficult to implement and change practices. During this research study, I shifted the focus from principal as leader to teacher practitioners as leaders. The next steps must include the school community as leaders, change agents, and equity warriors.

Looking back, I realize I had very little leadership preparation or coaching prior to becoming a principal. Much of what I learned as principal came from listening to other school leaders and reading about the principalship. Leadership in a school is far different from

leadership in action. While I understand that building relationships and connecting with the stakeholders is a critical part of being a leader, I have to acknowledge that a true leader in education will not be hindered by ineffective policy, lack of resources, or one-sided partnerships to determine what is best for students, no matter their ethnicity, color, or zip code. I intend to go on making good and necessary trouble for the benefit of the students and families we serve.

Conclusion

As an instructional leader, I have never shied away from the demands of the principalship. Being a Black woman in leadership can be challenging. Inequality is built into the principalship. As a Black leader, I have learned to fight differently, or tread lightly, so I do not get labeled an angry Black woman. With time to reflect and think, I have learned that my thoughts, ideas, and opinions matter. I have learned that I have an obligation to my students, their families, my staff, other school leaders, and the district I work in to speak up and expose the inequity and inequality I see; I must fight for equity. As I continue my leadership journey, I aim to ensure that teachers have a voice in diagnosing the problems of practice and have the space to be reflective practitioners alongside the instructional leader as we co-design solutions (Spillane, 2013). I must continue to do the heavy lifting of equity in education. This equity work is not only in the school that I have direct influence over but also in policy, practices, and resources that have the potential to impact students of color everywhere. I am "strong, balanced, and unafraid" (Mitchell, 2018, p. 153). I am an equity warrior.

During this journey, through collaboration, mindfulness, personal narratives, and reflection, we learned to trust one another and our collective knowledge. By better understanding the problems we seek to address, we can change how teachers plan and implement equitable instructional practices for students of color. By making incremental changes, we acknowledge

that being a student of color should not be a hurdle, and we must improve equitable instructional practices one classroom and one school at a time. We know what to do; we need the skill and will to act on behalf of children and families as an act of liberation.

> *There is no such thing as a neutral educational process. Education either functions as an instrument which is used to facilitate the integration of the younger generation into the logic of the present system and bring about conformity to it, or it becomes the practice of freedom—the means by which men and women deal critically and creatively with the reality and discover how to participate in the transformation of their world.*
>
> –Freire, 1970

REFERENCES

Aguilar, E. (2018). *Onward: Cultivating emotional resilience in educators.* Jossey Bass.

Aguirre, J. M., & del Rosario Zavala, M. (2013). Making culturally responsive mathematics teaching explicit: A lesson analysis tool. *Pedagogies: An International Journal*, *8*(2), 163-190.

Ahn, I., Chiu, M., & Patrick, H. (2021). Connecting teacher and student motivation: Student-perceived teacher need-supportive practices and student need satisfaction. *Contemporary Educational Psychology*, *64*, 101,950. doi:10.1016/j.cedpsych.2021.101950

Akiba, M., & Liang, G. (2007). Effects of teacher professional learning activities on student achievement growth. *The Journal of Educational Research*, *109*(1), 99-110.

Allen, B. A., & Boykin, A. W. (1992). African-American children and the educational process: Alleviating cultural discontinuity through prescriptive pedagogy. *School Psychology Review, 21*(4), 586–596.

American Psychological Association. (2019). *Publication manual of the American Psychological Association* (7th ed.). American Psychological Association.

Anderson, R. (2007). Being a mathematics learner: Four faces of identity. *The Mathematics Educator*, *17*(1), 7–14.

Auerbach, C. F., & Silverstein, L. B. (2003). *Qualitative data: An introduction to coding and analysis.* New York University Press.

Ball, D. L., Hill, H. C., & Bass, H. (2005). Knowing mathematics for teaching: Who knows mathematics well enough to teach third grade, and how can we decide? *American Educator*, *29*(1), 14–46.

Bambrick-Santoyo, P., Peiser, B., & Lemov, D. (2012). *Leverage leadership: A practical guide to building exceptional schools*. Jossey-Bass.

Berry III, R. Q. (2020, February). *How do we help teachers teach math to black kids?* https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Robert-Q_-Berry-III/February-2020/

Berry III, R. Q., Thunder, K., & McClain, O. L. (2011). Counter narratives: Examining the mathematics and racial identities of Black boys who are successful with school mathematics. *Journal of African American Males in Education, 2*(1), 10-23.

Berry III, R. Q., Ellis, M., & Hughes, S. (2014) Examining a history of failed reforms and recent stories of success: Mathematics education and Black learners of mathematics in the United States. *Race Ethnicity and Education, 17*(4), 540-568.

Berwick, D. M. (2008). The science of improvement. *The Journal of the American Medical Association, 299*(10), 1,182-1,184.

Birch, S. H., & Ladd, G. W. (1997). The teacher-child relationship and children's early school adjustment. *Journal of School Psychology, 35*(1), 61-80.

Boaler, J. (1998). Open and closed mathematics: Student experiences and understandings. *Journal for Research in Mathematics Education, 29*(1), 41–62.

Boaler, J. (2002a). The development of disciplinary relationships: Knowledge, practice and identity in mathematics classrooms. *For the Learning of Mathematics, 22*(1), 42–47.

Boaler, J. (2002b). *Experiencing school mathematics: Traditional and reform approaches to teaching and their impact on student learning.* Erlbaum.

Boaler, J. (2002c). Learning from teaching: Exploring the relationship between reform curriculum and equity. *Journal for Research in Mathematics Education, 33*(4), 239-258.

Boaler, J. (2005). The 'psychological prison' from which they never escaped: The role of ability grouping in reproducing social class inequalities. *FORUM, 47*(2&3), 135-144.

Boaler, J. (2006). Opening their ideas: How a de-tracked math approach promoted respect, responsibility and high achievement. *Theory into Practice, 45*(1), 40-46.

Boaler, J. (2016). *Mathematical mindsets: Unleashing student potential through creative math, inspiring messages, and innovative teaching.* Jossey-Bass.

Boaler, J., & Greeno, J. (2000). Identity, agency and knowing in mathematics worlds. In J. Boaler (Ed.), *Multiple perspectives on mathematics teaching and learning* (pp. 171–200). Ablex Publishing.

Boaler, J., & Staples, M., (2008). Creating mathematical futures through an equitable teaching approach: The case of Railside school. *Teachers' College Record, 110*(3), 608-645.

Bolman, L. G., & Deal, T. E. (2009) *Reframing organizations, artistry, choice, and leadership.* Jossey-Bass, Inc.

Bondy, E., Ross, D., Gallingane, C., & Hambacher, E. (2007). Creating environments of success and resilience: Culturally responsive classroom management and more. *Urban Education*, *42*(4), 326-348. doi:10.1177/0042085907303406

Borg, S. (2003). Teacher cognition in language teaching: A review of research on what language teachers think, know, believe, and do. *Language Teaching, 36*(2), 81-109.

Boykin, A. W., & Noguera, P. (2011). *Creating the opportunity to learn: Moving from research to practice to close the achievement gap*. ASCD.

Branch, G., Hanushek, E. A., & Rivkin, S. G. (2012). *Estimating the effect of leaders on public sector productivity: The case of school principals*. National Center for Analysis of Longitudinal Data in Education. https://www.nber.org/system/files/working_papers/w17803/w17803.pdf

Brewster, C., & Railsback, J. (2003). *Building trusting relationships for school improvement: Implications for principals and teachers.* Northwest Regional Educational Laboratory.

