ABSTRACT

Robbin T. Cooper, LANGUAGE IS NOT MY HURDLE: IMPROVING EQUITABLE INSTRUCTIONAL PRACTICES ONE CLASSROOM AT A TIME (Under the direction of Dr. Matthew Militello). Department of Educational Leadership, May 2023.

Language should not be a hurdle for English language learners in mathematics. The participatory action research study focused on how first-grade teachers identified, planned, and implemented discourse strategies to support English Language Learners in math instruction. To do so, I engaged three teachers who were English Language Learners as students and were novice teachers in analyzing equitable academic discourse and culturally and linguistically responsive pedagogy. Using improvement sciences and community learning exchange processes, teachers developed a robust collegial network, engaged in inquiry cycles, examined culturally responsive teaching, and planned and implemented instructional practices. To collect qualitative data, I collected and analyzed field notes, teacher interviews, artifacts from our discussions, classroom observations, and post-observation conversations. The findings confirmed that the instructional leader's role in supporting teachers to transfer their beliefs into consistent practices is critical. By relying on teachers' funds of knowledge and experiences, using data-driven observational practices, engaging in collaborative conversations, and facilitating structured professional learning, the teachers enacted their espoused beliefs; however, they needed consistent input to make steady progress. The study has implications for practice, policy and research as teachers need support to navigate conflicting district directions about instructional practices in order to stay the course of using equitable practices for English language learners.

LANGUAGE IS NOT MY HURDLE: IMPROVING EQUITABLE INSTRUCTIONAL PRACTICES ONE CLASSROOM AT A TIME

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By
Robbin Thoth Cooper
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Director of Dissertation: Matthew Militello, PhD
Dissertation Committee Members:
Lawrence Hodgkins, EdD
Karen Jones, PhD
Lynda Tredway, MA
Lisa Green, EdD

DEDICATION

To the strongest woman I know, my mom (Teresa Warren Powell).

This has been a journey...

This one is for you!

First Generation Graduate!

We got through it!

What's next, only God knows.

To my son CJ and daughter Jillian...

Keep your minds clear

Your heart open

Your soul grounded

Your eyes on God

and follow your dreams

It's your time for greatness!

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CHAPTER 1: NAMING AND FRAMING THE FOCUS OF PRACTICE

In our rural context in North Carolina, we are experiencing an influx of immigrant families who bring multiple assets to our schools and communities. However, we need to be equipped in our schools to adequately educate the increasing numbers of English language learners. To do so, we need to fully understand the best strategies for culturally and linguistically responsive ELL practices. Language should not be a hurdle for students; rather we need to ensure that we reduce the inequities and performance disparities that remain after multiple reform efforts to support students identified as English Language Learners (ELLs; Gándara, 2009; Schneider et al., 2006). Efforts to ameliorate these disparities include national and state policies, increased funding, education agency plans, district policies and plans, and school curriculum and pedagogy. Despite laudable goals, inconsistent policies and practices have instead expanded learning differences and are a hurdle for English language learners in mathematics. We need to remove those hurdles. A new direction is necessary, and this qualitative research study was designed to diminish the language hurdles in first-grade math classes.

In this study, through collaboration with teachers, we re-imagined mathematical teaching and learning for ELL students. This study aimed to identify culturally and linguistically responsive strategies teachers could use to support ELL students. Specifically, as both an instructional leader and lead researcher, I collaborated with and supported three teachers in implementing equitable mathematical discourse practices for ELL students.

The participatory action research project and study occured at Roosevelt Elementary School in Dolphin County, North Carolina where I served as the principal. English Language Learners are one of the fastest-growing groups in Dolphin County. The success rates of ELL students in our county mirror national trends of low completion of high school and the

uncertainty of future success (Lopez, 2017). Mathematics continues to be a gatekeeping class that excludes learners of color; "similar to whiteness, mathematics holds unearned privilege in society" (Gutiérrez, 2013, p. 10) and is viewed incorrectly as innate rather than malleable (Dweck, 2007). Moses and Cobb (2002) named math a civil right that should be more accessible to all students.

While the school district is committed to equity for all and supports this effort in individual schools, historical evidence revealed a continuous underperformance in math, especially among ELL students. Teachers of ELL students have voiced concerns about ineffective teaching practices, lack of teacher training, and student failure. As a result, the contextual circumstances, educator desire, and student achievement present the necessary data to compel us to conduct this research (Steele & Aronson, 1995). In a collaborative, site-based research project and study, I had the opportunity to work with teachers to change the oppressive policies and practices, including identity threats that damage the academic future of our ELL students (Sherman et al., 2013; Steele, 2010; Steele & Aronson, 1995). "Latino students, in particular, face a significant stereotype threat that correlates directly to lower levels of achievement. Conversely, when negative stereotypes about these students' abilities are replaced with more positive self-images, achievement outcomes improve" (Parsi, 2016).

In this chapter, I describe the research study Focus of Practice (FoP) and provide a rationale for this study. Then, I discuss the methodological design of the Participatory Action Research (PAR) study. Finally, I provide an overview of study considerations, including limitations, validity, confidentiality, and ethics.

Focus of Practice

Access to classroom discourse and mathematics teaching practices can dramatically impact student success (Aguirre & del Rosario Zavala, 2013; Echevarria et al., 2018; Kareva, 2013; Kwihangana, 2021). Thus, I focused on a specific aspect of teaching and learning for English Language Learners that required a change in mindset for teachers who may unwittingly diminish ELL learning opportunities (Hammond, 2015). While our ultimate goal was student engagement, in this project and study, I needed to understand the reasons for the lack of engagement and learning from the teachers' perspectives and teachers' practices. The FoP for this participatory action research is: *Implement equitable discourse strategies to engage English Language Learners in first-grade mathematics classrooms*. Next, I discuss the rationale for the FoP and unpack the assets and challenges in three levels of analysis (meso, macro, and micro).

Rationale

North Carolina has one of the largest English learner populations in the US and is one of the five states with the most significant growth in English learners between 2000 and 2014 (NC Demography, 2019). Despite this increase, the state still needs to catch up with supporting and equipping the districts and schools to ensure English learners' academic accomplishment (Montgomery, 2019); consequently, the gap between English learners and their peers has yet to be satisfactorily addressed. For example, English learners had difficulty understanding third-grade mathematics, with only 48% achieving proficiency (NC Demography, 2019). Many teachers, however, lack the language, skills, and cultural and linguistic competencies required to address the diverse needs of their students, which can create further barriers to student participation. Valdés (2020), in her discussion of the miseducation of language learners, expresses concerns that the processes and policies for ELL students have focused too heavily on

assessment and categorizing and re-classification; this focus is misplaced and does not sufficiently address classroom instruction that would support learning through language and cultural assets.

This focus of practice was essential because while the Latino population has become the largest minority group in the United States, it remains among the most poorly educated people in our education system (Schneider et al., 2006). Students from multiple Spanish-speaking countries with varied academic backgrounds and minimal English language skills enter American schools that are not equipped to provide them with the necessary tools. However, they need to communicate, express themselves, and engage in learning which is vital to their success. Ralabate and Nelson (2017) indicate that these pedagogical factors are crucial for simultaneous bilingual students, long-term ELL, newcomers with appropriate formal schooling, and newcomers with little formal education. They focus on how teachers can build classroom cultures that support students' academic needs through equity-driven stances and practices is the most significant influence on student success.

Dudley-Marling (2015) posited that the "structures of contemporary schooling tend to reinforce the status quo by privileging the cultural and linguistic experiences of children of the already privileged" (p. 1). Parents rely on and trust schools to provide students equitable access to resources to participate successfully. Life experiences, cultural background, and relationships directly influence how we learn, and express learning is known as funds of knowledge which are recognized as essential to educating students of all cultures and consist of the following three objectives:

1. To improve academic outcomes of traditionally underserved students.
2. To improve ties between families and schools.

3. Use funds of knowledge to modify teaching practices. (Ralabate & Nelson, 2017)

The child is not the problem, nor is the family, culture, or community (Dudley-Marling, 2015). Instead, the issue resides in the structural elements of identifying and providing interventions for ELLs as well as the instructional capacities of teachers. While we cannot address all the structural elements, we can change teaching practices at the school level. Next, I analyze the FoP through the lenses of assets and challenges of the schooling experience.

Analysis of Assets and Challenges

To determine how to address the FoP, I collaborated with teachers during a weekly Professional Learning Community (PLC) meeting to deeply understand the assets and challenges of engaging ELL students in academic discourse opportunities in mathematics. I identified the assets and challenges in the fishbone diagram (see Figure 1). In describing the assets and challenges for the FoP, I delineated those assets and challenges at the micro (classrooms and school), meso (district), and macro (state and national) levels.

Micro Assets and Challenges

The school and the teachers who participated are at the micro level. The staff realized that our school community faced various assets and challenges that affected how teachers engaged and taught ELLs. For example, teachers have watched the population of ELL students continuously grow; however, they know that their instructional practices remain the same and are insufficient for teaching English language learners. As a result, teachers did their best to modify instruction for students learning a second language. However, this modification often simplified curriculum and instructional practices to levels below the student's cognitive ability to adjust to perceived language fluency.

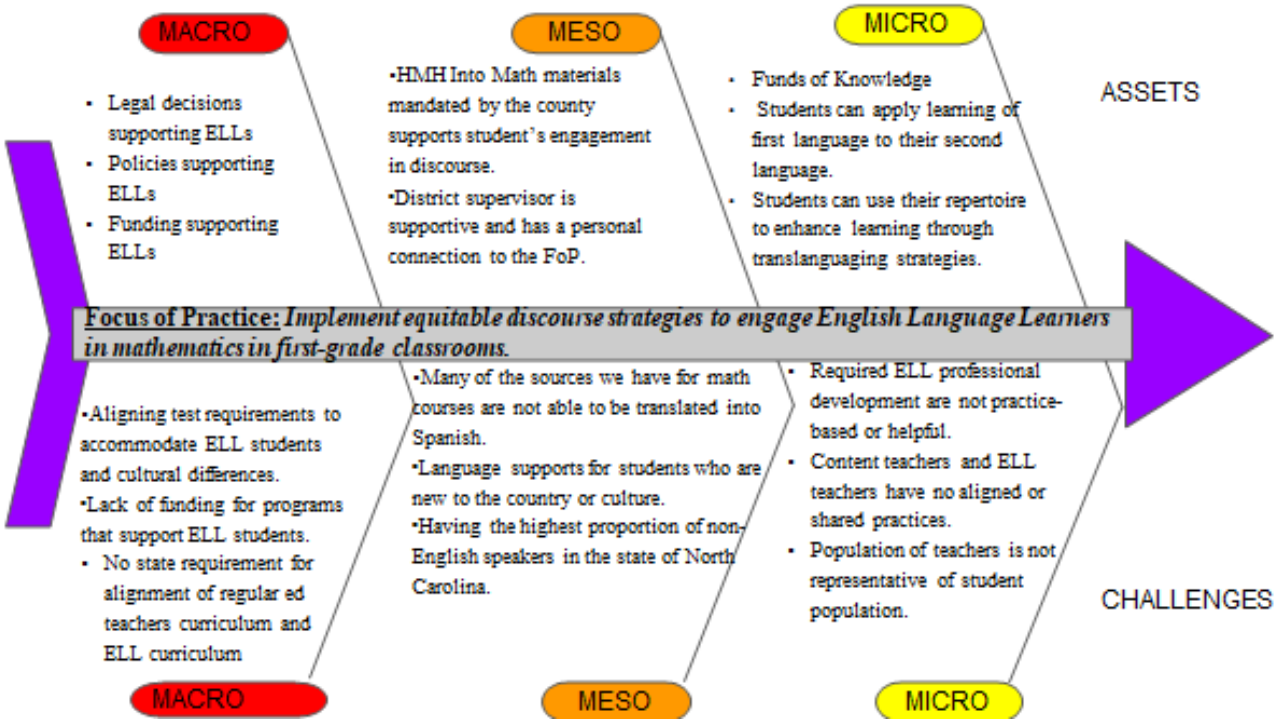


Figure 1. The fishbone diagram presents an analysis of assets and challenges of FoP.

The students and families brought assets to the project: they have funds of knowledge on which we could draw to know them and their cultural assets (González et al., 2005). Secondly,second language learners bring significant assets as they learn one language and can apply that learning to a second language; students can use their repertoire to expand the classroom repertoire and learn English by using translanguaging strategies (García, 2019). Finally, as the instructional leader, I ensured that teachers provided quality instruction to pupils. That required significant professional learning on their part, which we provided at the school level.

A key asset in our context was that teachers were eager to learn how to assist ELL students in improving their performance; however, the county's compulsory yearly English Language Learner training was ineffective and typically the same year after year. Sitting through a module or listening to a speaker is not the best way to learn; people must be actively involved in learning and thinking (Hawley & Valli, 1999). Then, education can become the best teaching practice and expand teacher toolkits. Professional development that was practical, functional, and aligned to a specific need to teach ELL students was a consistent concern and request among the small groups as we examined the assets and challenges. As the instructional leader, building in intervention time allows students to get direct, guided instruction in needed areas. Strategic scheduling is integral to ensuring that students get the most out of instructional time.

Meso Assets and Challenges

The district is the meso level, which includes the district's resources and support from several departments. Like many schools, student achievement is tied directly to acquiring appropriate curriculum materials that support teaching and learning. Supporting teaching and learning is especially important when textbook budgets are cut, as books are usually on a five-

year or more purchase cycle. For example, in the Summer of 2021, the Local Education Agency (LEA) purchased new mathematics curriculum materials that support and encourage student engagement through academic discourse. These resources incorporated proven strategies in each chapter that engaged students in math discourse. Teachers expressed their excitement about having the books; however, due to the worldwide COVID-19 pandemic, most schools were forced to implement distance learning. Thus, we have yet to be able to provide adequate training; the math text is not translated to meet the needs of English Language Learners, and there is no specific academic support for students new to the country and culture. As a result, teachers relyed on multiple sources when providing instruction to support student learning and new learning. Still, they needed help to reflect deeply with colleagues to determine the effectiveness of engagement. With a team of three teachers in first grade, we participated in professional learning and use focused, researched-based strategies on mathematical academic discourse supported by the curriculum's mathematical resources.