Bryk, A., & Schneider, B. (2003). Trust in schools: A core resource for school reform. *Educational Leadership, 60*(6), 40-44.

Bryk, A. S. (2010). Organizing schools for improvement. *The Phi Delta Kappan, 91*(7), 23-30. doi:10.2307/25655236

Bryk, A. S., Gomez, L. M., Grunow, A., & LeMahieu, P. G. (2015). *Learning to improve*: *How America's schools get better at getting better.* Harvard Education Press.

Chapin, F. S., Folke, C., & Kofinas, G. P. (2009). A framework for understanding change. In C. Folke, G. Kofinas, & F. Chapin (Eds.) *Principles of ecosystem stewardship* (pp. 3-28). Springer.

Caprara, G., Barbaranelli, C., Borgogni, L., & Steca, P. (2003). Efficacy beliefs as determinants of teachers' job satisfaction. *Journal of Educational Psychology, 95*(4), 821-832.

Caprara, G., V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of School Psychology, 44*(6), 473–490.

Cheliotes, L. G., Reilly, M. F., & Bailey, S. T. (2018). *Coaching conversations: Transforming your school one conversation at a time*. Corwin.

Chen, X. (2016). *Remedial course-taking at U.S. public two and four year institutions: Scope, experiences, and outcome.* U.S. Department of Education National Center for Education Statistics.

Cherng, H. Y. S., & Halpin, P. F. (2016). The importance of minority teachers: Student perceptions of minority versus white teachers. *Educational Researcher, 45*(7), 407-420.

Clark, L. M., Jill, N. D., Toya, J. F., Nishio, M., Campbell, P. F., Smith, T. M., Griffin, M. J., Rust, A. H., Conant, D. L., & Choi, Y. (2014). Teacher characteristics associated with mathematics teachers' beliefs and awareness of their students' mathematical dispositions. *Journal for Research in Mathematics Education, 45*(2), 246-284.

Coburn, C. E., Russell, J. L., Kaufman, J. H., & Stein, M. K. (2012). Supporting sustainability: Teachers' advice networks and ambitious instructional reform. *American Journal of Education*, *119*(1), 137–182.

Cooper, D. (1999). Urban school reform: Student responses to detracting in a racially mixed high school. *Journal of Education for Students Placed At-Risk, 4*(3), 259-275.

Copur-Gencturk, Y., Cimpian, J. R., Lubienski, S. T., & Thacker, I. (2019). Teachers' bias against the mathematical ability of female, Black, and Hispanic students. *Educational Researcher, 49*(1), 30–43.

Crawford, K. (2018, July 12). *When teachers think differently about themselves as math learners, students benefit.* Stanford School of Education. https://ed.stanford.edu/news/study-when-teachers-think-differently-about-themselves-math-learners-students-benefit

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Sage Publications.

Creswell, J. W., & Clark, V. L. P. (2007). *Designing and conducting mixed methods research.* Sage Publications.

Creswell, J. W., & Clark, V. L. (2011). *Designing and conducting mixed methods research*. Sage Publications.

Creswell, J. W., & Creswell, J. D. (2018). *Research design* (5th ed.). Sage Publications.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). Sage Publications.

Creswell, J. W., & Guetterman, T. C. (2019). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (6th ed.). Pearson.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Sage Publications.

Cross, C. T., Woods, T. A., & Schweingruber, H. E. (2009). *Mathematics learning in early childhood: Paths toward excellence and equity*. National Academies Press.

Cuban, L. (1984). *How teachers taught. Constancy and change in American classrooms, 1890-1980*. Longman.

Cuban, L. (2009) *Hugging the middle: How teachers teach in an era of testing and accountability*. Teachers College Press.

Cuban, L. (2011). *Data-driven instruction and the practice of teaching.* National Education Policy Center. https://nepc.colorado.edu/blog/data-driven-instruction-and-practice-teaching

Cuban, L. (2012). Why so many structural changes in schools and so little reform in teaching practice? *Journal of Educational Administration*, *51*(2), 109-125.

Cuban, L. (2021). *Confessions of a school reformer.* Harvard Education Press.

Cuban, L., & Tyack, D. (2018). Learning from the past. In E. B. Hilty (Ed.), *Thinking about schools* (pp. 59-67). Routledge.

Curry, M. (2008). Critical friends groups: The possibilities and limitations embedded in teacher professional communities aimed at instructional improvement and school reform. *Teachers College Record*, *110*(4), 733–774.

Darling-Hammond, L. (1998). Teachers and teaching: Testing policy hypotheses from a national commission report. *Educational Researcher*, *27*(1), 5–15.

Darling-Hammond, L. (2021). Defining teaching quality around the world. *European Journal of Teacher Education*, *44*(3), 295-308.

Delpit, L. D. (1995). *Other people's children: Cultural conflict in the classroom*. New Press.

Delpit, L. D. (2012). *Multiplication is for white people: Raising expectations for other people's children.* New Press.

Deming, W. E. (2000). *The new economics for industry, government, and education*. The MIT Press.

Doabler, C. T., & Fien, H. (2013). Explicit mathematics instruction: What teachers can do for teaching students with mathematics difficulties. *Intervention in School and Clinic*, *48*(5), 276-285.

Doabler, C. T., Baker, S. K., Kosty, D. B., Smolkowski, K., Clarke, B., Miller, S. J., & Fien, H. (2015). Examining the association between explicit mathematics instruction and student mathematics achievement. *Elementary School Journal*, *115*(3), 303–333.

Drago-Severson, E. (2012). *Helping educators grow: Strategies and practices for leadership development.* Harvard Education Press.

DuFour, R. (2004). What is a “professional learning community”? *Educational Leadership, 61*(8), 6-11.

DuFour, R. (2006). *Learning by doing: A handbook for professional learning communities at work.* Solution Tree.

DuFour, R., & DuFour, R. (2009). *Revisiting professional learning communities at work: New insights for improving schools.* Solution Tree Press.

DuFour, R., Eaker, R., & Many, T. (2010). *Learning by doing: A handbook for professional learning communities at work* (2nd ed.). Solution Tree.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology, 43*(6), 1,428–1,446. https://doi.org/10.1037/0012-1649.43.6.1428

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest: A Journal of the American Psychological Society, 14*(1), 4–58.

Dweck, C. S. (2015). Carol Dweck revisits the “growth mindset.” https://www.edweek.org/ew/articles/2015/09/23/carol-dweck-revisits-the-growth-mindset.html

Dweck, C. S. (2019). The choice to make a difference. *Perspectives on Psychological Science, 14*(1), 21–25.

Eddy, C. M., & Easton-Brooks, D. (2011). Ethnic matching, school placement, and mathematics achievement of African American students from kindergarten through fifth grade. *Urban Education*, *46*(6), 1,280-1,299.

Education Trust. (2002) *The education trust.* Retrieved from the Library of Congress, https://www.loc.gov/item/lcwaN0002394/

Egalite, A. J., & Kisida, B. (2015). The effects of teacher match on students' academic perceptions and attitudes. *Educational Evaluation and Policy Analysis, 40*(1), 59–81.

Elmore, R., & Burney, D. (1997). *Investing in teacher learning: Staff development and instructional improvement in community school district #2.* National Commission on Teaching & America's Future, Consortium for Policy Research in Education. (ED 416203).

Emdin, C. (2016). *For White folks who teach in the hood…and the rest of y'all too: Reality pedagogy and urban education.* Beacon.

Eubanks, E., Parish, R., & Smith, D. (1997). Changing the discourse in schools. In P. M. Hall (Ed.), *Race, ethnicity and multiculturalism policy and practice* (pp. 151-167). Garland Publishing.

Eyster L. S., & Tashiro J. S. (1997). Using manipulatives to teach quantitative concepts in ecology. *American Biological Teacher*, *59*(6), 360–364.

Ferguson, R. F. (2003). Teachers' perceptions and expectations and the Black-White test score gap. *Urban Education*, *38*(4), 460–507.

Fisher, D., Frey, N., Almarode, J., Flores, K., & Nagel, D. (2020). *PLC+: Better decisions and greater impact by design.* Corwin.

Fisher, D., Frey, N., & Almarode, J. (2019). 5 questions PLCs should ask to promote equity. *The Learning Professional, 40*(5), 44-47.

Fischer, K. W. (2009). Mind, brain, and education: Building a scientific groundwork for learning and teaching. *Mind, Brain, and Education, 3*(1), 3-16.

Freire, P. (1970) *Pedagogy of the oppressed*. Herder and Herder.

Gallagher, A., & Thordarson, K. (2018). *Design thinking for school leaders: Five roles and mindsets that ignite positive change*. ASCD.

Garmston, R. J., & Wellman, B. M (2013). *The adaptive school: A sourcebook for developing collaborative groups.* Rowman & Littlefield.

Gawande, A. (2011, September 26). Personal best: Top athletes and singers have coaches. Should you? *The New Yorker*, 44-53.

Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice*. Teachers College.

Gellert, L. M. (2013). Elementary school teachers and mathematics: Communities of practice and an opportunity for change. *Journal of Education and Learning, 2*(4), 113-122.

Gerdes, D. A., & Conn, J. H. (2001). A user-friendly look at qualitative research methods. *Physical Educator, 58*(4), 183-190.

Gholson, M., (2012, August 25). 'Federal grant funds study of Black students' learning in algebra'. Newswise. https://www.newswise.com/articles/federal-grant-funds-study-of-black-students-learning-in-algebra

Gholson, M. L., Bullock, E. C., & Alexander, N. N. (2012). On the brilliance of Black children: A response to a clarion call. *Journal of Urban Mathematics Education, 5*(1), 1–7.

Gholson, M. L., & Robinson, D. D. (2019). Restoring mathematics identities of Black learners: A curricular approach. *Null, 58*(4), 347-358.

Gholson, M. L., & Wilkes, C. E. (2017). (Mis)taken identities: Reclaiming identities of the "collective Black" in mathematics education research through an exercise in Black specificity. *Review of Research in Education, 41*(1), 228–252.

Glanz, J. (2005). *What every principal should know about instructional leadership*. Corwin Press.

Glanz, J., & Sullivan, S. (2013). *Supervision that improves teaching and learning: Strategies and techniques* (4th ed.). Corwin.

Gleason, S. C., & Gerzon, N. (2013). *The case for professional learning to support equity and personalization.* Corwin Press.

Gleason, S. C., & Gerzon, N. (2013). *Growing into equity: Professional learning and personalization in high-achieving schools.* Corwin Press.

Goffney I., Gutiérrez, R., & Boston, M. (2018). *Rehumanizing mathematics for Black, Indigenous and Latinx students*. National Council of Teachers of Mathematics.

Good, C., Aronson, J., & Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Journal of Applied Developmental Psychology, 24*(6), 645–662.

Goodwin, A. L. (2002). The social/political construction of low teacher expectations for children of color: Re-examining the achievement gap. *Journal of Thought, 37*(4), 83-103. Retrieved from JSTOR database, http://www.jstor.org/stable/42589722

Grant, M. R., Crompton, H., & Ford, D. J. (2015). Black male students and the algebra project: Mathematics identity as participation. *Journal of Urban Mathematics Education, 8*(2), 87-118.

Greeno, J. (2015). Classroom talk sequences and learning. In L. Resnick, C. Asterhan, & S. Clarke (Eds.), *Socializing intelligence through academic talk and dialogue* (pp. 290–299). American Education Research Association.

Grissom, J. A., Loeb, S., & Master, B. (2013). Effective instructional time use for school leaders: Longitudinal evidence from observations of principals. *Educational Researcher, 42*(8), 433-444.

Grissom, J. A., Egalite, A., & Lindsay, C. A. (2021). *How principals affect students and schools: A systematic synthesis of two decades of research*. The Wallace Foundation.

Gomoll, A., Hmelo-Silver, C. E., & Sabanovic, S. (2022). Co-constructing professional vision: Teacher and researcher learning in co-design. *Cognition and Instruction, 40*(1), 7-26.

Grootenboer, P., & Zevenbergen, R. J. (2007). Identity and mathematics: Towards a theory of agency in coming to learn mathematics. *Eurasia Journal of Mathematics, Science and Technology*, *1*(5), 335-344.

Grubb, N. (2008, April). *Narrowing the multiple achievement gaps in California: Ten goals for the long haul.* https://www.mydigitalchalkboard.org/cognoti/content/file/resources/documents/eb/ebfbdf82/ebfbdf82c7286e9ade697529b8789f97eecd2300/Grubb_Paper.pdf

Grubb, W. N., & Tredway, L. (2010). *Leading from the inside out: Expanded roles for teachers in equitable schools.* Paradigm Publishers.

Guajardo, M. A., Guajardo, F., Janson, C., & Militello, M. (2016). *Reframing community partnerships in education: Uniting the power of place and wisdom of people* (1st ed.). Routledge.

Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching, Theory and Practice, 8*(3), 381-391.

Gutiérrez, R. (2013). Why (urban) mathematics teachers need political knowledge. *Journal of Urban Mathematics Education, 6*(2), 7-19.

Gutierrez, R. (2013). The sociopolitical turn in mathematics education. *Journal for Research in Mathematics Education, 44*(1), 37-68.

Hale, C. R. (2008). *Engaging contradictions: Theory, politics, and methods of activist scholarship.* University of California Press.

Hale, C. R. (2001). What is activist research? *Items and Issues 2*(1), 13-19. Social Science Research Center.

Hale, S., & Napier, J. (2013). Research methods in interpreting. A practical resource. *Journal des traducteurs, 61*(485), 456.

Halverson, R., Kelley, C., & Kimball, S. (2004). Implementing teacher evaluation systems: How principals make sense of complex artifacts to shape local instructional practice. In W. K. Hoy & C. G. Miskel (Eds.), *Educational administration, policy, and reform: Research and measurement* (pp. 153-188). Information Age.

Halverson, R., & Kelley, C. (2017). *Mapping leadership: The tasks that matter for improving teaching and learning in schools*. John Wiley & Sons.

Hamm, J. V., & Faircloth, B. S. (2005). Peer context of mathematics classroom belonging in early adolescence. *The Journal of Early Adolescence, 25*(3), 345–366.

Hammersley-Fletcher, L., & Orsmond, P. (2004). Evaluating our peers: Is peer observation a meaningful process? *Studies in Higher Education, 29*(4), 489-503.

Hammond, Z. L. (2015). *Culturally responsive teaching and the brain*. Corwin Press.

Hargreaves, A. (1994). *Changing teachers, changing times: Teachers' work and culture in the postmodern age*. Teachers College Press.

Harper, F. K. (2019). Collaboration and critical mathematical inquiry: Negotiating mathematics engagement, identity, and agency. *Occasional Paper Series, 41*. https://educate.bankstreet.edu/occasional-paper-series/vol2019/iss41/5/

Hattie, J. (2008). *Visible learning: A synthesis of meta-analyses relating to achievement*. Routledge.

Haycock, K. (2001). Helping all students achieve: Closing the achievement gap. *Educational Leadership, 58*(6), 1-9.