Macro Assets and Challenges

Identifying macro assets include legal decisions, policies, research, and funding that can support the efforts to teach English as a Second Language (ESL). Legally, it was the Lau decision which provided a list of remedies instituted in all states by the Office of Civil Rights (Stewner-Manzanares, 1988). A plethora of research supports incorporating the cultural assets of students and families as a critical part of approaching second language learners (García, 2019; González et al., 2005). States and professional organizations have developed robust policies and materials that support bilingual education. The National Association of Bilingual Education and several state organizations regularly write reports and offer resources to support teaching and learning for ELLs. The U.S. Department of Education has supported bilingual education through

policy and funding since 1967 under Title VII and instituted the National Clearinghouse for Bilingual Education to support research and policy in bilingual education.

However, as Valdés (2020) indicated in her analysis of why the approaches to language instruction has not worked well -- we have focused too much on the assessment and categorization of levels of language learners and not sufficiently on the learners' assets to the process. In addition, funding for programs that support ELL students' academic language acquisition is insufficient to ensure that many immigrant groups coming to the US have access to language learning. Further, state testing requirements are not aligned to accommodate students whose first language is not English, cultural differences, and the lack of state-required alignment for content area teacher's curriculum and English Language Learner (ELL) curriculum supports. In addition, teachers expressed frustration and concerns about what students are learning in the ELL classrooms and if it is worth being pulled out of their class time. In the fishbone diagram, I summarized the current assets and challenges in supporting ELL students at the micro, meso, and macro levels.

Significance

The context of this study is a PreK-eighth grade elementary school located within a rural county in the coastal plains of North Carolina. Of the total student population (n=1,167), 684 students identify as Hispanic (Latino) and 409 of the 684 Hispanic (Latino) students were identified as ELLs (Roosevelt School, 2021). Therefore, I chose equitable academic mathematical discourse as an instructional strategy that supported teachers as they raised their awareness, developed their skills, and implemented strategies to address English Language Learners (ELLs) understanding of mathematical concepts.

Beliefs about teaching and learning mathematics are influenced by the teachers' and students' perceptions and dispositions. In a study of kindergarten teachers of ELL students, Umansky and Dumont (2019) found that teachers had lower expectations of ELLs. In addition, teachers' perceptions and dispositions are highly influenced by state-mandated testing requirements, curriculum, and what students should be able to do at a particular age of development, while students are influenced by past experiences related to how and with whom they interacted (orally, mentally, and physically) at an early age. The perceptions and dispositions of students who are English learners are often different from their teachers (Shim & Shur, 2018). Using their home language may limit access to resources at the school. The students need access, equity, and effective mathematics instruction addressing their culture, conditions, and language to enhance mathematical learning daily (Blanks, 2010).

Due to the changing demographics of schools, I invited teachers to take part in this study who wanted to be effective ELL teachers but needed more preparation to work effectively with students who are learning English as a second language. As the leader, I provided instructional support, including research-based equity strategies, to help teachers establish and implement adequate ELL support and improve equitable teaching practices. Ensuring teachers are equipped with the appropriate materials for high-quality math instruction, the county purchased new textbooks to make math discourse accessible and support academic language acquisition. The National Council of Teachers of Mathematics (NCTM) summarizes the need for support:

> Access and equity require but are not limited to high expectations, access to high-quality mathematics curriculum and instruction, adequate time for students to learn, appropriate emphasis on differentiated processes that broaden students' productive engagement with mathematics, and human and material resources. (NCTM, 2014, p. 59)

Through the participatory action research project and study, I intended to support the practices at our school. In our context, our work helped support teachers through professional development and provided scaffolds for students in various language acquisition stages. In addition, our work may be helpful to the local education agency and possibly other schools in the district to make funding decisions to support ELL instructional support in the district. However, this would require the LEA to provide additional resources to support teachers' professional learning.

Practice

As a public PreK-eighth grade school in North Carolina, the teachers worked hard to support all students, especially those learning a second language. In the PAR, I examined the instructional process of implementing academic discourse through teacher observations and professional development. We grounded our work in practices that support ELL engagement in discourse opportunities and equitable teaching practices. As the lead researcher, I supported the CPR members with professional development and improvement science practices to accomplish this. In addition, I assisted first-grade teachers in changing how they engage ELLs in mathematical discourse activities and modified my leadership methods to better support teachers.

As teachers built the capacity for effectively inergrating ELL practices into their daily curriculum, they contributed to the learning of other teachers at the school. In addition, their knowledge and skills could support changes in the way the district approaches professional learning for teachers and how the district might reframe the ELL curriculum and instruction in the district.

Policy

While federal law requires schools to ensure ELLs have equal access to education, students who do not yet fully comprehend English are often excluded from equitable education

even though they have access to the same facilities, textbooks, teachers, and curriculum as their peers. This study may be helpful for policymakers who work to ensure equitable policies and practices. For this FoP and PAR the findings about how leaders could better support teachers in the use of equitable mathematics discourse strategies could influence policy as well as practice. This study could contribute to policy related to equitable access for language learners, cultural and linguistically responsive (CLRP) teaching practices, and CLRP leadership.

Research

Education should be without barriers and accessible to all students. While this is a small study in a single school, the research community could benefit from more action research projects that engage those closest to the work in solving their problems of practice. Our school and district can benefit from this research because of the high population of ELL students. In addition, the PAR aligned with the FoP assisted in informing teaching practices in the classrooms and supported teachers of ELLs use of discourse strategies in mathematics. This knowledge of practices and the Project I^4 equitable protocols assisted in supporting teachers in improvement science processes, CLRP, and strengthening CLR leadership. It can benefit other schools with similar populations and add to the literature supporting equitable teaching practices.

Connection to Equity

Equity is a goal of the entire PAR project. To accomplish those goals, we addressed equity by focusing on the research-based practices that best support language acquisition. First, students must have opportunities to use language in the classroom because that is the primary way that students learn – by engaging in dialogue with peers (Hammond, 2015).

> Teaching is not meant to be like loading up a truck (a student's mind) with a large pile of bricks (facts) to dump out into a pile somewhere (standardized tests). Students must have

> academic knowledge available in their mind for thinking and conversation purposes. (Zwiers & Crawford, 2011, p. 9)

Of 1,167 students, 29% have been identified as English Language Learners. This group of students would benefit from teaching practices that engage them in content instruction and developing their new language. By and large, all classrooms today provide students with minimal opportunities to talk through and explore the understanding of mathematical concepts; this is particularly complex for language learners as they need to use language to learn a language (Cummins, 1986).

Secondly, using the first language in mathematics to access concepts is translanguaging and can be helpful if it is strategic (Hotaki, 2021). Often, students are confined to stringent rules that mandate appropriate talk times limited to checking for the learning of facts or procedures and rarely allow for deeper thinking, understanding, or peer-to-peer dialogue (Zwiers & Crawford, 2011). Developing oral language is not emphasized in public education, even though non-English speaking students' language growth depends primarily on oral language experiences in schools.

The baseline data demonstrates that first-grade teachers used ineffective practices when engaging students, and particularly ELL students, in math processes. As teachers shifted their practices, they could empower students to be more independent in thinking critically and solving problems and can support language learners to use the language regularly to support both math and language learning. "It seems that many current teaching approaches, especially in classrooms with high percentages of diverse students, promote dependence on authority, passive involvement, and short-term learning" (Zwiers & Crawford, 2011, p. 22). The psychological and sociological equity frames support the focus of practice.

Psychological Frame

Stereotyping is a common form of prejudice that everyone faces at some point; however, certain groups experience stereotyping more than others, and the simple threat of being stereotyped can significantly influence their behaviors (Steele, 2010). Deficit thinking relies on attributing cultural traits and cultural community to underachievement. A particularly damaging version of deficit thinking often blames cultural-linguistic practices, such as poor quality and quantity of linguistic interactions within the family and community, as the cause of school failures (Dudley-Marling, 2015). This thinking never considers that the current schooling system only reinforces the linguistic experiences of native English-speaking students, which widens the achievement gap among native English-speaking students and students whose first language is not English.

When students enroll, they come with cultural, political, and racial identities, which are challenged in the new environment (Steele, 2010). For example, Latino students come from various Spanish-speaking countries, and their parents usually work in the agricultural industry. Too often, teachers then develop opinions about their abilities to be successful. Hence, students are often negatively stereotyped due to their social identities, and those negative stereotypes drive instructional practices that limit their engagement. When the teachers and I discussed the assets and challenges that might inform this project and study, the teachers acknowledged that language support for students new to the country was challenging. Participating in class discussions is a challenging area for English Language Learner students. Steele (2010) suggests "to change the behaviors and outcomes associated with social identity, change the contingencies to which all of that internal stuff is an adaptation" (p. 84). This PAR project and study supported

changing inaccurate preconceptions, so teachers can engage ELLs in math discourse opportunities during class.

Sociological Frame

Hispanics, often referred to as Latinos or Latinx, are the most significant racial minority in the United States. At this rural elementary school, as a group, Latinos have a considerable impact on the economy, politics, and education systems. Unfortunately, this group seems to be powerless because of the hierarchy of what Wilkerson (2020) terms the “caste system” that exists within the school. Whether intentionally or unintentionally, the school has separated individuals (staff and students) into a hierarchy of respect, authority, and assumptions of competence. Thus, teacher demographics, teaching practices, and cultural norms interact. We must better understand how to work with teachers beyond their monocultural lens or "preexisting notions of their centrality" (Wilkerson, 2020, p. 23).

As a result, some teachers use the practices acquired from institutions for higher learning that were built using similar racist policies, biases, and stereotypes. These teaching practices include strategies such as calling on students with raised hands, accepting answers that students blurt out, lecturing to students, calling on students for behaviors, "telling students definitions, formulas and rules they should know, demonstrating how to use information when solving problems, memorizing facts, formulas, and procedures, and then practicing skills over and over" (NCTM, 2014, p. 60). Second, dominant cultural beliefs about the teaching and learning of mathematics continue to be a significant obstacle for English Language Learners. Third, teachers' thoughts influence their decisions about teaching math concepts, while the students' beliefs influence their perceptions about their abilities to learn the subject (NCTM, 2014). This participatory action research facilitated meaningful mathematical discourse among English

Language Learners, one of the key Mathematics Teaching Practices (facilitate meaningful mathematical discourse), to strengthen teaching and learning in first-grade math classrooms.

Project I4 Framework

Using the Project I^4 framework (Tredway et al., 2019), the FoP is grounded in diagnosing the current stage of first-grade teachers' use of an equity-driven stance and academic discourse practices to move teachers from teacher-generated to teacher-initiated and facilitated and then to student-generated discourse moves. Moving teachers from teacher-generated learning opportunities to student-driven learning on the framework, using the PDSA cycle, improvement science, and the CLE axioms, was evident and is discussed in chapters two through six.

Using culturally and linguistically responsive pedagogical strategies drawn from the framework, I provided teachers with various equity strategies to increase student dialogue allowing me to "support teachers' knowledge, practices, and dispositions" (Tredway et al., 2019, p. 44). I supported teachers in the implementation of calling on and questioning strategies, students to student interactions, teacher-to-student interactions, student-to-teacher interactions, and curriculum and instruction, with attention to how to use generic academic discourse practices for specific use with ELL students (Zwiers & Crawford, 2011).

Participatory Action Research Design

I invited teachers to collaborate on the participatory action research (PAR project and study to increase our collective knowledge of equitable mathematical discourse strategies for engaging ELLs. Because the PAR design demands active participation from the lead researcher, I facilitated a community of three teachers to use evidence to support their activities systematically; they then acted as Co-Practitioner Researchers (CPR), meaning that they actively engaged with me regularly in meetings and individual conversations to understand and

implement new practices. In addition, they conducted member checks to determine the accuracy of the data analysis I undertook as lead researcher.

For three cycles of iterative inquiry using multiple forms of qualitative data, we met regularly, examined the data I analyzed, and discussed how to organize instruction and improve gradually. I collected and analyzed data from the CPR coaching conversations and classroom observations. I used CLE protocols to collect artifacts and used improvement science processes (Bryk et al., 2015; Guajardo et al., 2016). In addition, to augment the qualitative research and triangulate the data, I collected field notes and wrote regular reflective memos. As I coded data iteratively throughout the PAR, I generated categories in the Pre-Cycle, emergent themes in PAR Cycle One, and findings in PAR Cycle Two. Next, I presented the purpose statement, research questions, and theory of action.

Purpose Statement and Theory of Action

Herr and Anderson (2014) define action research as "inquiry that is done by or with insiders of an organization or community…..a reflective process…. deliberately and systematically undertaken" (pp. 3-4). I addressed the FoP using the Plan-Do-Study-Act (PDSA) cycle of improvement science processes and the community learning exchange protocols to engage teachers in professional development and implementation of effective teaching mathematics practices. I facilitated discourse among ELL teachers in the CPR meetings to build a conceptual understanding of first-grade mathematical concepts. I modeled collaborative practice in the PDSA cycles, observed teachers, and engaged them in post-observation conversations to discuss their learning and make decisions about the next steps to fortify inequitable discourse opportunities in mathematics for ELL students.

The PAR design was based on this Theory of Action (TOA): If the teachers identify equitable mathematics discourse protocols for English language learners (ELLs), then teachers will be able to design and implement academic discourse strategies to support English Language Learners (ELL) in the mathematics classroom.

Research Questions

The overarching question is: *What fosters and inhibits the classroom implementation of academic discourse structures for engaging English Language Learners?* The FoP is: *Implement equitable discourse strategies to engage English Language Learners in first-grade mathematics classrooms*. The sub-questions on which I collected and analyzed data are:

1. To what extent did teachers funds of knowledge transfer to their teaching practices?
2. To what extent do teachers implement equitable discourse protocols for engaging English Language Learners?
3. To what extent does engaging and supporting teachers in equitable mathematics discourse strategies affect my role as an instructional leader?

As the instructional leader, I evaluated my role and considered what I could do to assist classroom teachers in better understanding.