Hawley, W. D., & Valli, L. (2007). Design principles for learner-centered professional development. In W. D. Hawley (Ed.), *The keys to effective schools: Educational reform as continuous improvement* (pp. 117-138). Corwin Press.

Hendry, G. D., & Oliver, G. R. (2012). Seeing is believing: The benefits of peer observation. *Journal of University Teaching & Learning Practice, 9*(1), Article 7.

Henfield, M., Owens, D., & Moore, J. (2008). Influences on young gifted African Americans' school success: Implications for elementary school counselors. *The Elementary School Journal, 108*(5), 392-406.

Herr, K., & Anderson, G. L. (2014). *The action research dissertation: A guide for students and faculty*. SAGE Publications.

Hiebert, J., & Grouws, D. A. (2007). The effects of classroom mathematics teaching on students' learning. In F. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 371-404). Information Age.

Hiebert, J., & Wearne, D. (1993). Instructional tasks, classroom discourse, and students' learning in second-grade arithmetic. *American Educational Research Journal, 30*(2), 393-425.

Hirsh, S. (2009). Rich learning opportunities exist in a tough economy. *The Learning Professional, 30*(3), 57.

Hinnant, J., O'Brien, M., & Ghazarian, S. (2009). The longitudinal relations of teacher expectations to achievement in the early school years. *Journal of Educational Psychology, 101*(3), 662-670.

Hogg, L. (2011). Funds of knowledge: An investigation of coherence within the literature. *Teaching and Teacher Education, 27*(3), 666–677.

Howard, T. C. (2013). How does it feel to be a problem? Black male students, schools, and learning in enhancing the knowledge base to disrupt deficit frameworks. *Review of Research in Education, 37*(1), 54–86.

Hufferd-Ackles, K., Fuson, K. C., & Sherin, M. G. (2004). Describing levels and components of a math-talk learning community. *Journal for Research in Mathematics Education, 35*(2), 81–116.

hunter, l., emerald, e., & Martin, G. (2013). *Participatory activist research in the globalised world: Social change through the cultural professions.* Springer.

Jackson, K. J. (2009). The social construction of youth and mathematics: The case of a fifth-grade classroom. In D. B. Martin (Ed.), *Mathematics teaching, learning, and liberation in the lives of Black children* (pp. 175–199). Routledge.

Jackson, K., & Wilson, J. (2012). Supporting African American students' learning of mathematics: A problem of practice. *Urban Education, 47*(2), 354–398.

Jencks, C., & Phillips, M. (1998). *The black-white test score gap.* Brookings Institution Press.

Johnson, C. J., & Kritsonis, W. (2006). A national dilemma: African American students' underrepresented in advanced mathematics courses. *National Journal for Publishing and Mentoring Doctoral Student Research, 3*(1), 1-8.

Kajander, A. (2020). The mandate of scholarly mathematics education research: Moving ourselves forward. *Canadian Journal of Scientific Mathematics, and Technology Education, 20*, 775–779.

Kendi, I. X. (2019). *How to be an anti-racist.* One World.

Khalifa, M. A. (2018). *Culturally responsive school leadership*. Harvard Education Press.

Kisker, E. E., Lipka, J., Adams, B. L., Rickard, A., Andrew-Ihrke, D., Yanez, E. E., & Millard, A. (2012). The potential of a culturally based supplemental mathematics curriculum to improve the mathematics performance of Alaska Native and other students. *Journal for Research in Mathematics Education, 43*(1), 75-113.

Knowles, M. (1990). *The adult learner: A neglected species*. Gulf Publishers.

Kolb, D. A. (1984). *Experiential learning: Experience as the source for learning and development.* Prentice-Hall.

Kouzes, J. M., & Posner, B. Z. (2012). *LPI: Leadership practices inventory: Development Planner, 270.* John Wiley & Sons.

Kouzes J. M., & Posner B. Z. (2017). *The leadership challenge: How to make extraordinary things happen in organizations* (6th ed.). John Wiley & Sons Incorporated.

Koirala-Azad, S., & Fuentes, E. (2016).). Introduction: Activist scholarship—possibilities and constraints of participatory action research. *Social Justice, 36*(4), 1-5.

Ladson-Billings, G. (1992). Reading between the lines and beyond the pages: A culturally relevant approach to literacy teaching. *Theory into Practice, 31*(4), 312-320.

Ladson-Billings, G. (1994). *The dreamkeepers: Successful teachers of African American children*. Jossey-Bass Publishers.

Ladson-Billings, G. (1995a). But that's just good teaching! The case for culturally relevant pedagogy. *Theory into Practice, 34*(3), 159-165.

Ladson-Billings, G. (1995b). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal, 32*(3), 465–491.

Ladson-Billings, G. (1997). It doesn't add up: African American students' mathematics achievement. *Journal for Research in Mathematics Education, 28*(6), 697-708.

Ladson-Billings, G. (2006). From the achievement gap to the educational debt: Understanding achievement in U.S. schools. *Educational Researcher, 35*(7), 3-12.

Ladson-Billings (2009). *The dreamkeepers: Successful teachers of African American children.* (2nd ed.) Jossey-Bass.

Ladson-Billings, G. (2014a). Culturally relevant pedagogy 2.0 a.k.a. the remix. *Harvard Educational Review, 84*(1), 74-84.

Ladson-Billings, G. (2014b). Beyond beats, rhymes, & Beyoncé. In G. Sirakkos, Jr. & C. Emdin (Eds.), *Between the world and the urban classroom* (pp. 83–94). Sense.

Lampert, M. (1990). When the problem is not the question and the solution is not the answer: Mathematical knowing and teaching. *American Educational Research Journal, 27*(1), 29-63.

Langley, G., Moen, R., Nolan, K., Nolan, T., Norman, C., & Provost, L. (2009). *The improvement guide* (2nd ed.). Wiley.

Lewis, C. (2015). What is improvement science? Do we need it in education? *Educational Researcher*, *44*(1), 54-61.

Lieberman, A., & Miller, L. (2008). *Teachers in professional communities: Improving teaching and learning.* Teachers College Press.

Lieberman, A., & Miller, L. (2011). Learning communities: The starting point for professional learning is in schools and classrooms. *Journal of Staff Development, 32*(4), 16–20.

Lincoln, Y. S., & Guba, E. G. (2000). Paradigmatic controversies, contradictions, and emerging confluences. In N. K. Denzin, & Y. S. Lincoln (Eds.), *The handbook of qualitative research* (2nd ed.), pp. 1,065-1,122. Sage Publications.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry.* Sage Publications.

Little, J. (1993). Teachers' professional development in a climate of educational reform. Educational evaluation and policy analysis. *Educational Evaluation and Policy Analysis, 15*(2), 129-151.

Little, J. (2005). Professional learning and school-network ties: Prospects for school improvement. *Journal of Educational Change*, *6*(3), 277-284.

Louis, K. S., Leithwood, K., Wahlstrom, K. L., & Anderson, S. E. (2010). Investigating the links to improved student learning: Final report of research findings. University of Minnesota.

Malloy, C. E., & Malloy, W. W. (1998). Issues of culture in mathematics teaching and learning. *The Urban Review, 30*(3), 245–257.

Marks, H., & Printy, S. (2003). Principal leadership and school performance: An integration of transformational and instructional leadership. *Educational Administration Quarterly, 39*(3), 370–397.

Martin, D. (2000). *Mathematics success and failure among African American youth: The roles of sociohistorical context, community forces, school influence, and individual agency.* Lawrence Erlbaum.

Martin, D. (2003). Hidden assumptions and unaddressed in questions in mathematics for all rhetoric. *The Mathematics Educator, 13*(2), 7-21.

Martin, D. (2006). Mathematics learning and participation as racialized forms of experience: African American parents speak on the struggle for mathematics literacy. *Mathematical Thinking and Learning, 8*(3), 197-229.

Martin, D. B. (2007). Beyond missionaries or cannibals: Who should teach mathematics to African American children? *The High School Journal, 91*(1), 6-28.

Martin, D. B. (Ed.). (2009). *Mathematics teaching, learning, and liberation in the lives of Black children*. Routledge.

Martin, D. B., Price, P. G., & Moore, R. (2019). Refusing systemic violence against black children. In J. David, & C. Jett (Eds.), *Critical race theory in mathematics education* (pp. 32–55). Routledge.

Mays, N., & Pope, C. (1995). Qualitative research: Rigor and qualitative research. *BMJ, 311*(6997), 109-112.

McCormack, B., Henderson, E., Boomer, C., Collin, I., & Robinson, D. (2008). Participating in a collaborative action learning: Beginning the journey. *Action Learning: Research and Practice, 5*(1), 5-19.

McLaughlin, M. W., & Talbert, J. E. (2006). *Building school-based teacher learning communities: Professional strategies to improve student achievement*. Teachers College Press.

McLinden, M., Douglas, G., Hewett, R., Cobb, R., & Lynch, P. (2017). Facilitating participation in education: The distinctive role of the specialist teacher in supporting learners with vision impairment in combination with severe and profound and multiple learning difficulties. *Journal of Blindness, Innovation and Research, 7*(2).

Melketo, T. A. (2012). Exploring tensions between English teachers' beliefs and practices in teaching writing. *The International HETL Review, 2*(11), 98-114.

Mercer, N., & Howe, C. (2012). Explaining the dialogic process of teaching and learning: The value and potential of sociocultural theory. *Learning, Culture and Social Interaction, 1*(1), 12-21.

Merriam, S. B. (1998). *Qualitative research and case study applications in education.* Jossey-Bass.

Militello, M., & Guajardo, F. (2013). Virtually speaking: How digital storytelling can facilitate organizational learning. *Journal of Community Positive Practices, 13*(2), 80-91.

Militello, M., Rallis, S. F., & Goldring, E. B. (2009). *Leading with inquiry & action: How principals improve teaching and learning*. Corwin Press.

Moll, L., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory into Practice, 31*(2), 131-141.

Morton, C. H. (2014). A story of African American students as mathematics learners. *International Journal of Education in Mathematics, Science and Technology, 2*(3), 234-245.

Nachmanovitch, S. (1990). *Free play: Improvisation in life and art.* G.P. Putnam & Sons.

Narode, R., Board, J., & Davenport, L. (1993). Algorithms supplant understanding: Case studies of primary students' strategies for double-digit addition and subtraction. In J. R. Becker & B. J. Preece (Eds.), *Proceedings of the 15th annual meeting of the North American chapter of the International Group for the Psychology of Mathematics Education* (pp. 254–260). Center for Mathematics and Computer Science Education.

National Center for Education Statistics. (1992). *The 1992 NAEP technical report for the national assessment.* Author.

National Center for Education Statistics. (2015). *The 2015 NAEP technical report for the national assessment.* Author.

National Council of Teachers of Mathematics. (1989). *Professional standards for teaching mathematics.* Author.

National Council of Teachers of Mathematics. (1991). *Professional standards for teaching mathematics.* Author.

National Council of Teachers of Mathematics. (2000). *Standards 2000 project*. Author.

National Council of Teachers of Mathematics. (2006). *Curriculum focal points for prekindergarten through grade 8 mathematics: A quest for coherence*. https://www.nctm.org/Publications/teaching-children-mathematics/2006/Vol13/Issue3/Curriculum-Focal-Points-for-Pre-K–Grade-8-Mathematics_-A-Quest-for-Coherence/

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Author.

National Science Foundation. (2001). *The cultural context of educational evaluations: The role of minority evaluation professionals.* Author. https://www.nsf.gov/pubs/2001/nsf0143/nsf0143.pdf

Oakes, J. (1990). Opportunities, achievement, and choice: Women and minority 429 students in science and mathematics. *Review of Research in Education, 16,* 153-222.

O'Leary, M. (2014). *Classroom observation: A guide to the effective observation of teaching and learning.* Routledge.

Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology, and practice. *Educational Researcher, 41*(3), 93–97.

Paris, D., & Alim, H. S. (2014). What are we seeking to sustain through culturally sustaining pedagogy? A loving critique forward. *Harvard Educational Review, 84*(1), 85–100.

Patton, M. Q. (1990). *Qualitative evaluation and research methods*. Sage Publications.

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health Services Research, 34,* 1,189-1,208.

Peart, D. (2018, March 26). Guiding students to a healthy math identity. *Edutopia.* https://www.edutopia.org/article/guiding-students-healthy-math-identity/

Poekert, P., Swaffield, S., Demir, E., & Wright, S. (2020). Leadership for professional learning towards educational equity: A systematic literature review. *Professional Development in Education, 46*(4), 541-562.

Preston, D. S. (2016). *Untold barriers for Black students in higher education: Placing race at the center of developmental education.* Southern Education Foundation.

Ralabate, P., & Nelson, L. (2017). *Culturally responsive design for English Learners: The UDL approach.* CAST Professional Publishing.

Reeves, A. (2019). Classroom collaborations: Enabling sustainability education via student-community co-learning. *International Journal of Sustainability in Higher Education*. *20*(8), 1,376-1,392.

Rice, J. K. (2003). *Teacher quality: Understanding the effectiveness of teacher attributes*. Economic Policy Institute.

Rigby, J .G., & Tredway, L. (2015). Actions matter: How school leaders enact equity principles. In M. Khalifa, N. W. Arnold, A. Osanloo, & C. M. Grant (Eds.), *Handbook on Urban Educational Leadership* (pp. 329-346). Rowman & Littlefield.

Rimm-Kaufman, S. E., Larsen, R. A. A., Baroody, A. E., Curby, T. W., Ko, M., Thomas, J. B., Merritt, E. G., Abry, T., & DeCoster, J. (2014). Efficacy of the responsive classroom approach: Results from a 3-year, longitudinal randomized controlled trial. *American Educational Research Journal, 51*(3), 567–603

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.

Russ, R. S., Sherin, B. L., & Sherin, M. G. (2016). What constitutes teacher learning? In D. H. Gitomer, & C. A. Bell (Eds.), *Handbook of research on teaching* (5th ed.), pp. 391-438. American Educational Research Association.

Russo, J., & Hopkins, S. (2017). Student reflections on learning with challenging tasks: 'I think the worksheets were just for practice, and the challenges were for math'. *Mathematics Education Research Journal, 29*(3), 283-311.

Robinson, V. M. J., Lloyd, C., & Rowe, K. (2008). The impact of leadership on student outcomes: An analysis of the differential effects of leadership types. *Educational Administration Quarterly*, *44*(5), 635-674.

Rodriguez, M. C. (2004). The role of classroom assessment in student performance on TIMSS. *Applied Measurement in Education*, *17*(1), 1-24.

Rosenthal, B., & Younger, A. (2015). What lies beneath. In N. Peters-Davis & J. Shultz, *Challenges of multicultural education: teaching and taking diversity courses* (pp. 148-159). Routledge.