PAR Activities and Cycles of Inquiry

In Table 1, I identifed the inquiry cycles and the suggested actions we engaged in. This chart is a general overview of the table I present in Chapter 3 to explain the inquiry cycles and the specific data I collected and analyzed. The information from each inquiry cycle guided our activities to make informed judgments about the following stages. I grounded the study in two key principles and processes to fully engage in the PAR: improvement science and community learning exchanges.

Table 1

Research Cycles and Activities

Cycles	Activities
PAR Pre-Cycle Fall 2021 (Chapter 4)	• Invite CPR Group • Establish goals and objectives • Create a plan for implementation • Collect and analyze field notes • Write reflective memos
PAR Cycle One Spring 2022 (Chapter 5)	• Collect data using protocols/strategies and use to inform PAR Cycle Two • Facilitate CPR meetings Collect and analyze field notes • Collect and analyze field notes • Observe classrooms • Write reflective memos
PAR Cycle Two Fall 2022 (Chapter 6)	• Collect data using protocols/strategies and use to inform PAR Cycle Two • Facilitate CPR meetings • Observe classrooms and conduct post-observation conferences • Write reflective memos

Improvement Science Principles and Processes

Improvement science is grounded in inquiry to improve schools' practices (Bryk et al., 2015; LeMahieu et al., 2017). Bryk et al. (2015) outlined the six principles listed below that are explicitly tied to the study.

- Make the work problem-specific and user-centered (p. 12)
- Focus on variation in performance (p. 13)
- See the system that produces the current outcomes (p. 14).
- We cannot improve at scale what we cannot measure (p. 15).
- Use discipline inquiry to drive improvement (p. 16).
- Accelerate learning through networked communities (p. 17)

Making the work problem-specific and user-centered, seeing the system that produces the current outcomes, and using discipline inquiry to drive improvement are the specific improvement principles that guided the study. When aligned with core improvement science concepts, the Plan, Do, Study, Act (PDSA) cycle lead to fast learning through several phases to enhance teacher practices (Bryk et al., 2015). Through the PDSA framework, I engaged in iterative data collection to narrow the data aligning to the FoP.

Community Learning Exchange (CLE) Axioms

The Community Learning Exchange (CLE) processes are an integral part of the PAR. We used the CLE axioms and CLE processes during the CPR meetings to guide us (Guajardo et al., 2016). As part of this PAR study, CPR members used the CLE axioms to build and maintain relationships while preparing pedogeological processes to strengthen teaching and learning. The CLE processes encouraged participants to be open and have honest conversations that led to relationships that empowered participants to take risks in the classroom and enhance their

practices. By engaging in CLEs and focusing on the processes of improvement sciences through the PDSA cycles of inquiry, teachers increased their knowledge for engaging ELLs in equitable mathematical discourse strategies. I collected and analyzed the artifacts from the CPR meetings in which we used CLE processes as data.

Study Considerations: Limitations, Validity, and Confidentiality and Ethics

For the study, I participated as the lead researcher. The research design in Chapter 3 further details the limits, validity, confidentiality, and ethical considerations for this study, which I summarized in this chapter. I ensured that all participants provided informed consent without fear of feeling forced or obligated. They were free to withdraw their permission at any time with no penalty (Creswell & Creswell, 2018). I mitigated risks through careful planning and triangulating evidence (Saldaña, 2016).

Limitations

One key limitation was the sample size. The qualitative study involved a small sample of educators, and the findings were relevant to the school context but may not be generalizable to other settings. However, by providing an in-depth analysis of the practices of three teachers over three cycles of inquiry, we influenced our school and district context.

My role as the administrator was a limiting factor as well. Because I evaluate educators, there are power dynamics associated with the study. To mitigate those dynamics, I kept the observations and conversations in this study separate from the teacher evaluation process and clarified that separation with the teachers.

Validity

In this participatory action research study, reliability and validity are vital criteria of methodological rigor (Guba & Lincoln, 2000). Establishing trustworthiness requires establishing

credibility, reliability, and confirmability. I engaged in CLE strategies to develop the important relational trust necessary to form and facilitate the CPR group. Using reflective memos and member checks, I ensured validity by triangulating the evidence. I conducted member checks after each inquiry cycle to ensure evidence accuracy (Creswell & Guetterman, 2018).

Confidentiality and Ethics

For this study, confidentiality and ethical issues were critical factors in qualitative research. I used pseudonyms to protect both the school and the research participants. Each participant completed consent forms provided by the Institutional Review Board at East Carolina University (ECU IRB) and understood that their participation was entirely voluntary. Because I was the lead researcher and the administrator during the study, I ensured that all participants gave informed consent without fear of pressure or compulsion. Participants can withdraw their permission at any moment without the risk of repercussions.

I shared data with the CPR group for disclosure, improvement, and reflection. CLE artifacts and member checks were used as a tool for triangulation to eliminate bias and ensure accuracy (Creswell & Guetterman, 2018). I protected data by storing evidence in a locked file or using a password to protect evidence stored on the computer. I will destroy all data after three years.

Summary

In introducing the focus of practice and participatory action research (PAR) project and study, I discussed the assets and challenges of the micro, meso, and macro levels that were in place during the study. I provided insight into the psychological, sociological, and Project I^4 frameworks that influenced the context and participants in the study. In Chapter 2, I present a literature review from theoretical, normative, and empirical perspectives. The three areas of

emphasis are equitable academic discourse in mathematics, Cultural and Linguistically Responsive Pedagogy (CLRP), and instructional leadership. Chapter 3 presents the research design and discusses the methodology I used during the PAR in more depth. The PAR was qualitative. In Chapter 4, I discuss the context and the results of the Pre-Cycle in which I code initial data and develop categories. In Chapters 5 and 6, I discuss the emergent themes from PAR Cycle One and the findings from PAR Cycle Two. Finally, in Chapter 7, I discuss the findings considering the extant literature, the implications for practice, policy, research, and my growth and development as a leader.

CHAPTER 2: LITERATURE REVIEW

In 1989 the National Council of Teachers of Mathematics (NCTM) launched an initiative to promote systemic improvements in math education. With the adoption of the Common Core State Standards for Mathematics (CCSSM), there has been a shift away from mechanical drills and memorized procedures for problem-solving (Hiebert & Wearne, 1993) in favor of engaging in meaningful interactions that support discourse among students (Bennett, 2014).

A language and its applications are closely linked to culture. Mathematics' language and culture are rich with social practices and meanings that must be traversed to grasp the underlying mathematical principles (Forman & Ansell, 2002; Moschkovich, 2010; Royce et al., 2007). Mathematics language acquisition may be divided into four components: oral, written, symbolic, and gestural practices (Lemke, 1990; Moschkovich, 2010; Sfard & Cole, 2003). All of these techniques contribute to mathematical discourse. To acquire a language, we must learn to speak, read, and write (Zamel, 1998). According to applied linguistics, learning a language begins with acquiring oral language abilities and then progresses to the written word. "Each subject area has its method of utilizing language to create knowledge, and students must be able to use language effectively to participate in those ways of knowing" (Schleppegrell & Go, 2007, p. 140). In mathematics instruction, instructors' oral language abilities and their value on these skills influence how students utilize oral language in mathematics (Huang et al., 2005).

Students must engage in oral mathematical discourse and social interactions with teachers and other students to learn to communicate mathematically (Kieran et al., 2002; Moschkovich, 2002; O'Halloran, 2015). This is known as participating in the mathematics register (Gee & Gee, 2007; Gutiérrez, 2013; Temple & Doerr, 2012). Even passive participants in oral mathematical

discourse have demonstrated gains in oral language use and social behaviors merely by being present in a mathematical discourse community (Moschkovich, 2010; Van Dijk, 1993).

In this literature review, I examine equitable academic discourse and how math standards and curricula have evolved to support English Language Learners (ELLs). I then review the literature on Cultural and Linguistically Responsive Pedagogy (CLRP) and instructional leadership changes through supporting teachers and improving practices.

Equitable Academic Discourse

Academic language is impacted by home and school settings, and the mechanisms that shape it are complex, particularly in classes with students from diverse backgrounds (Zwiers, 2007). However, academic language is a generic word for school language, and its absence is seen as the main reason for low success among various pupils. More specifically, academic discourse for mathematics can be defined as talking and acting in ways mathematically competent individuals communicate and act while talking about mathematics in a classroom and entails far more than technical vocabulary (Zwiers, 2007). Students participate in discourse to help develop academic language and higher-order thinking skills, which are closely linked and influenced by home and school circumstances.

Students who grow up in mainstream English-speaking environments share many knowledge bases, culturally unique communication cues, and thought processes found in learning settings and materials in U.S. schools. As a result, these pupils have gained far more than just linguistic skills, which help them excel in school. On the other hand, many non-native speakers of the school language and members of non-dominant groups begin school without a good range of communication patterns that drive the tasks, texts, and tests in

mainstream classes. Traditional discourse practices in mathematics can provide information on processes that either support instruction for these students or hinder it.

Traditional Discourse Practices in Mathematics

In the past, mathematics in the United States has been characterized as seldom asking students to think (Banilower et al., 2006). Before adopting the Common Core State Standards (CCSS), mathematics education focused on basic skills without connecting to meaning, problem-solving, or understanding concepts (Bransford & Donovan, 2005). Much has changed since the Common Core state standards in 2009 (Smith & Stein, 2018). Traditional math discourse included problem-solving and algorithms instead of discussing mathematical processes and conceptual understandings

Common Core State Standards Mathematics and Academic Discourse

In conjunction with federal initiatives such as the Every Student Succeeds Act (ESSA), today's state requirements have ensured that academic opportunities for discourse tasks are embedded in everyday practices while meeting the needs of the increasing population of ELL students (Sandilos et al., 2020). "Academic discourse is aligned with the national Common Core State Standards as well as the World-Class Instructional Design and Assessment (WIDA) model" (Zwiers & Crawford, 2011, p. 11) that teachers use to support English Language Learners during instruction. Much of the assistance provided is focused on learning the English Language and content-related vocabulary (NCTM, 2014). While both are essential for English learners, academic conversations are powerful teaching resources that engage, create ideas, solve problems, and improve comprehension (Zwiers & Crawford, 2011, p. 1). An engaging mathematics curriculum that promotes dialogue necessitates selecting tasks that enable students to understand and process knowledge (Bransford & Donovan, 2005).

The Common Core State Standards (CCSS) provide a rigorous, focused, coherent mathematics curriculum that promotes conceptual understanding and reasoning and skill fluency (NCTM, 2014) while supporting discourse through the eight mathematical practices with their adoption. Students must incorporate language into math learning due to the transition to Common Core State Standards in mathematics, move away from procedural-based questions, and emphasize students' mathematical reasoning and comprehension of math concepts (Poplin & Bermudez, 2019) through the eight mathematical practices. These practices include:

1. Make sense of problems and preserve in solving them.
2. Reason abstractly and quantitatively.
4. Construct viable arguments and critique the reasoning of others.
5. Model with mathematics.
6. Use appropriate tools strategically.
7. Attend to precision.
8. Look for and make use of structure.
9. Look for and express regularity in repeated reasoning (NCTM, 2014, p. 8; Poplin & Bermudez, 2019, pp. 73-74).

Next, I connect to the standards for mathematical practices and practices for ELL in math that support the focus of practice.

Standards for Mathematical Practices

Teaching practices provide a foundation for bettering mathematics instruction and learning. The abovementioned approaches represent a core set of high-leverage activities and essential teaching abilities to promote deep mathematics learning. In addition, two practices are closely connected with my research. Although there are eight practices, I will describe how two

in particular are connected to my FOP. The second practice is "implementing tasks that promote reasoning and problem solving, allows students with multiple entry points and varied solution strategies" (NCTM, 2014, p. 10). Students must realize that numerous methods exist to break down a problem to find a solution. Students can employ context skills rather than traditional methods if they use symbols, drawings, or other representations to express the distinct portions of the issue.

The third practice, using and linking mathematical representations (NCTM, 2014, p. 10), encourages students to make connections while increasing their grasp of mathematical ideas and methods as a problem-solving tool. This standard aims to provide a common mathematical language that can be used to discuss and explain math and support or criticize other people's work. Math vocabulary may be included in everyday lesson plans for students to communicate effectively. Activities like effectively restating a classmate's argument or supporting their reasoning for agreeing or disagreeing are crucial in establishing and improving communication skills. In addition, students communication skills improved by encouraging them to participate more actively in class mathematics discussions. Next, I discuss the methods for supporting ELL students' mathematics development.

Developing English Language Learners in Mathematics

A significant issue is the experience and expertise of both new and veteran teachers regarding the effective teaching of English learners (Poplin & Bermudez, 2019). In addition, teachers' inadequacy, or lack of training to effectively teach ELL students, has been a challenge (Echevarria et al., 2018; Kareva, 2013; Poplin & Bermudez, 2019). However, teachers can use seven research-based strategies to help ELL students improve their math skills.

1. Connect math to students' real-life experiences and prior knowledge (Chval & Chávez, 2011; Williams et al., 2020).
2. Create classroom environments rich in language and math materials (Chval & Chávez, 2011; NCTM, 2014).
3. Emphasize the importance of context and that words may have many meanings (Chval & Chávez, 2011).
4. When learning English and mathematics, students may need to express meaning using gestures, sketches, or their native Language (Chval & Chávez, 2011; Kareva, 2013; Leinwand, 2009).
5. In classroom discussions, use visual aids such as physical objects, videos, diagrams, and gestures (Chval & Chávez, 2011; Kareva, 2013).
6. Create and display anchor charts with essential ideas, concepts, and words so students can refer to them throughout the lesson (Chval & Chávez, 2011).
7. Provide students the opportunity to discuss their mathematical thinking and revise their work (Chval & Chávez, 2011).

A few of the research-based strategies stated above, in particular, are supported by North Carolina's Department of Public Instruction and are critical to the research of my FoP: Creating a language-rich environment, making meaning through gestures, sketches, or their native language, discussing mathematical thinking, the Sheltered Instruction Observational Protocol (SIOP) framework, and Common Core State Mathematics Standards are strategies aligned with engaging ELLs in mathematical discourse practices.