Rosenthal, L. (2019). *Fits and starts: One elementary school's journey toward trauma-informed leadership* (Order No. 27629324). Available from ProQuest Dissertations & Theses A&I; ProQuest Dissertations & Theses Global. (2353569572). https://search.proquest.com/dissertations-theses/fits-starts-one-elementary-schools-journey-toward/docview/2353569572/se-2?accountid=14496

Safir, S., & Dugan, J. (2021). *Street data: A next-generation model for equity, pedagogy, and school transformation.* Corwin.

Saldaña, J. (2016). *The coding manual for qualitative researchers.* Sage.

Silver, E. A., Smith, M. S., & Nelson, B. S. (1995). The Quasar Project: Equity concerns meet mathematics in middle school In L. G. Secada, E. Fennema, & L. B. Adajian (Eds.) *New directions in equity in mathematics education* (pp. 9-56). Cambridge University Press.

Smith, M., & Cooper, C. (1994). Leadership and stress. *Leadership & Organization Development Journal*, *15*(2), 3-7.

Smith, M., Bill, V., & Raith, M. L. (2018). Promoting a conceptual understanding of mathematics. *Mathematics Teaching in the Middle School*, *24*(1), 36–43.

Smith, M. S., & Stein, M. K. (2011). *5 practices for orchestrating productive mathematical discussion* (2nd ed.). National Council of Teachers of Mathematics.

Solomon, Y. (2009). *Mathematical literacy: Developing identities of inclusion*. Routledge.

Sowell, E. (1989). Effects of manipulative materials in mathematics instruction. *Journal for Research in Mathematics Education, 20*(5), 498-505.

Spencer, J. A. (2009). Identity at the crossroads: Understanding the practices and forces that shape African American success and struggle in mathematics. In D. B. Martin (Ed.), *Mathematics teaching, learning, and liberation in the lives of Black children* (pp. 200-230). Routledge.

Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35*(1), 4-28.

Spillane, J. P., Halverson, R., & Diamond, J. B. (2001). Investigating school leadership practice: A distributed perspective. *Educational Researcher*, *30*(3), 23-28.

Spillane, J. P., & Zeuli, J. S. (1999). Reform and teaching: Exploring patterns of practice in the context of national and state mathematics reforms. *Educational Evaluation and Policy Analysis*, *21*(1), 1-27.

Star, J. R. (2016). Improve math teaching with incremental improvements. *Phi Delta Kappan, 97*(7), 58-62.

Steele, C. M. (2010). *Whistling Vivaldi: How stereotypes affect us and what we can do.* W.W. Norton.

Stein, M. K., Smith, M., Henningsen, M., & Silver, E. A. (2000). *Implementing standards-based mathematics instruction: A casebook for professional development* (1st ed.). Teachers College Press.

Stein, M. K., & Lane, S. (1996). Instructional tasks and the development of student capacity to think and reason: An analysis of the relationship between teaching and learning in a reform mathematics project. *Educational Research and Evaluation, 2*(1), 50–80.

Stein, M. K., Engle, R. A., Smith, M. S., & Hughes, E. K. (2008). Orchestrating productive mathematical discussions: Five practices for helping teachers move beyond show and tell. *Mathematical Thinking and Learning, 10*(4), 313–340.

Stevenson, H. W., & Stigler, J. W. (1992). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education.* Summit Books.

Stinson, D. W. (2006). African American male adolescents, schooling (and mathematics): Deficiency, rejection, and achievement. *Review of Educational Research, 76*(4), 477-506.

Stoll, L., & Louis, K. S. (2007). *Professional learning communities: Divergence, depth, and dilemmas*. McGraw-Hill/Open University Press.

Supovitz, J., Sirinides, P., & May, H. (2010). How principals and peers influence teaching and learning. *Educational Administration Quarterly, 46*(1), 31-56.

Talbert, J. (2010). Professional learning communities at the crossroads: How systems hinder or engender change. In A. Hargreaves, A. Lieberman, M. Fullan, & D. Hopkins (Eds.), *Second international handbook of educational change* (pp. 555-571). Springer.

Tredway, L. (1995). Socratic seminars: Engaging students in intellectual discourse. *Educational Leadership*. Association for Supervision and Curriculum Development.

Tredway, L. (2000). The teacher as moral and intellectual guide. In K. G. Elam & M. Duckfield, *Creating a community of learners: Using the teacher as facilitator model* (pp. 74-85). National Dropout Prevention Center.

Tredway, L., Militello, M., & Simon, K. (2021). Making classroom observations matter. *Educational Leadership, 78*(7), 56-62.

Tredway, L., Simon, K., Militello, M., Hodgkins, L., & Morris, C. (2019). *Project I^4 Framework of classroom learning and practice: Propelled by equity-driven tools for school change.* https://www2.ecu.edu/coe/web/Project%20I4/FRAMEWORK.pdf

Tyack, D., & Tobin, W. (1994). The 'grammar' of schooling: Why has it been so hard to change? *American Educational Research Journal*, *31*(3), 453–79.

U.S. Department of Education. Institute of Education Sciences. (2015). *The nation's report card: 2015 mathematics and reading assessments.* National Center for Education Statistics. https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015136

Varelas, M., Martin, D. B., & Kane, J. M. (2012). Content learning and identity construction: A framework to strengthen African American students' mathematics and science learning in urban elementary schools. *Human Development, 55*(5/6), 319–339.

Villegas, A. M., & Irvine, J. J. (2010). Diversifying the teaching force: An examination of major arguments. *The Urban Review, 42*(3), 175-192.

Voelkel Jr., R. H., & Chrispeels, J. H. (2017) Understanding the link between professional learning communities and teacher collective efficacy. *School Effectiveness and School Improvement, 28*(4), 505-526.

Vygotsky, L. (1978). *Mind in society.* Harvard University Press.

Waters, T., Marzano, R. J., & McNulty, B. (2003). *Balanced leadership: What 30 years of research tells us about the effect of leadership on student achievement*. Mid-Continent Research for Education and Learning.

Wise, D., & Jacobo, A. (2010). Towards a framework for leadership coaching. *School Leadership & Management, 30*(2), 159–169.

Wenger-Trayner, E., & Wenger-Trayner, B. (2015). *Communities of practice. A brief introduction*. [online]: Wenger-Trayner. http://wenger-trayner.com/wp-content/uploads/2015/04/07-Brief-introduction-to-communities-of-practice.pdf

Whitford, B. L., & Wood, D. R. (Eds.) (2010). *Teachers learning in community: Realities and possibilities.* SUNY Press.

Wiggins, G. (2012). 7 keys to effective feedback. *Educational Leadership, 70*(1), 10–16. ASCD.

Williams, L. (2018, April 18) "How to shape students' mathematical identity." *Corwin Connect* (blog). https://corwin-connect.com/2018/04/how-to-shape-students-mathematical-identity/

Wilson, J., Nazemi, M., Jackson, K., & Wilhelm, A. (2019). Investigating teaching in conceptually oriented mathematics classrooms characterized by African American student success. *Journal for Research in Mathematics Education, 50*(4), 362-400.

Woodland, R. H. (2016). Evaluating PK–12 professional learning communities: An improvement science perspective. *American Journal of Evaluation*, *37*(4), 505-521.

Woods, C. (2010). Employee wellbeing in the higher education workplace: A role for emotion scholarship. *Higher Education, 60*(2), 171-185.

Wong, C., Kumpulainen, K., & Kajamaa, A. (2021). Collaborative creativity among education professionals in a co-design workshop: A multidimensional analysis. *Thinking Skills and Creativity, 42*, 1-17.

Yosso, T. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race, Ethnicity & Education, 8*(1), 69–91.