Classroom ecology and context are fundamental to English Language Learners as they can engage in problem-solving, independent thinking, and discourse in mathematics (Khisty &

Chval, 2002, p. 157). Classrooms that are well-structured, caring, hold high expectations for all students, and exemplify cultures of participation are more likely to increase student engagement (Bennett, 2014, p. 21). It is essential to remember that students need a safe classroom environment to participate comfortably in discourse opportunities (Bansal, 2018). The most notable feature of successful, equitable mathematic discourse in the classroom context is how the environment is created to incorporate rich mathematic language that students use to think and communicate thoughts and ideas (Khisty & Chval, 2002). It is beneficial for English Language Learners (ELLs) to be surrounded by and engage in math talks that encourage mathematic vocabulary, spoken language, written language, and mathematical expressions (Blanks, 2010).

The Sheltered Instruction Observational Protocol (SIOP) framework promotes academic language development. It presents curricular material to ELL students using methods and techniques, such as gestures, sketches, or their native language, that help students understand new knowledge (Chval & Chávez, 2011; Echevarria et al., 2018; Kareva, 2013; Leinwand, 2009). This model ensures that academic language skills are developed in all domains (reading, writing, listening, and speaking) and subject areas. Teachers who have used the SIOP model have experienced improved academic performance. For example, in a study of a 502-student elementary school in Boston, Massachusetts, 90% of the students speak Spanish, and half do not speak English. However, using SIOP with observations and input over a year, students' math scores rose from 28 points below the state average to 20 points higher than the state average (Kareva, 2013). The implications for ELL students are high levels of student-to-teacher interactions, student-to-student interactions, and interactions with academic texts, all of which lead to elaborated discourse and critical thinking (Echevarria et al., 2018).

Mathematics learning is an active process that offers an avenue for teachers to create equitable mathematics-rich learning environments and interactions (Bennett, 2014) for English language learners (ELLs) to build math knowledge while engaging in math social language and discourse tasks (Khisty & Chval, 2002). Moschkovich (2002) refers to discourse practices as language and other symbolic expressions, objects, and communities embedded in practices. Discourse among teachers and students is central to meaningful teaching and mathematics learning (NCTM, 2014). Unfortunately, math-rich conversations and high-quality math tasks are most scarce in classrooms with the highest number of linguistically and culturally diverse students (Zwiers & Crawford, 2011). Access to high-quality math tasks and discourse opportunities are typically assigned to students with backgrounds of the dominant language and culture. Moreover, the opportunity for English language learners to participate in rich academic discourse presents its challenges when English proficiency is seen as a prerequisite to meaningful participation in the curriculum and "inequalities in achievement are perceived as the result of a hierarchy of competence" (NCTM, 2014, p. 59).

Classrooms inclusive and supportive of diverse cultures are necessary for supporting non-English speaking students, exemplifying cultures of participation and equitable learning experiences (Bennett, 2014). In addition, the NCTM (2014) outlines socially, emotionally, and academically safe environments for mathematics teaching and learning in which students feel safe to engage with one another and with teachers (Education Alliance, 2002).

Equitable Discourse Practices

With the shift in CCSS comes restructuring the classroom from teacher-centered to student-centered teaching and learning practices. "Students' learning of mathematics depends fundamentally on what happens inside the classroom as teachers and learners interact over the

curriculum" (NCTM, 2014, p. 8). Various strategies can aid the comprehension and engagement necessary for effective ELL education. These are called structured language practices. To strengthen teachers' lessons and mathematical proficiencies among ELL students, it is critical to provide research-based strategies to support mathematics learning. According to Hammond (2015), teachers must have appropriate context knowledge and access to information to use culturally sensitive tools and techniques.

Teacher instructional practices such as turn and talk support students' engagement in mathematics and establish student-to-student discourse opportunities (Moschkovich, 2002). Exploratory talk is essential for student learning and the development of teacher questioning that provokes students' thoughts, critical thinking, elaboration of ideas, and student-to-student engagement (Adams et al., 2020). "Math talk learning communities is a theoretical framework that refers to a classroom community in which the teacher and students use discourse to support mathematical learning" (Hufferd-Ackles et al., 2004, p. 82) and extends both teacher and student thinking. Such dialogic interactions supported by teacher moves, also known as discursive moves (Adams et al., 2020; Bansal, 2018), promote students' understanding, reasoning (Adams et al., 2020), and accountable talk (Ferris, 2014). "Academic language is best developed in context through meaningful and active use of new language" (Khisty & Chval, 2002, p. 156). I discuss these critical strategies in the Project I^4 Framework (Tredway et al., 2019) tools and techniques considered for the FOP.

Talk Moves

Teachers are crucial to the success of all students, particularly English language learners; thus, how teachers use engagement methods is just as essential as the material information they offer in their classes. Teachers utilize talk moves to increase students' opportunities to engage in

and encourage academic conversation. Talk moves, specifically revoicing, are one way for teachers to support and encourage teacher-student and student-student academic exchanges (Ferris, 2014; Herbel-Eisenmann et al., 2009).

Revoicing includes rehashing all or part of what students add to a conversation to confirm whether the educator accurately deciphered the information (Ferris, 2014). Revoicing can prompt student participation in three ways: First, it opens opportunities for expanded and iterative evaluations between the teacher and student on the initial student response to achieve mutual understanding and minimize misinterpretations. Second, it can model academic discourse by rephrasing or translating the student's response to reinforce specific mathematical terms, which is an effective way to help ELLs develop mathematical language. Third, mathematics teachers can also use it to "set different student ideas against one another to formulate a mathematical argument that can be fruitful for achieving deeper conceptual understanding" (Shein, 2012, pp. 191-192). Paired with revoicing, calling on strategies can be a highly effective way for teachers to ensure students can understand their peers and have equitable opportunities to respond and engage in discourse.

Calling-on Strategies

Teachers must encourage and manage all students' participation while engaging in discourse activities during class. Discussion is the most frequently used active learning strategy in classrooms. However, this strategy is less inclined to include the voice of all students, which leads teachers to cold call on students to engage and participate. When used correctly, cold calling may be beneficial. On the other hand, teachers are at varying comfort levels with various calling-on methods, generally employed in whole-group teaching. For example, cold calling is helpful when the teacher can state the question, provide adequate wait/think time (3-8 seconds

depending on the cognitive level of the topic), and then name a student to reply. However, it is ineffective to call on pupils without giving them time to ponder or because they are disengaged, in which case the instructor uses the call as a disciplinary signal (Tredway et al., 2019). By addressing the student by name before asking the questions, other pupils are informed that they are not required to reply. If the instructor is explicit about using blurt out or "popcorn" during certain activities, it is acceptable; generally though, the teacher merely accepts callouts or blurt-outs as a time-saving measure. To have partners communicate, the instructor may utilize Think-Pair-Share (TPS) or "turn and talk;" nevertheless, teachers too frequently recognize raised hands in the sharing stage. Instead, the instructor should listen to student dialogues during TPS and help a student "rehearse" an answer before introducing that student's response to the group.

Cold-calling students to refocus their attention or discourage unwanted behaviors has been used in many classrooms and is ineffective in engaging reluctant students in discussions. Cold calling can descrease students' voluntary classroom engagement, participation, and comfort (Dallimore et al., 2013). Many students, especially ELLs, are deeply uncomfortable when called upon to answer a question or share an idea, and we, as instructors, may need to do more to build students' confidence to share. A student's ability to participate in class discussions is an acquired skill developed over time. Calling on strategies is a way to encourage the student to think and talk. Culturally and linguistically responsive pedagogy supports teachers and students. However, the teacher must use these strategically.

Scaffolding: Translanguaging

Scaffolding is one of the most critical aspects of culturally and linguistically responsive education because it allows teachers to accommodate each ELL's specific needs (Kame'enui et al., 2002). According to Larkin (2002), teachers provide more assistance as students learn new or

complex tasks. The support or "scaffold" is gradually reduced as mastery or competency is established. This shifts the responsibility of learning from the teacher to the learner. For ELLs, the importance of this mutual interaction cannot be overstated.

ELLs need numerous representations to support a deep understanding learning of mathematics. Supports such as scaffolding supports the FoP of the research. Scaffolding translanguaging (SF: TL) combines scaffolding with translating concepts or essential ideas into students' native languages and is a crucial tool for promoting knowledge and engagement in math, science, and literacy education (Pacheco et al., 2019). Allowing students to translate for one another to ensure that all topics are understood is essential for adequate comprehension.

Culturally and Linguistically Responsive Pedagogy (CLRP) in Mathematics

A culturally and linguistically responsive pedagogy, according to Hollie (2012), is "the validation and reinforcement of the student's home culture and home language for the goals of developing and bridging the culture of academia and mainstream society" (p. 23). Students preserve cultural competency, academic achievement, and self-esteem when their culture and language become a vehicle for learning through culturally and linguistically responsive teaching (Bennett, 2014).

To eliminate the language barrier for ELLs and educational debt (Ladson-Billings, 2006), teachers, administrators, and other educators must use their knowledge to help solve such problems. Educators understand and value the assets that ELLs bring to the classroom (Cummins, 1986; Gay, 2010a; Howard, 2001; Howard & Terry, 2011; Ladson-Billings, 1994; Lucas et al., 1990; Lucas et al., 2008; Moll, 1988; Nasir et al., 2009; Pease-Alvarez et al., 1991). Through cultural and linguistic practices, teachers transform their pedagogy to be inclusive, equitable, and affirming. This transition strengthens and nurtures students' connections to new

learning (Sleeter, 2012), and their cultural and native languages become essential elements of learning (Ladson-Billings, 2009).

CLRP (Culturally Linguistically Responsive Pedagogy) intentionally includes students' cultural backgrounds in the classroom setting and everyday lessons above the surface level. Culturally relevant or culturally responsive education takes advantage of students' cultural backgrounds and talents in the classroom (Gay, 2010b). The teacher's knowledge of the students' cultures, histories, and other factors are also necessary. The teacher draws on the students' past knowledge, not of the current topic, but of similar experiences or instances that could help them understand. In addition, Aud et al. (2013) notes that the importance of instructional approaches and supports that promote equitable outcomes in mathematics is critical for ELL students. Although more evidence is needed, culturally responsive education has been pushed to enhance student achievement, particularly for BIPOC (Black, Indigenous, and People of Color).

Valuing students' cultural knowledge and building upon it is a crucial component of culturally responsive teaching. Mathematics makes sense only when deeply embedded in historical, cultural, social, and political contexts (Smith, 2017). The learner's cultural context must be recognized to plan successful instruction and create bridges between home and school. This can be accomplished using meaningful instructional materials, examples, analogies to explain new concepts, and various teaching strategies connecting cultural experiences and academic content (Education Alliance, 2002). Language concerns have gotten far less attention than cultural issues, although both should be considered in the education of ELLs. Based on their work educating culturally sensitive teachers and the research on how to educate ELLs successfully, Lucas and Villegas (2010) created a framework for linguistically responsive teachers.

Culturally Responsive Pedagogy (CRP)

Culturally responsive pedagogy, also known as culturally relevant pedagogy (Ladson-Billings, 1994) and culturally responsive teaching, is a theoretical idea in multicultural education with various titles (Gay, 2002). Ladson-Billings (1994) created the phrase "culturally relevant pedagogy" within a theory based on three criteria: the capacity to develop pupils intellectually, the desire to foster cultural competency, and the development of critical consciousness. Culturally Responsive Pedagogy (CRP) is based on research that shows that children learn best when engaged in interactive, relational activities rather than when taught in a group setting that is teacher-dominated (National Scientific Council on the Developing Child, 2009). In addition, according to research, educational programs for ELLs should encourage children to improve their original language (Cummins, 1989; Tharp et al., 2000).

Gay (2002) expanded on Ladson-Billings' (1994) work in developing culturally sensitive teaching methods. Culturally responsive teaching focuses on leveraging different students' cultural features, experiences, and views as conduits for effective teaching. Culturally responsive pedagogy focuses on leveraging different students' cultural features, experiences, and views as conduits for effective teaching. This idea claims that when students' experiences and frames of reference build academic knowledge, education becomes more personally relevant, exciting, and more accessible and thorough to learn. Culturally responsive education, according to Gay, is affirming because it recognizes the legitimacy of cultural heritages as elements that influence students' learning and as worthy subjects to teach (Gay, 2010b). Culturally Responsive Teaching (CRT) asserts that cultural diversity has a place in every topic taught in schools and that instructors must adapt the current curriculum to meet the needs of all pupils (Gay, 2002). According to Gay (2000, 2010b), CRT has five essential aspects that consequence educational

procedures. They include developing a cultural diversity knowledge base, incorporating ethnic and cultural diversity content into the curriculum, demonstrating caring and creating learning communities, communicating with ethnically diverse students and families, and responding to ethnic diversity in the delivery of instruction. While culturally responsive education focuses on a necessary component of CLRP, it is critical to include a student's home language regarding ELLs. Next, I share literature on how linguistics influences learning among ELL students.

Linguistically Responsive Teaching (LRT)

Language is necessary for learning, growth, and human activity (Vygotsky, 1978). Linguistically responsive teaching (LRT) aims to dispel the idea that there is a single version of "Standard English" (Lucas et al., 2008). Rather, LRT appreciates the communication knowledge and abilities that ELL students bring to classrooms. This emphasis "places language at the center of the discussion rather than on the margins, articulating essential orientations, knowledge, and skills for teaching English language learners" (Lucas & Villegas, 2010, p. 67). As a result, LRT aims to give the language components of culture equal priority.