Yosso, T. (2006). *Critical race counter stories along the Chicana/Chicano educational pipeline*. Routledge.

Yurkofsky, M. M., Petersen, M. J., Mehta, J. D., Horwitz-Willis, R., & Frumin, K. M. (2020). Research on continuous improvement: Exploring the complexities of managing educational change. *Review of Research in Education, 44*(1), 403-433.

Zilanawala, A., Martin, M., Noguera, P. A., & Mincy, R. B. (2017) Math achievement trajectories among Black male students in the elementary- and middle-school years. *Educational Studies: Journal of the American Educational Studies Association, 54*(2), 143-164.

Zwiers, J. (2007). Teacher practices and perspectives for developing academic language. *International Journal of Applied Linguistics, 17*(1), 93-116.

Zwiers, J., & Crawford, M. (2011). *Academic conversations: Classroom talk that fosters critical thinking and content understandings*. Stenhouse Publishers.

APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

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** ·
rede.ecu.edu/umcirb/

Notification of Exempt Certification

From: Social/Behavioral IRB
To: Carin Geathers
CC: Matthew Militello
Date: 1/11/2022
Re: UMCIRB 21-001661
BUILDING CULTURALLY RESPONSIVE TEACHING PRACTICES FOR AFRICAN AMERICAN STUDENT SUCCESS IN MATHEMATICS

I am pleased to inform you that your research submission has been certified as exempt on 1/11/2022. This study is eligible for Exempt Certification under category # 1 & 2ab.

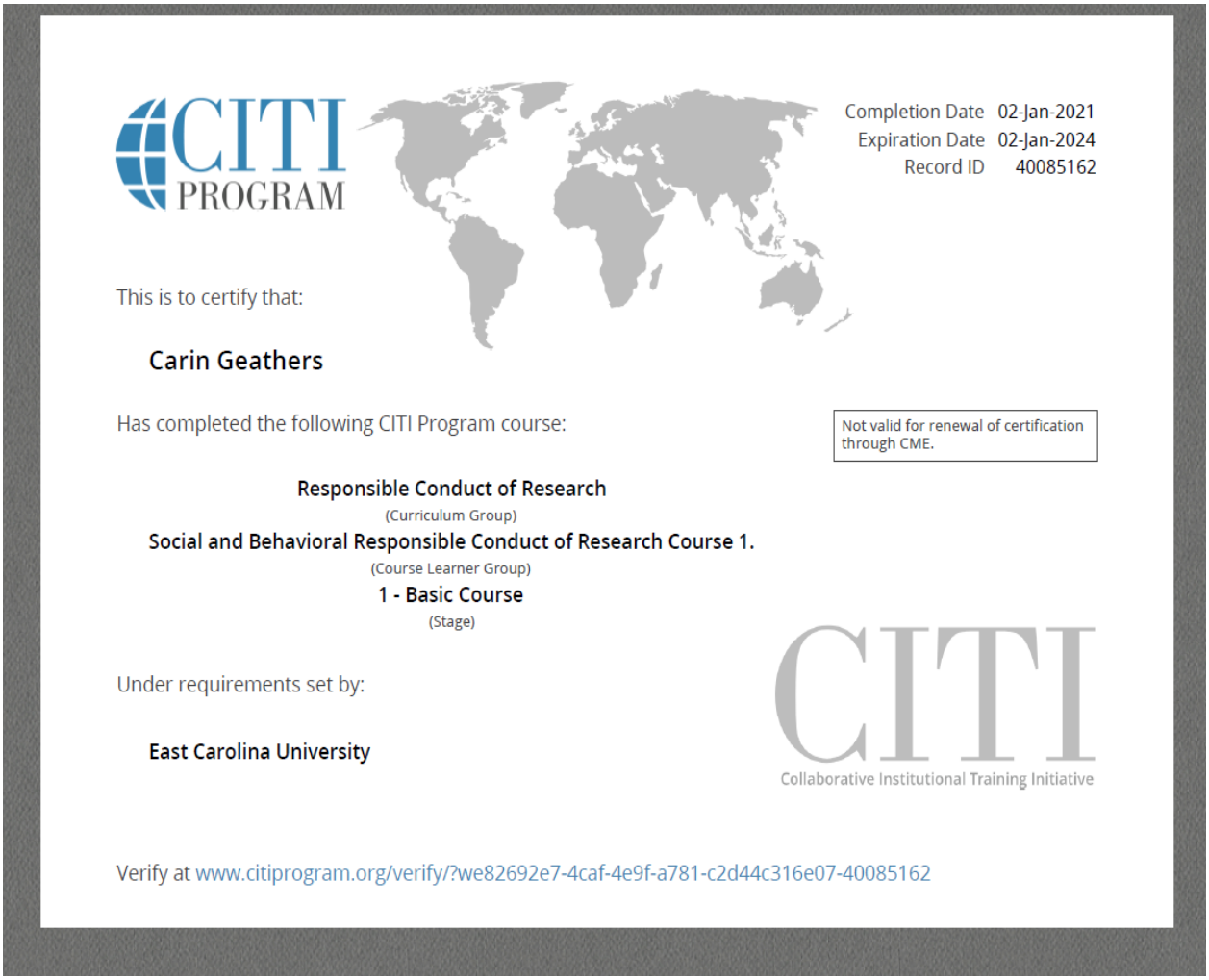
It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

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
Appendix K(0.01)	Interview/Focus Group Scripts/Questions
CALL Survey Appendix H.docx(0.01)	Surveys and Questionnaires
Final Revision Geathers Chapters 1-3, References and Appendices 11.21.21 (1).docx(0.01)	Study Protocol or Grant Application
Geathers_Appendix H.docx(0.01)	Additional Items
Geathers_Appendix I.docx(0.01)	Additional Items
Geathers_Appendix J .docx(0.01)	Additional Items
Geathers_Data Collection Form_Appendicx G.docx(0.01)	Additional Items
Geathers_Data Collection Instrument_Appendix F.docx(0.01)	Additional Items
Geathers_Data Collection_Appendix E.docx(0.01)	Additional Items
Geathers_Informed Consent Form _Appendix C.docx(0.02)	Consent Forms
Geathers_Recruitment Script_Appendix D.docx(0.01)	Recruitment Documents/Scripts

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

APPENDIX B: CITI TRAINING CERTIFICATE



CITI PROGRAM

Completion Date 02-Jan-2021
Expiration Date 02-Jan-2024
Record ID 40085162

This is to certify that:

Carin Geathers

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/?we82692e7-4caf-4e9f-a781-c2d44c316e07-40085162

APPENDIX C: DISTRICT PERMISSION

OAKLAND UNIFIED SCHOOL DISTRICT
Community Schools, Thriving Students

Statement of Research Approval

Title of Research Project	Getting into Good Trouble: Building Culturally Responsive Teaching Practices for African American Student Success in Mathematics
Researcher	Carin Geathers
Institution/Organization	East Carolina University
Date	September 19, 2021
Research ID	210912

To OUSD Principals and Leaders,

The proposed research has been approved by the OUSD Research Review Committee. The proposed research has been determined to be in compliance with existing legal and ethical research guidelines. The researcher has agreed that the study will not differ significantly from the activities described within the proposal that was submitted to the Research Review Committee. The researcher has stipulated that all participation will be voluntary, and it is understood that **approval of the proposal will not obligate any person, school, or department in OUSD to participate**. The researcher ensures that all student or staff data provided by the district will not be shared with other researchers or organizations. The researcher is obligated to submit any amendments to the original proposal to the Research Review Committee for approval before further research is permitted. The researcher agreed to provide the Office of Research & Assessment and each participating school with a copy of the research findings.