As the rate of linguistic assimilation in the United States grows, numerous researchers have highlighted the communication skills, knowledge, and wealth that ELL students bring to the classroom (Delpit, 1995; Delpit & Dowdy, 2002; Gay, 2000; Moll, 1988; Moll et al., 1992; Yosso, 2005). Students are more likely to experience academic success when their home languages are incorporated into the classroom. Lucas et al. (2008) proposed a knowledge base for LRT that explicitly focused on second-language acquisition and second-language learners. In their framework for LRT, the authors established seven elements for LRT:

- sociolinguistic consciousness;
- valuing linguistic diversity;

- an inclination to advocate for English language learners (ELLs);
- knowledge of English language learner students' linguistic backgrounds, experiences, and proficiencies;
- understanding of the language demands of classroom tasks;
- applying critical principles of second language learning; and
- scaffolding instruction to promote linguistically diverse students' learning. (Lucas & Villegas, 2010, p. 57)

Support Mathematic Language Development

A command of the academic language is essential for learning in the mathematic language context. For example, teachers who successfully teach mathematics to ELL students emphasize using mathematics terms and definitions while connecting them to real-world experiences (Hattie et al., 2017; Ross et al., 2002). This is accomplished by using word walls and pictorial representations, building meaning through revoicing students' answers, and repeating terms when students show trouble pronouncing the words or are showing resistance to saying them (Chval & Chávez, 2011). However, bilingual teachers who speak similar languages could leverage that skill to enhance their understanding of concepts.

Instead of adequately addressing any advantages of bilingualism for mathematics learning, research on ELLs tends to treat monolingual classrooms as the standard or focus on the English mathematical register's barriers to these learners (Moschkovich, 2010). Moschkovich (2010) suggests the following to avoid the pitfalls:

- Move away from dichotomies like everyday/academic, formal/informal, or in-school/out-of-school to recognize the complexity of language. Because various

registers in English and Spanish might exist, avoiding these dichotomies may help study in ELL practices in mathematics.

- Use academic material from many relevant disciplines to develop interdisciplinary perspectives and methodologies. Furthermore, researchers must employ frameworks that consider the mathematical reasoning that participants create "in, though, and with language" to focus on the mathematical meanings that participants construct rather than the mistakes they make" (p. 155).
- Consider language difficulties in various contexts to avoid deficit models focusing solely on the obstacles participants encounter rather than the resources and skills they bring to the mathematics classroom. When research is focused on comparisons between monolingual and bilingual speakers, multilingual abilities such as translanguaging, for example, might be overlooked.

Driscoll et al. (2012) argue that ELLs should engage in productive mathematical discourse despite language barriers. Given mathematics language's complex and challenging nature, educators must actively focus on working with this demographic (Schleppegrell, 2007). Teachers must recognize that math is more than just teaching numbers. They must widen their approach to include ELLs' language knowledge (Warren & Miller, 2015), including the communication skills required to successfully engage in mathematical discourse (Moschkovich, 2010). Explicitly teaching academic vocabulary throughout math lessons, asking open-ended questions, modeling vocabulary in context (Holland et al., 2016), and reviewing or previewing the content in students' first language (Nguyen & Cortes, 2013) are some strategies for developing academic language.

Native Language Supports Engagement in Mathematics Academic Discourse

Learners who have a solid native language are more likely than those who have a weak native language to achieve native fluency in the target language (Dixon et al., 2012). Language is essential to teaching and learning (DiCerbo et al., 2014). Communication is one of the most critical aspects of developing comprehension in the mathematics classroom of the twenty-first century (Smith, 2017). It is how knowledge is communicated and how a teacher can assess whether students have grasped the concepts and skills taught (Education Alliance, 2002; Freeman & Freeman, 2004; Smith, 2017). Poor classroom teaching limits English language learners' opportunities to learn mathematics (Waxman et al., 2007). According to Guglielmi (2012), there has been much debate about educating English language learners better; integrating the students' mother tongue in math teaching and learning would improve academic achievement. The foundation for acquiring a second language is literacy in the heritage language. As a result, teachers must be aware of the quantity of conceptual information and abilities acquired in the primary language (Cummins, 1981, 2000, 2010; Dixon et al., 2012).

In the twenty-first-century mathematics classroom, communication is one of the most critical factors in fostering comprehension. Scholars have sought ways to address best practices in scaffolding the participation of English Language Learners (ELL), which include drawing on their first language as a resource and activating prior knowledge where English is the dominant Language (Aguirre & del Rosario Zavala, 2013). Teachers can assist students in succeeding by understanding and capitalizing on their native language's strengths (Moll et al., 1992). Speakers of a non-dominant language may believe that the language they bring to the classroom is undervalued; however, teachers can make their instruction culturally responsive by allowing students to use their first language knowledge to gain proficiency (Freeman & Freeman, 2004).

This supports the Boykin and Bailey (2000) finding that when the school's learning environments are sensitive to the child's history and cultural background, students' academic performance and cognitive functioning improve. Students with a solid academic base in their native language find it easier to learn English (Cummins, 1981, 2000, 2010; Dixon et al., 2012; Freeman & Freeman, 2004). According to research, when students are completely fluent in their native language in reading and writing, they can transfer it to the second language (Freeman & Freeman, 2004). When teachers use the skills students have developed at home and draw on those skills to engage students in learning new academic material, they effectively link the home and students' prior knowledge with school (Education Alliance, 2002).

Translanguaging

Translanguaging theory is a "process of making meaning, shaping experiences, and gaining understanding and knowledge through the use of two languages" (Lewis et al., 2012, p. 655). This instructional practice supports using ELLs' native language to enhance second language acquisition. Translanguaging encourages linguistic flexibility in everyday content, allowing bilingual students to use both languages to enhance their learning (García, 2019; Lewis et al., 2012). ELL students receive information in one language and understand the second language (Lewis et al., 2012). Before the information can be used successfully, the ELL student must fully understand it. The educational advantages of translanguaging are to promote a deeper understanding of the subject matter, develop the weaker language, strengthen the home-school connection, and help the integration of fluent speakers with early learners. While there are many debates among practitioners rejecting the use of native language in the classroom, "the benefits are increasingly noticed, and students develop indispensable academic and linguistic skills" (Kwihangana, 2021, p. 89).

Cultural Perspectives in Math

In the literature, culturally responsive mathematics instruction is characterized as pedagogical knowledge, teacher beliefs, and instructional methods that promote mathematical thinking, value students' knowledge resources, and address power and social justice concerns in mathematics instruction (Aguirre & del Rosario Zavala, 2013). Connecting mathematics teaching and learning to students' culture, family, and home increases their ability to connect math to the outside world and their everyday lives (Djonko-Moore, 2020). There are many aspects that teachers do not know about their students that connecting with the family or culture could alleviate. Teachers must learn about the cultures of their students in order to properly teach and promote education (Scrimsher & Tudge, 2003). Teachers provide the culture of the target language to the students. Developing a classroom community of practice requires this collaborative interaction (Lave & Wenger, 1991; Wenger, 1999).

The benefits of blending cultural perspectives in mathematics provide students with a positive belief about themselves and a safe space to be affirmed, celebrated, and valued (Djonko-Moore, 2020); moreover, the teacher will "know the child as a whole person, not merely as a student" (Moll et al., 1992, p. 133). Funds of knowledge refer to the experiences and understandings students bring from their home community to the classroom and can be used in instruction.

Funds of Knowledge (FoK)

Funds of knowledge (FoK), according to Moll and Greenberg (1990), are "the key cultural practices and bodies of knowledge and information that families utilized to survive, advance, or thrive" (p. 321). The term "funds of knowledge" (FoK) has been modified to refer to "these historically collected and culturally formed bodies of information and skills that are

important for household or individual functioning and well-being" (Moll et al., 1992, p. 132). Cultural background determines how we view and function within the world. Life experiences and relationships shape how we learn and express learning, directly related to a concept called funds of knowledge.

A study by Paris (2012) found that culturally relevant and culturally responsive methods failed to guarantee the valuing and preservation of our multiethnic and multilingual society. By definition, funds of knowledge are practices that recognize, appreciate, and use family and community knowledge about the less empowered students within the school (Education Alliance, 2002; Paris, 2012; Ralabate & Nelson, 2017). According to a growing body of research, funds of knowledge can promote social justice and allow long-awaited advances in multicultural education (Hogg, 2011). Several researchers have lately emphasized how important it is for children's social, intellectual, and linguistic requirements to be met by integrating school and home experiences (Au, 2014; Gay, 2010a; Hogg, 2011; Moll, 1988; Moll et al., 1992; Paris, 2012; Phuntsog, 2001; Rodriguez, 2013; Yosso, 2005, 2006). ELL children and their families were once thought of as a rich source of social and intellectual resources, but many schools now see them as "lacking" in the language forms and information sanctioned by educational institutions (Au, 2014; González et al., 1995; Grant & Sleeter, 2011; Nieto, 2013). ELL students and their families offer a wealth of knowledge to the classroom. Households and communities rely on numerous cultural systems and networks as a resource. There is a consensus among these experts that school education should be more closely linked with the cultural and linguistic practices in ELL households (Au, 2014; González et al., 1995; Gregory et al., 2004; Hogg, 2011; Ladson-Billings, 2001; Marshall & Toohey, 2010; Moll et al., 1992; Orellana & Reynolds, 2008; Paris, 2012; Rodriguez, 2013).

Mathematics instruction for English Language Learners (ELLs) needs to be particularly intentional, providing opportunities to support content and language development (Blanks, 2010; Zwiers & Crawford, 2011) and allowing culture to influence learning (Djonko-Moore, 2020). Connecting mathematics with culture, family, and home can help students connect mathematics to the outside world and everyday lives (Paris, 2012). Our background knowledge is grounded in our experiences, and our experiences are influenced by our culture and social interactions (Ralabate & Nelson, 2017). Moll et al. (1992) asserted that the "students' community provides a resource of tremendous value for educational reform and improvement" (p. 21). These claims are based on Vygotsky's (1978) assumption that learning occurs via social contacts, which confirms that emerging bilinguals, like their majority counterparts, have engaged in various social practices in their homes and communities. Moll et al. (1992) and his colleagues proposed that these social behaviors supply students with funds of knowledge to enhance student potential.

Assuming that education is a social activity, the significance of student-teacher engagement, student-student interaction, and community networks cannot be overstated (Moll et al., 1992; Stanton-Salazar, 2011; Stanton-Salazar & Spina, 2000; Vygotsky, 1978). When interactions occur between students and teachers, both groups' funds of knowledge are enhanced. The three primary objectives of funds of knowledge are "improving academic outcomes, improving ties between families and schools, and modifying teaching practices" (Ralabate & Nelson, 2017, p. 56). All learning experiences involve Language (Freeman & Freeman, 2004) and are deeply connected to one's culture (Education Alliance, 2002), which helps build the foundation needed for student success and English Language acquisition (Freeman & Freeman, 2004). Understanding the cultural values and resources that students' families and communities have enhances academic performance and builds relationships that strengthen family, school, and

community partnerships. The partnerships influence ELLs academic success in the following ways:

1. Higher student achievement and more enthusiasm and joy in the classroom and at home increase.
2. Pedagogically, teachers can better connect content to students' real-life experiences.
3. Teachers can better select meaningful instructional materials and use examples and analogies to clarify new concepts.
4. Use various teaching strategies that connect cultural experiences and academic content.

Social interaction norms and expectations are part of the shallow culture. On the other hand, deep culture comprises unconscious expectations and implicit information that impact how people behave, believe, and cooperate with others. Going beyond surface-level culture demands a teacher's ability to tap into the vast resources of emerging bilinguals and their families can help them transcend past deficit thinking and stereotypes and tap into an excellent potential for invention and creativity, resulting in a safe and enjoyable learning environment for pupils.

Building a safe classroom environment that promotes equitable mathematics practices, encourages relational trust, and provides rigorous mathematical tasks ensures accessibility, equality, and cultural responsiveness (NCTM, 2014). Since academic language can increase the complexity of math elements for ELLs, math debate involving interpretation, argumentation, and defense of mathematical concepts should be a defining feature of a quality mathematics classroom experience (Smith, 2017). ELLs' opportunities for rich discourse in mathematics classrooms can only occur when students' native language is encouraged and developed. Culturally and linguistically sensitive teachers validate, facilitate, liberate, and empower

ethnically diverse students by cultivating their cultural integrity, individual abilities, and academic success" (Gay, 2000, pp. 43–44).

Language Learning

Theoretically, there is a significant link between arithmetic development and language learning. Critical theorists and researchers have established second language acquisition models relevant to mathematics development and can help explain the additional problems ELLs experience in the mathematics classroom. Cummins (1981) introduced the developmental interdependence hypothesis, which states that when students begin intense exposure to their second language (L2), their proficiency in their first Language (L1) is functionally reliant on their proficiency in L2. Despite the reduced time spent in L2, student can gain proficiency in both languages if development is maintained and fostered following the introduction of L2. However, the opposite is not valid. Parts of a student's linguistic abilities do not fully develop if their L1 stops developing, which may happen when minority language children enter an English-only kindergarten. As a result, students need help mapping new L2 knowledge onto an incomplete cognitive-linguistic system. This has ramifications for acquiring new subject information, such as mathematical ideas. When bilingual students are already familiar with a subject in their first language, they need to name it differently in their second language (Cummins, 1981). If they are still getting familiar with the topic, they must learn both conceptual understanding and language simultaneously.

Kroll and Stewart (1994) offered a revised hierarchical model as a cognitive model explaining why this dependency arises. These cognitive researchers investigated the asymmetric links between bilingual memory representations for language. Words in a bilingual speaker's two languages are thought to be kept in two different memory systems, with a third abstract memory

system storing concepts shared by both languages. According to the updated hierarchical model, the memory system for L1 directly relates to the underlying idea, and the connection between L2 and the underlying concepts is mediated via L1 translation in starting learners. Direct conceptual linkages between L2 and the underlying are apparent to learners once they become more skilled in L2. Because of the critical role L1 plays in linking L2 words with concepts helps explain the functional dependency between L1 and L2. These two language acquisition models are crucial to the development of mathematics content because the amount of conceptual mathematical information students have from their first language influences their conceptual understandings. ELLs have nothing to map their new learning onto unless they have a fundamental knowledge of mathematical principles, and the content training may appear useless (Cummins, 1981). According to some research, Hispanic kids taught mathematics solely in English do worse than those taught bilingually (Wong & Valdez, 1986). Building subject matter knowledge in school demands complex networks of conceptual information, and the quantity of past-related knowledge influence how new knowledge is built (August et al., 2005). Mathematical knowledge is organized systematically so that new information may be related to previous knowledge (Kilpatrick et al., 2001). Mathematical knowledge is hierarchical in this way, with small groups of ideas crammed into more extensive mathematical notions. This organized information style might be complex for ELLs trying to develop their basic abilities in a foreign language. Furthermore, there may be a neurological link between the brain regions involved in math and language. Some studies claim that the brain networks for mathematics and language comprehension overlap (Baldo & Dronkers, 2007), which might have significant consequences for ELLs learning math.

On the other hand, there are studies that claim that the brain mechanisms that facilitate mathematical reasoning are far more complex than previously assumed (Geary, 2011). Other environmental factors may play a role in the overall success of ELLs. Teachers often admit to having little experience working with pupils who are not fluent in English (Combs et al., 2005). According to one study, just 13.9% of instructors had received more than nine and a half hours of training on how to help ELL students during instruction by mid-year (Master et al., 2016). This is problematic because the same study revealed that teachers who had gotten at least nine hours of training were more successful with ELLs than teachers who had not had such training. I transition to review the literature on instructional leadership through the lens of adult learning, improvement science, coaching conversations, and culturally and linguistically responsive leadership.

Instructional Leadership: Adult Learning and Coaching

Since the 1980s, when instructional leadership surfaced during the research of effective impoverished urban elementary schools, instructional leadership has become a prominent leadership style. Administrators that demonstrated leadership traits were strong, direct, and determined to turn around their institutions (Edmonds, 1979; Hallinger & Murphy, 1985). Hallinger and Murphy (1985) developed a model for instructional leadership that included three dimensions and ten functions. The instructional leadership model, which has been used more frequently in instructional leadership empirical studies than any other, presents the three dimensions of instructional leadership as “defining the school's mission, managing the instructional program, and promoting a positive school learning climate" (Hallinger & Murphy, 1985, p. 225). Hallinger and Murphy's instructional model stresses the importance of "supervising and evaluating instruction, coordinating the curriculum, monitoring students'

progress, and promoting professional development" (Hallinger & Murphy, 1985, p. 221) as expectations of the instructional leader.

Blase and Blase (1999) provided yet another description of instructional leadership. According to Blase and Blase, instructional leadership has high expectations for creating professional progress among teachers. The instructional leader stimulates self-reflection, is visible, protects instructional time, honors staff, and encourages change and autonomy so that teachers have control over their professional lives.

Hattie (2015) proposed a final definition of instructional leadership. According to Hattie, instructional leadership focuses on providing a disruption-free learning environment, a system with explicit learning objectives, and more significant standards for instructors and students. Hattie suggested that leaders work together to determine what constitutes evidence and then utilize that evidence to choose which practices should be kept and discarded. Leaders may find it challenging yet vital to determine what needs to be eliminated (Hattie, 2015); thus, "instructional leadership is as much about choosing what not to do as choosing what to do, based on student achievement for all students" (p. 38).

Adult Learning

The first formal approach to education was to teach adults. "Adult education is an endeavor to develop a new technique and create a new motivation for learning; its ramifications are qualitative, not quantitative," (Lindeman, 1926, p. 28). Friere's experience teaching the oppressed inspired adult learning theory. He cautioned "Education must begin with the resolution of the teacher-student conflict by reconciling the poles of the contradiction so that both are simultaneously instructors and students" (Freire, 1970, p. 72). He contended that adults must take joint responsibility for processes so that everyone can benefit. According to Lindeman (1926),

Knowles (1990), and Freire, (1970), adult educators should function as guides as well as co-learners.

In discussing Lindeman's theories, Nixon-Ponder (1995) said that he believed that adult coursework should not be guided authoritatively and should be less formal than traditional classroom settings; in addition, adult learning should be more collaborative and that huge lecture hall environments were not conducive to adult learning. In addition, adult learning should be focused on experiences rather than subjects and that textbooks should not be used (Knowles, 1990). Finally, humility is an essential quality in an adult facilitator (Knowles, 1990).

Knowles (1990) laid the groundwork for today's adult education paradigm. Although Knowles (1990) did not coin the term andragogy, his definition, "the art and science of helping adults in learning" (p. 54), is widely used. Adult learners share a "life-centered" perspective to learning; learning should be experienced, adult learners have a "strong need to be self-directing," and there are more significant differences in adults than children owing to life experiences, according to Knowles. Lindeman's work was used by Knowles (1990) in his andragogical model. There are six assumptions that the andragogical model is founded on:

1. *The need to know*. Before they begin, adult learners must understand why they are learning why it is important and how it will benefit them.
2. *The learners' self-concept*. The ability to self-direct is an important part of a learner's self-concept. Educators must be seen and treated as mature adults rather than youngsters. Adult students must be seen as responsible and capable of making decisions.
3. *The role of the learners' experience*. Adults bring different life experiences to the classroom. The experiences will enhance the group's variety, including "background,

learning style, motivation, requirements, interests, and goals" (Knowles, 1990, p. 58). The teacher should take advantage of this opportunity to capitalize on diversity. Because people build "mental habits, prejudices, and presuppositions that tend to induce us to close our brains to new ideas, fresh views, and alternative ways of thinking" (Knowles, 1990, p. 59), this higher degree of background experiences may have a negative influence. Educators must also consider the importance of a learner's experience in shaping who they become as adults. An experience, on the other hand, is perceived by a youngster as "something that happened to them" (Knowles, 1990, p. 60).

4. *Readiness to learn*. Adults enter the classroom with a ready-to-learn attitude. This contrasts with younger students, who may be at various stages of development.
5. *Orientation to learning*. Adults are more "life-centered" than children, who are more "subject-centered" in their approach to education (Knowles, 1990, p. 61). Therefore, facilitators should apply what they have learned in the classroom to "real-life scenarios" (Knowles, 1990, p. 61).
6. *Motivation*. Though external motivators such as progress in the workplace and increased pay are significant to adult learners, internal motivation is the most important source of motivation. According to Knowles, job satisfaction, self-esteem, and quality of life are three motivators for adult learners.

The preconceptions regarding adult learners and their unique demands impact how instructors should work with them. Knowles based his assumptions on his own experiences and research into occurrences in the history of andragogy. Researchers who followed Knowles used those assumptions as a starting point. The distinction between teaching children and adults may

be more subtle than it appears. Children's roles as learners are more passive in pedagogy and the focus is on instruction. "In this style of education, textbooks and teachers serve a new and secondary function; they must yield to the learner's primary importance" (Lindeman, 1926, p. 9). Adult students have an active role in the process, and the focus is on learning, frequently used to address pressing issues or concerns, most of which are work-related. Adult learners need an environment where deep learning occurs and feedback through coaching conversations is integral to the process.

Coaching

Coaching conversations are a complex, powerful, and valuable tool for teaching and learning within an educational process that exists in two forms of feedback, formal and informal. Informal feedback occurs naturally throughout events, although "not formally defined in the curriculum" (Värlander, 2008, p. 149). Informal feedback can include giving a pupil praise or encouraging a struggling student. The curriculum explicitly mentions formal feedback (e.g., grades, rubrics). For example, it may reveal information about how the grade was calculated. Feedback can be summative or formative. Summative feedback concentrates on what has already occurred (Värlander, 2008). Summative feedback is usually formal, curriculum-related feedback and includes things like grades. Formative feedback, on the other hand, focuses on providing recommendations that can help the student learn more effectively in the future (Biggs & Tang, 2011; Värlander, 2008). Concerning the concept of deep learning, Biggs and Tang (2011) and Värlander (2008) argue that successful formative assessment can promote deep learning. The instructor is usually the one who initiates feedback, but the student might request it. Feedback can be both encouraging and discouraging.

Feedback has a significant impact on learning and achievement for students, but feedback mechanisms influence adult learners. Providing good, relevant feedback, on the other hand, necessitates a significant amount of effort. Traditionally, feedback has been viewed as a means of transmitting information from the instructor to the pupil or in this case from a supervisor (school leader) to the teacher. This often narrows the perspective of those providing feedback to simply reporting on progress and downplays the significance of the person receiving feedback (Juwah et al., 2004; Värlander, 2008). Recognizing participant involvement in utilizing feedback recommends a shift from transmission to the feedback loop. Adult students may have the most precise understanding of the focus of desired feedback to improve their learning and apply it both inside and outside of the classroom.

Since feedback is often problematic for adults, devising other ways of coaching adults to have more productive conversations is necessary. As a result of changing observational practices and adapting more effective post-conversation process (Tredway et al., 2019), instructional leaders in their supervisory role with teachers can provide evidence to support stronger learning processes for teachers (Tredway et al., 2019). These processes do not engage the supervisor in providing feedback but in using evidence to support teacher choices, a key factor for adult learning.

A Network Structure for Adult Learning: Networked Improvement Communities

The Carnegie Foundation's work in the Improvement Sciences recommended Networked Improvement Communities (NICs) as a productive structure for improving practices in schools (Bryk et al., 2015; Russell et al., 2015). Bryk et al. (2015) observed individuals within a system utilizing the tools of improvement science to solve localized practice issues to learn rapidly on a small scale and accumulate proof of success. However, rather than considering a tool, routine, or

other instructional resources to be proven adequate, improvement research aims to determine how such artifacts might be adaptively integrated with efficacy into various situations (Lewis, 2015). For example, Sowers and Yamada (2015) used improvement science and networked improvement communities to solve the prevalent problem of developing math students failing to finish a college-level mathematics course within three years.

Individuals closest to the problem are involved in the issue-solving process, and reform develops from the bottom up rather than the top down. Improvement science equips educators with strategies and instruments for inquiry about improving teaching and learning, collaborating to share promising approaches, and learning from variation and scaling approaches that lead to improvement (Bryk et al., 2015).

Improvement science provides a powerful tool for teachers to explore and adapt existing craft knowledge and research to adapt those pieces that are contextually useful into a usable, evidence-based set of pedagogical tools to aid their profession and consequently improve by focusing on the local context where teaching and learning occur and attending to variation through collaborative networks. According to Lewis (2015), brief Plan-Do-Study-Act (PDSA) cycles are used to evaluate potential changes, such as a "group noticing routine" that helps students develop relations outside of the current mathematical context and enhance student belonging, a mutual feeling of responsibility, and attendance. Embodying the "learning by doing ethos" (Russell et al., 2015), communities of practice allow educators to draw upon a well-established set of tools and profound practical experiences.

The Plan-Do-Study-Act cycle is designed for rapidly experimenting with new practices in four stages: plan, do, study, and act. The PDSA cycle encourages a systematic approach to routine tasks, PDSA is comparable to action research and referred to as a test by improvement

(Bryk et al., 2015; Langley et al., 2009; Tichnor-Wagner et al., 2017). First, improvement teams design the test by determining what modifications to make to the current practice, who should test it, what measurements are to be used, and what changes the improvement team expects to observe as a result of implementing this new practice. The heart of the cycle, and the process as a whole, encourages improvement teams to predict what they thought would happen when they ran this test and then compared that forecast to what happened later in the cycle. Second, as the team works to complete the test, they collect data on what occurred throughout the test and the results. Third, the team analyzes the data obtained during the trial and compares it to projections made about the likelihood that this modification would result in an improvement. After studying the data, the team acts, deciding whether to abandon the new modification because it was unsuccessful, cooperate to modify it since data indicated its potential for usage, or keep it as is and try it in other settings (Berwick, 2008; Bryk et al., 2015; Langley et al., 2009; Tichnor-Wagner et al., 2017).

This disciplined approach "places short inquiry cycles and data analysis at the center of the improvement agenda" (Cohen-Vogel et al., 2015, p. 262). The Model for Improvement and the PDSA Cycle (along with the six core principles of improvement) provides an integrated set of guidelines and methods that can be used flexibly to support educational improvement efforts. In addition, this method offers improvement teams a framework and process that coordinates network-wide improvement activities and keeps them focused on solving the network's problem of practice (Gomez et al., 2016). Finally, improvement teams build both technical knowledge about improving everyday practices in their specific contexts and how changes can be modified to fit those contexts, as well as the capacity to support the use of this type of improvement methodology to new problems of practice (Langley et al., 2009; LeMahieu et al., 2017).

Summary

Discourse is a tool for students to gain a more profound knowledge of mathematics. Teachers can use to facilitate, encourage, and extend the mathematical conversation. Students need the opportunity to engage in verbal exchanges and deeper thinking, and their teacher requires the chance to speak with one another. Academic Conversations are focused strategies that give students various options for starting and continuing conversations. In this literature review, I have concentrated on the factors that would most influence the study: how students learn in math classrooms, how to best engage adults in learning, how to facilitate their learning, and what structures and protocols might best be useful for adult larning.

CHAPTER 3: RESEARCH DESIGN

In this participatory action research (PAR) study, I examined how teachers developed the capacity to use equity-based protocols in elementary school classrooms promoted academic discourse (Moschkovich, 2013). The PAR Theory Of Action (TOA) is: If the teachers identified equitable mathematics discourse protocols for English Language Learners (ELLs), then teachers would be able to design and implement academic discourse strategies to support ELLs in mathematics classrooms. At the start of the study, I helped them analyze how their lived experiences and funds of knowledge contributed to their understanding of best practice. I invited three first-grade mathematics teachers to participate in the study. They understood and identified equitable discourse practices for ELLs during mathematics lessons. They designed lessons that included the practices and implemented them in the classroom. Throughout the 14 months of this research study, teachers collaboratively reflected on their identities and experiences as Engligh language learners, current teaching practices, best practices for ELL, and implemented research-based practices to support improved teaching for engaging English Language Learners through equitable discourse.

The study occurred in a large rural public elementary school (PreK-eighth grade) in southeastern North Carolina. The school demographic trends indicate that we serve a growing number of English language learners each year. At the time of this PAR project, our total student population was 1,167, of which 409 of the 684 Hispanic students were ELL. The teachers acted as a Co-Practitioner Researcher (CPR) group. The CPR group worked closely with me throughout the entire project and study to fully understand and implement culturally and linguistically responsive practices in mathematics for our increasing numbers of English language learners. I observed teachers and had coaching conversations to support making

changes and understanding pedagogical strategies based on observational data and post-observation conversations.