I am available to assist you with any questions regarding the research after you have discussed it with the researcher. Please call/email me if you have any questions about the research before or after it has been conducted.

Sincerely,

Kaia Vilberg
Statistician
Research, Assessment & Data
Kaia.Vilberg@ousd.org

APPENDIX D: ADULT CONSENT FORM

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: Getting Into Good Trouble: Building Culturally Responsive Teaching Practices for African American Student Success in Mathematics
Principal Investigator: Carin Denise Geathers
Institution, Department or Division: East Carolina University Department of Educational Leadership
Address: Burckhalter Elementary School 3994 Burckhalter Avenue Oakland, CA 94605
Telephone #: 510-879-2105 X 1058008

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 to examine to what extent teachers can co-design and implement conceptual mathematics lessons that will equitably engage African American students. You are being invited to take part in this research because of the role you have within the school setting and 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 to better engage our African American students in learning mathematical concepts.
If you volunteer to take part in this research, you will be one of six 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 in the Oakland Unified School District. You will need to come *to computer lab and/or room #15 approximately fifteen times* during the study. The total amount of time you will be asked to volunteer for this study is fifteen 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 Co-Practitioner research design and planning meetings, classroom observations, coaching conversations, an anonymous survey, and attend community-learning exchanges during the study. Research team members will document (e.g. record or write notes) the Co-Practitioner research design, planning meetings, classroom observations, coaching conversations and community learning exchange.

All of the meetings will focus on your experience with co-designing and implementing conceptual mathematics lessons that engage African American students at Burckhalter Elementary School.

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 and will be stored for a minimum of three years after completion of the study. 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 510-879-2105 (days, between 8:00 am and 4:00 pm or email geathersc19@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**

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**

_____

Principal Investigator (PRINT) ***Signature*** ***Date***

APPENDIX E: DATA COLLECTION INSTRUMENT:

OBSERVATION TOOL CALLING-ON TOOL 1

Type One of Calling On: Make a seating chart.
Using a seating chart to determine equitable calling on is critical. Too often, some students are totally overlooked – they may not raise their hands, or, if they do, teachers ignore them. If possible, write student names if you know them. Either use STUDENT NAME or identity (F/M or race/ethnicity): AA= African American; L= Latinx; W=White; AsA= Asian American. This classroom map is of one table of 6 persons.

Make a slash mark (/) for every instance of the items in the tool. Try to indicate with short abbreviation of the type of calling on or teacher response that was used (after the slash mark). It will take a bit of practice to get used to the names of calling on (chart below), but this offers precise data with which to have the conversation with the teacher

St 1 (F/AA) /R/CC I/TR	St 2 (M/L) /B-
St 3 (F/W) /R/R/R/R/R /R/TR	St 4 (M/AsA)

CCD	Cold Call for Discipline
B-A	Blurt out-Accepts
B-I	Blurt out-Ignores
C&R	Call and Response: Teacher asks for group response or indicates students should "popcorn"
ES	Uses equity strategy (equity stick or card to call on student)
TR*	Teacher repeats student response to class verbatim
TRV	Teacher revoices student response
TPS	Think and Pair and then Share
Other	Any other strategy you note

R	Raised hand
CC	Cold Call
CCD	Cold Call for Discipline
B-A	Blurt out-Accepts
B-I	Blurt out-Ignores
C&R	Call and Response: Teacher asks for group response or indicates students should "popcorn"
ES	Uses equity strategy (equity stick or card to call on student)
TR	Teacher repeats student response to class verbatim
TRV	Teacher revoices student response

TPS	Think and Pair and then Share
Other	Any other strategy you note

Teacher **Observer** **Date**
Duration of Observation _____ to _____

Student Name OR number	Raised hand **CO: R**	Cold Call **CO: CC**	Cold Call Discipline **CO:CCD**	Calling out **CO: C&R CO: B-A CO: B-I**	Equitable method **CO: ES**	Simple Repetition **TR**	Teacher Revoicing **TRV**	Other
1.								
2.								
3.								
4.								
5.								

After the observation using selective verbatim, tabulate the number of instances of each type of calling on.

Teacher **Observer** **Date**
Duration of Observation _____ to _____

R*	Raised hand	Total Number
CC**	Cold Call	
CCD	Cold Call for Discipline	
B-A	Blurt out-Accepts	
B-I	Blurt out-Ignores	
C&R	Call and Response: Teacher asks for group response or indicates students should "popcorn"	
ES	Uses equity strategy (equity stick or card to call on student)	
TR***	Teacher repeats student response to class verbatim	
TRV***	Teacher revoices student response	
TPS	Think and Pair and then Share	

Other	Any other strategy you note	

APPENDIX F: QUESTION FORM PROTOCOL

The tool is designed to collect basic information for the teacher to record question form. Use selective verbatim by selecting and recording teacher questions. If the teacher addresses a question to a specific student, name the student and recognize if the student name is first or last and if there is think(wait) time or not. Record time if possible.

Teacher **Observer** **Date**
Duration of Observation _____ to _____

TIME	Teacher Questions	Question Form

Question Form Abbreviation	**Question form explanation**
Y/N ?	Yes/no questions
QW or	Question word (question starts with question word)
NQW	No question word (question does not start with question word)
FIB ?	Fill in the blank question.
SNA	Student name after question
SNB	Student name before question
TT	Adequate Think Time for type of question
NTT	No think time used
Other	Anything else you observe about question form

APPENDIX G: DATA COLLECTION INSTRUMENT:

QUESTION LEVEL PROTOCOL

Observation Tool Question Level

The tool is designed to collect basic information for the teacher to see what types (levels) of questioning the teacher is using. **First, use selective verbatim by selecting and recording teacher questions and student responses (use T; or S: to indicate which). If possible, name the student to whom the teacher addresses the question. Second, analyze the evidence using names from the next page.**

Teacher	**Observer**	**Date**
Duration of Observation _____ to _____		

TIME	Teacher Questions and Student Responses (Use T: or S: to indicate speaker)	Level or Type of question

Naming Questioning

Use these names and abbreviations to analyze the selective verbatim evidence for teacher questions and student responses.

Name Level or Type of Question. Use one type of question naming practice for your use with a teacher. You should choose based on the kind of language you use in your school or district or a type you want to introduce and use regularly.

Bloom Revised	**Five Practices Questions**	**Lyman Think Trix**
Remember/Recall Understand Apply	Assessing	Recall Cause/Effect Similarity/Difference
Analyze Evaluate Create	Advancing	Idea to Example Example to Idea Evaluation

If you are developing skills in the question form, you can combine the equity tools of Question Form and Calling On with Questioning Level – access and rigor are in the same observation. Note: WK (Who knows) is an addition from fall Project I[4]

Abbreviation	Full name	Explanation or Definition
Question Form		
? word	Uses question word	Uses question words to cue students that a question is coming.
Y/N ?	Yes/No Question	The question typically does not start with a question word.
WK	Who knows….?	A question that usually does not elicit student responses/often used in conjunction with hand raising.
FIB ?	Fill in the blank	Typically, the teacher starts to make a statement, but about half way through the statement then shifts to fill in the blank form of question.
Supports for Students		
TT/NTT	Think time/No think time	Think time of 3-8 seconds depending on question level is typically useful. Takes time for teachers to get students to depend on TT. NTT=no think time before calling on or eliciting response
TPS	Think-Pair-Share	Scaffolding for students to rehearse responses; requires every student response. However, cannot be "sloppy". T. needs to insist on TPS protocol

As you do these processes, you may add other abbreviations and names.