In this chapter, I discuss the process for conducting qualitative research through the primary methodology of Participatory Action Research (PAR), informed by activist research. Community learning exchange and improvement science processes were critical parts of this participatory action research's collaborative learning and problem-solving process (Bryk et al., 2015; Guajardo et al., 2016). The PAR included three iterative cycles within the 14-month time frame of the research study (Fall 2021-Fall 2022). In this chapter, I discuss the participants, data collection, and analysis. I conclude the chapter with a discussion of the study's possible limitations, issues of validity and confidentiality, and ethical concerns.

Qualitative Research Process: Participatory Action Research

Qualitative research aims to address and answer the questions that drive the study (Creswell & Creswell, 2018). As the lead researcher, I collected data and used multiple sources to ensure that the evidence was valid, including observations, meeting notes, interviews, conversations, and reflective memos. I then organized the data to determine categories, themes, and findings (Saldaña, 2016). In this PAR study, I collected and used data analysis to work with the three teachers in the co-practitioner research group to inform practice changes. I met regularly with them individually and as a group. In addition, I co-facilitated our meetings using community learning exchange (CLE) processes and conducted member checks after each inquiry cycle to ensure internal validity (Bryk et al., 2015; Creswell & Creswell, 2018; Creswell & Guetterman, 2018; Saldaña, 2016). Using the PAR methodology, I incorporated improvement science (Bryk et al., 2015) and CLE axioms and processes (Guajardo et al., 2016) to guide the research design. In addition, because I focused on issues of equity and access within the setting

(Hale, 2017), the methodology aligns with the activist action research approach. As a result, I responded to the research questions by collecting and analyzing data.

The focus of practice was: *Implement equitable discourse strategies to engage English Language Learners in mathematics in first-grade classrooms.* Therefore, the overarching question is: *What fosters the classroom implementation of academic discourse structures for engaging English Language Learners?* The research design supported three iterative cycles of inquiry that addressed the PAR research sub-questions, which are:

1. To what extent did teachers funds of knowledge transfer to their teaching practices?
2. To what extent do teachers design and implement equitable discourse practices for engaging English Language Learners?
3. To what extent do engage and supporting teachers in equitable mathematics discourse protocols affect my role as an instructional leader?

I addressed these questions using action and activist participatory research methods and processes.

Action and Activist Research

I selected action research to improve collaboration among the teachers and the school leader while empowering individuals to act; in action research methodology, I worked directly with teachers to improve instruction (Creswell & Guetterman, 2018). We reflected together and developed techniques that influenced the outcome of the focus of practice they wanted to change (Creswell & Creswell, 2018). The teachers are the "people closest to the issues [and] are best situated to discover answers to local concerns" (Guajardo et al., 2016, p. 25). By combining action research principles with activist research aims, I collaborated with teachers to "challenge inequalities and inequities of the status quo while promoting social change" (Cancian, 1993, p.

92). The collective action of the two enhanced my research and grounded it in theory and practice. The PAR processes encouraged teacher reflection and change in the first-grade classroom and potentially in other contexts (Cancian, 1993; Creswell & Guetterman, 2018).

In addition, participatory action and activist research are social processes that bring about change in practice through collaboration and building relationships among members (Cancian, 1993; Creswell & Guetterman, 2018; Hale, 2017). As I enacted the PAR, participants shared their individual and community stories, made connections, and framed their learning (Guajardo et al., 2016) through community learning exchange and improvement science processes.

Community Learning Exchange

The Community Learning Exchange (CLE) processes define how we engage, activate, and build relationships that nourish our individual and collective development and how we use those close relationships to discuss and address a common issue (Guajardo et al., 2016). Using community learning exchange processes, the three teachers and I worked collaboratively to build relationships and shift mindsets from individual to collaborative practice through the critical components of the five axioms. These CLE axoms supported the project and study:

- learning and leadership are social processes;
- critical conversations are essential to pedagogical processes;
- the people closest to the issues are best situated to discover answers;
- crossing boundaries enriches education; and
- hope and change are built on assets and dreams (Guajardo et al., 2016, pp. 24-27).

As a result, I collected and analyzed CLE artifacts as data in determining the response to the critical questions about how teachers understand and implement culturally and linguistically responsive mathematics for English language learners.

Improvement Science

The PAR participants and I used improvement science processes to focus on the specific task and learn by doing (Bryk et al., 2015). First, as a CPR team, we revisited the fishbone in Chapter 1 to re-examine the assets and challenges of the focus of practice. Then we engaged in cycles of inquiry that include the four steps of improvement science design; in the Plan, Do, Study, Act (PDSA) improvement cycles, we intended to "answer new questions as the scope of the inquiry expands" (Bryk et al., 2015, p. 121). Aligned with crucial improvement science principles, the PDSA cycle can guide rapid learning through different stages to improve teacher practices (Bryk et al., 2015). Next, using the PDSA model of inquiry (see Figure 2), I guided the CPR group through iterative improvement cycles. Finally, I shared my analysis of the data with teachers and collaboratively decided on the next steps toward improvement. In addition, using the PDSA cycle allowed for praxis to be embedded as the CPR group actively reflected on the data I collected and analyzed using improvement science processes to engage in changing practices fully.

Role of Praxis

Reflection is an integral part of the improvement process and an essential part of the PAR project and study. Freire (1970) defines praxis as the process of deep reflection in order to act by using the input of those closest to the work; he says, “it is not our role to speak to the people about our view of the world, nor attempt to impose that view on them, but rather to dialogue with the people about their view and ours” (p. 85). I facilitated and guided the process as the CPR group reflected on processes to assess the research topics and revise when new evidence became available. The PDSA cycle's objective is to allow each cycle to be changed as new information is discovered. Throughout this research, I created activities that foster praxis. At the CPR meetings,

Note. (Duckworth, 2016).

Figure 2. Plan Do Study Act (PDSA) cycle of inquiry model.

we reflected on the process, highlighted accomplishments, addressed emerging practice dilemmas, and used observation data to discuss shifting our practices. The reflective activities would aid the CPR group in determining the most beneficial equity-based protocols for developing academic conversation. To support their reflection, I conducted classroom observations and had data analysis conversations in one-on-one coaching meetings to reflect upon and determine each teacher's subsequent actions.

The CPR members and I wrote reflections before and after each teaching segment and during and after each PDSA cycle. There were multiple opportunities to collect reflection data during the CPR meetings. The reflection informed practices and provided information for the research questions. The reflections are embedded in the PDSA cycles and inform any necessary modifications in my leadership actions in the PAR cycles, activities, data collection, and analysis. Throughout the research, I utilized reflective memos to track my leadership development, and in the final chapter, I reflected on my leadership in greater depth.

Action Research Cycles

I facilitated three improvement cycles for the PAR project and study. We began the planning process during the Pre-Cycle. The Co-Practitioner Researcher (CPR) group met to identify the improvements that were necessary to achieve our goals. In addition, they participated in the CPR meetings using community learning exchange processes. We engaged in two action cycles after the Pre-Cycle, which followed the PDSA improvement cycle phases (Bryk et al., 2015). Furthermore, the work relied heavily on the five axioms of CLE methodology (Guajardo et al., 2016).

Schools are frequently organized in ways that do not foster social and continuous learning. Consequently, forming a regular CPR group aided attempts to solve a primary issue of

mutual concern while encouraging collaborative problem-solving and responsibility. The teachers used the evidence collected from each PAR cycle to enhance their practices. Through cooperation and improvement science, the CPR focused on developing equitable teaching methods (Bryk et al., 2015). The project timeline was Fall 2021 (PAR Pre-Cycle), Spring 2022 (PAR Cycle One), and Fall 2022 (PAR Cycle Two), which are highlighted in Table 2.

Participants, Data Collection, and Analysis

In the following sections, I provide details on the participants, data collection, and analysis used throughout the PAR project. I examine each of the evidence components utilized during the cycles of inquiry.

Participants

I was the lead researcher and the school's instructional leader in the PAR project and study. Therefore, I invited three classroom teachers to participate as Co-Practitioner Researchers (CPR) during the study. There are two types of participants in the study: three first-grade mathematics teachers in the CPR and others who participate later in a Community Learning Exchange to learn about the strategies we identified and implemented (n=10). The CPR group engaged in the PDSA cycles to understand and implement academic discourse strategies to consistently support English language learners in the mathematics classroom. All participants signed the adult consent form (see Appendix C).

I utilized purposeful sampling to invite teachers to participate (Creswell & Guetterman, 2018; Patton, 1990). The subgroup data showed a high need for mathematics restructuring among the highest demographic group, the Hispanic students who are ELLs. Therefore, I invited first-grade teachers to participate in the PAR. I selected participants based on their interests and their experiences as bilingual students.

Table 2

Research Cycles and Key Activities

Cycles	Activities
PAR Pre-Cycle Fall 2021 (Chapter 4)	● Establish CPR Group ● Establish equity protocols or strategies for discourse and or use of specific protocols in the classroom ● Facilitate CPR group meetings using CLE processes ● Write field notes and reflective memos ● Conduct member checks
PAR Cycle One Spring 2022 (Chapter 5)	● Observe implementation of protocols/strategies ● Participate in coaching conversations ● Facilitate CPR group meetings ● Facilitate Community Learning Exchange (CLE) ● Write field notes and reflective memos ● Conduct member checks
PAR Cycle Two Fall 2022 (Chapter 6)	● Conduct Coaching Conversations ● Facilitate CPR Meetings ● Conduct Interviews ● Community Learning Exchange ● Conduct Member checks on evidence: PAR Cycle One ● Write field notes and reflective memos

The three classroom teachers acted as a Co-Practitioner Researcher (CPR) group that met regularly and provided valuable information to the research. Other participants included individuals invited to participate in the community learning exchanges in PAR Cycle One and PAR Cycle Two. They were purposefully chosen to help the research group understand the problem and need for this research (Creswell & Creswell, 2018). The participants included in the CLE included: the CPR group, the Curriculum Facilitator, K-sixth grade ELL teachers, three additional first-grade teachers, and one Assistant Principal. During PAR Cycle Two, I observed the teachers. In addition, all participants signed consent forms to participate (see Appendix C).

Data Collection

The qualitative data used in this study are divided into these areas: documents, observation protocol, conversation protocol, interviews, and CLE artifacts (Creswell & Creswell, 2018). I wrote regular reflective memos. In addition, I conducted member checks after each inquiry cycle to determine the accuracy of the analysis (Creswell & Guetterman, 2018). In Table 3, I align the research questions with data collection instruments, and the data used to triangulate with the key data sources. Triangulation is a qualitative research strategy to test validity by converging information from different sources (Saldaña, 2016).

Documents

In each PAR cycle, we had regular CPR meetings. At those meetings, we collected these documents: agendas, written reflections, and meeting notes. Collecting lesson plans and observation notes, I checked for alignment of agreed-upon actions. The CPR members and I wrote reflective memos (Saldaña, 2016).

Observation Protocols

The PAR project's classroom observations were an integral element of each cycle. I used

Table 3

PAR Research Questions and Data Sources

Overarching Question: What fosters and inhibits the classroom implementation of academic discourse structures for engaging English Language Learners?

Research Question	Proposed Data Collection	Triangalged Using
1. To what extent can first-grade teachers articulate the connection between discourse strategies and language learning for English Language Learners?	• CLE Artifacts • Documents • Observation Protocol • Conversation Protocol	• Reflective Memos • Member Checks
2. To what extent do teachers implement equitable discourse protocols for engaging English Language Learners?	• CLE Artifacts • Documents • Observation Protocol • Conversation Protocol	• Reflective Memos • Member Checks
3. To what extent does engaging and supporting teachers in the use of equitable mathematics discourse strategies affect my role as an instructional leader?	• Reflective Memos	• Member Checks • Interview Protocol

an observation technique to keep track of what I was observing. I conducted observations and had a conversation with CPR members. Appendices D-G contain the observation protocols and a deeper discussion of each is included within the appropriate sections.

Conversation Protocol

As the lead researcher, I used the conversation protocol to ask open-ended questions for coaching conversations. The conversation protocol's primary goals are to help the teacher assess the facts from the observation, make judgments about what they want to change, and develop a clear strategy to enhance instructional practice (Tredway et al., 2019). The data from the coaching conversation protocol was recorded to inform teaching practices and provide themes and categories that are important to the FoP.

Interviews

For data analysis, I recorded and transcribed all interviews. In addition, I asked open-ended questions during the interview to get a sense of the participants' perspectives, opinions, and predictions (Saldaña, 2016).

Community Learning Exchange Artifacts

As the lead researcher, I collected Community Learning Exchange (CLE) artifacts during each PAR cycle. The CLE artifacts consisted of anchor charts, images, and notes developed to keep track of all information. I was intentional about the activities, the evidence I gathered, and that the codes aligned with the Focus of Practice.

Reflective Memos

Several documents contributed to the data collection. All members of the CPR group used reflective memos to document information before, during, and after the teaching cycles. Meeting notes, lesson plans, agendas, and journey lines were used in the reflection process.

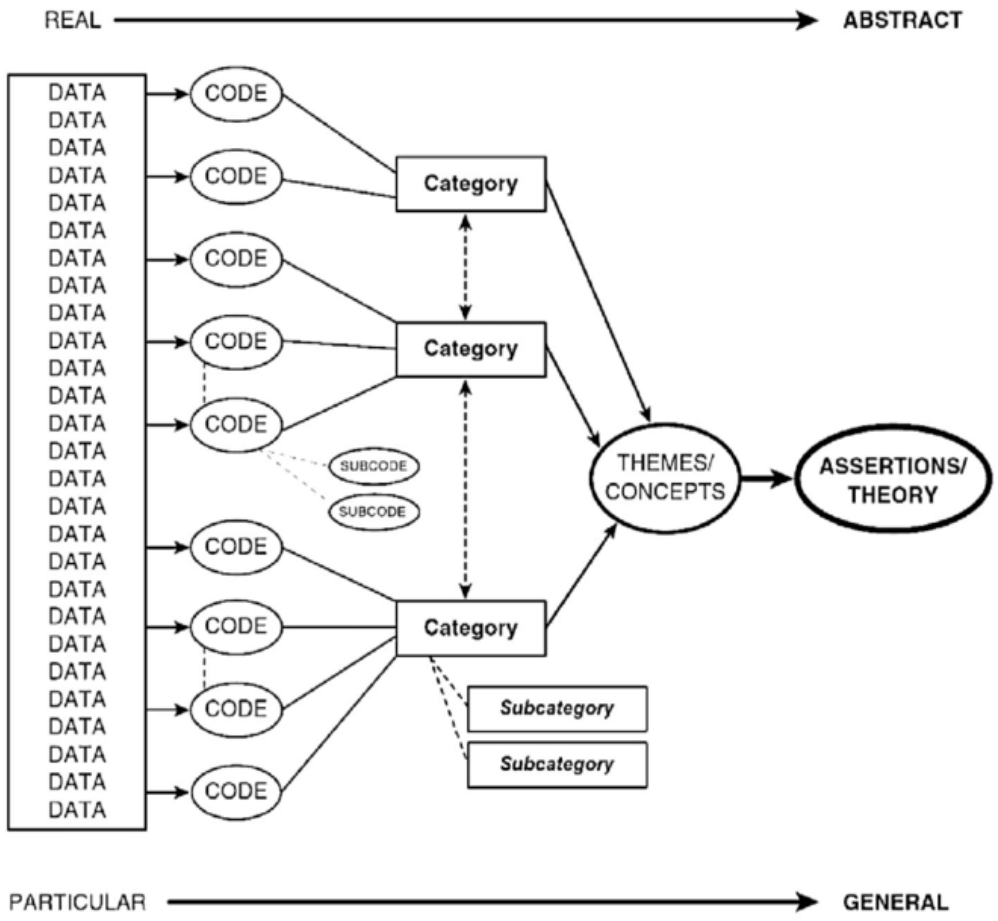
Member Checks

Member checking improves rigor in qualitative research by ensuring that accurate descriptions or interpretations of occurrences are inherently credible (Birt et al., 2016; Creswell & Guetterman, 2018). This data collection source helped determine the accuracy of the qualitative findings. The lead researcher checked in with the co-practitioner research team to review significant results and themes to establish the validity of multiple data sources (Creswell & Creswell, 2018).

Data Analysis

I coded the data to determine themes and findings significant to the study (Saldaña, 2016). In the Pre-Cycle, I coded qualitative data to determine categories. During PAR Cycle One, I coded and analyzed data to discern emergent themes. Finally, I focused on the assertions and claims that I derived from a final PAR Cycle Two (Saldaña, 2016). These data sources are chosen because they are "problem-specific and focused on variations in performance and understand the system that has created the current outcomes" (Bryk et al., 2015, pp. 172-173).

During each PAR cycle, I began the pre-coding process by circling, highlighting, underlining, or coloring similar ideas, behaviors, and thoughts about the process of mathematical discourse, teacher practices, strategies, student engagement, and equitable mathematical practices. Figure 3 depicts a simplified codes-to-theory paradigm for qualitative research (Saldaña, 2016). In this methodology, I coded and categorized datae, and successive data sets helped me check prior analyses and fortify emergent themes and findings. I confirmed the topics and evaluated the research findings based on PAR Cycle Two. As a result, I could make claims concerning the study questions.



Note. (Saldaña, 2016, p. 4).

Figure 3. Codes-to-theory model for qualitative inquiry.

Study Considerations: Limitations, Validity, and Confidentiality and Ethics

The roles of the researcher and participants in qualitative research, especially PAR, are critical. First, as the lead researcher and supervisor of the CPR group members, I was aware of my positionality and how it influenced the study. I attempted to alleviate concerns through deliberate contemplation, meticulous planning, and triangulation. Second, establishing validity is a crucial duty of the qualitative researcher. Internal validity is a significant issue, especially in action and activist research, when participants are actively involved in the research process. Finally, procedures for confidentiality and ethics are examined.

Limitations

I came to the PAR project as the lead researcher with ideas for what I wanted to explore and included prospective CPR members who would be willing to and benefit from participating in the research. We designed and implemented CLEs, examined artifacts, and participated in the PDSA cycle of inquiry as a CPR group. Throughout each PAR cycle, I consulted with the CPR group. As a result, I had multiple views when implementing each PAR cycle and numerous reflections. I intend to examine the study's validity with the CPR group.

To complete this study, I must examine my responsibilities at school. Because I evaluate the CPR group, I influence them, yet their participation was important to be optional. All participants signed informed consent forms (see Appendix C). No one was reprimanded if they choose not to participate at any point throughout the event.

I expected the three classroom teachers and a school administrator to be part of the research team. Everyone in the CPR group works on the same grade-level team. In addition, other school staff members, as described in the CPR and other participants sections, participated in the CLE, starting in PAR Cycle One. The research is restricted to a specific setting. The

study's findings benefited one population and one setting, but they may not apply to other situations. However, the technique for conducting a site-based short qualitative study of this sort may be replicated in various situations.

The school district and direct supervisor approved the request to complete the study (see Appendix D). 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).

Validity

Validity is determined in qualitative research by evaluating if the researcher's and participants' results are accurate. Using multiple data forms, I established the study's validity, including data triangulation, member checks, extended time, and peer debriefing (Creswell & Creswell, 2018). I engaged the CPR group in member checking after each cycle of inquiry (Creswell & Guetterman, 2018).

Internal Validity

I kept field notes, and all CPR members wrote reflective memos to reflect on perspective and ensure trustworthy evidence continuously. In addition, to enhance internal validity, the researchers used member checks, engaged in observations, commented on the categories, themes, and findings as they emerged, participated in all phases, and triangulated the data used (Creswell & Creswell, 2018). Trustworthiness is a critical component of this study and establishes the value of truth, applicability to other contexts, consistency, and neutrality to the research (Lincoln & Guba, 1982). Establishing trust within the CPR group begins with building relationships before any discussions related to the research begin. Once the connections were

established, we engaged in data discussions, member checks (Creswell & Creswell, 2018), and reflections (Lincoln & Guba, 1985).

External Validity

The PAR took place in a pre-kindergarten through eighth-grade setting. PAR research is important because it focuses on changing practices in one setting (Creswell & Guetterman, 2018). The themes generated in the context were used to decide the modifications within this setting. However, this issue is common in many schools in the district and state. Therefore, the procedure might be duplicated in other contexts, but the results will be inconsistent. This study takes place with a small sample of teachers. The study methodology can be replicated; however, the outcomes may not be consistent across settings. Nevertheless, the procedures I employed to engage instructors are replicable.

Confidentiality and Ethical Considerations

The participants in this study were first-grade practitioners devoted to enhancing equity protocols in the mathematics classroom to enhance academic conversations. I chose participants based on their previous work experience and skills. I collaborated with each participant individually to check whether they were interested in participating in the study. Before participating, each member completed a consent form. My connections with the participants were based on trust and an awareness that we needed to have open and honest discussions regarding the project's findings. The study's primary focus was how first-grade teachers use equity-based protocols in the classroom to promote mathematics discourse among English Language Learners.

Because the volunteers may be vulnerable during the study, I used pseudonyms to safeguard them. Data are collected and presented in a non-judgmental manner and shared with

the CPR group and school system openly and transparently to improve. Before the start of the project, participants signed consent forms and completed permission papers that the International Review Board authorized at East Carolina University (ECU IRB). The district approved the study (see Appendix D), and I completed the CITI training to certify me as a researcher (see Appendix B). In addition, participants know that participation is entirely optional. Data security and participant confidentiality was the priority in this project, and I kept the data in a safe place for the duration of the study and will store and destroy the data after three years.

Conclusion

In this chapter, I described the PAR study's research design and methodology to address themain research question: What fosters the classroom implementation of academic discourse structures for engaging English Language Learners? The CPR group participated in the PAR study by engaging in three cycles of inquiry, participating in the community learning exchanges, and applying equity-based protocols in their classroom that promote academic dialogue in mathematics. I gathered and analyzed data during each cycle while reflecting on my leadership. Next, I discuss the context and Pre-Cycle in Chapter 4.

CHAPTER 4: PAR PRE-CYCLE

In the Participatory Action Research (PAR) project and study, the co-practitioner researcher group and I focused on implementing academic discourse strategies that engage English Language Learners (ELLs) in mathematics. We aimed to promote equity of voice and build a process that better supports ELLs by using Community Learning Exchange (CLEs) processes to bring together diverse voices for conversations about changing classroom practices.

In this chapter, first, I share the context of the study and the participants. An overview of the school, including the curriculum, faculty, organizational structure, and leadership team, is included, followed by a description of the Co-Practitioner Researcher (CPR) group members. Next, I discuss the steps to form the CPR group, facilitate the CLEs, and engage in data collection and analysis. I share the categories that emerged from data analysis regarding process and substance. I also explain how these initial categories relate to the research questions and emergent framework. Finally, in the last portion of this chapter, I describe my contributions, including how I assisted the CPR group, created the PAR and presented evidence as needed.

PAR Context

To approach the PAR project and study to plan for PAR Cycle One in the spring of 2022, the study's context and participants were critical factors. First, I describe the school's geographic, historical, and cultural context. Finally, I describe the participants in this PAR study.

Place

Roosevelt Elementary School (RES) is a PreK-eighth grade Title I elementary school located in Dolphin County, in one of the tenth largest rural counties in North Carolina. Dolphin County has historically been one of North Carolina's most prominent agricultural hubs for crops such as tobacco, corn, soybeans, and more; however, the agribusiness economic focus has shifted

to industrial livestock such as hogs and poultry. Dolphin County is ranked in the top five among NC counties in total farm cash receipts in 2019 and is home to an internationally known agriculture processing plant. Over the last approximately 20 years, the emphasis on agricultural processing led to an influx of Latino families as part of the workforce for the processing plants. Of the school's total current student population (n=1,167), 684 identify as Hispanic (Latino) and 409 of those students are identified as ELLs (Roosevelt School, 2021).

Dolphin County Schools has had historical inequities, including a refusal to address school segregation and 40 years of rejected recommendations by the North Carolina Department of Public Instruction (NCDPI) to comply with equity recommendations. From 1979 to 1983, the NCDPI proposed various school reorganization plans that would equitably and effectively use educational facilities and resources while creating more racially integrated schools; however, they were all rejected (Center for Civil Rights, 2017). In 1989-1990, the schools' survey report, which echoed DPI's previous recommendations to consolidate, was again rejected by the DCS board. Furthermore, NCDPI Board actions included the consolidation of students in the Webster-Roosevelt school system district, which created other disparities among facilities and increased racial isolation within the schools by concentrating all white students in one classroom (Center for Civil Rights, 2017). The demographics of the area schools are shown in Table 4.

Roosevelt used to serve students in PreK-fifth grades in the western and southwestern portions of the county where most of Dolphin County's students of color resided (Center for Civil Rights, 2017). Historically, the school has consistently been staffed by less experienced teachers and struggled with high teacher turnover rates (Center for Civil Rights, 2017) until the Board of Education agreed to move forward with NCDPI's recommendation to merge the

Table 4

Demographics of Area Schools

School	Student Population	Percentage of White Non-Latino Students
Webster-Roosevelt High School (9-12)	678	29.5%
Charisma Middle School (6-8)	478	24.1%
Webster Elementary School (PreK-5)	808	27%
Roosevelt Elementary School (PreK-5)	747	14.3%

historically African American Charisma Middle School and the majority Hispanic (Latino) Roosevelt School in 2014.

Project Participants

I chose the CPR group using purposeful sampling; the CPR team included three first-grade teachers and myself. All three teachers are bilingual, two speak Spanish as their native language and are fluent in English, and the third teacher's native language is Creole and is also fluent in English. These teachers were closest to the issue, and I determined they were the persons who could best help with finding strategies to engage ELLs in mathematics discourse opportunities. The other project participants attended the CLEs and included the elementary ELL teacher, who is multilingual, speaking three languages and has over ten years in education, the Curriculum Facilitator, who has been in her role for the past eight years at RES, and the remaining first-grade teachers. However, the primary data collection and analysis continued to be with the three bilingual first grade teachers.

Ms. Teacher A

Teacher A, a 22-year-old bilingual first-year teacher, is of Hispanic heritage. Her path to education was traditional: entering college after attending Dolphin Early College High School. However, she received a "grow your own" scholarship from Dolphin County that paid for her undergraduate education at East Carolina University. Accepting this scholarship required her to return to Dolphin County to teach for at least four years. During the height of the COVID pandemic, she completed her internship in a kindergarten class in Greenville, NC, and graduated with her Bachelor's in education degree in 2021. Teacher A was committed to returning home to teach students who are English Language Learners like her. She wants to give her students a safe

space, make them excited about learning, change their mindsets about education, and bridge the gap between the school and the Spanish-speaking community we serve.

Ms. Teacher B

Teacher B is a 22-year-old first-year teacher born in El Salvador who grew up in Dolphin County. She began thinking about a career in teaching as a young child while helping the younger children of her church in Bible study and her siblings around the house. Growing up bilingual provided her ample opportunities to practice English and Spanish as she often served as a translator for her friends, family, parents, and church community. Her ability to translate eventually led to her helping them learn English. Her love for translating and sharing her knowledge of the English language helped influence her decision to become a teacher. Teacher B comes from a long line of educators who influenced her decision to become a teacher. Her mom is currently an ELL Teacher Assistant at our school, and her father works in the building as a custodian. She attended this school when it was a Pre-K through fifth-grade school, and she attended sixth through eighth grade at Charity Middle School before the two-schools merged. Teacher B attended Dolphin Early College High School and then stayed close to home to earn her80egreee in Early Childhood Education from the University of Mount Olive.

Mrs. Teacher C

Teacher C is a veteran teacher with thirteen years of experience and is originally from Jamaica. However, she is new to bilingual teaching. Her parents played an essential part in her schooling success. Her first formal schooling was called Basic School, similar to our Pre-Kindergarten. Jamaican elementary school includes first through sixth grade and is called primary school. After primary school, Teacher C passed an achievement exam required to be accepted into a traditional Jamaican high school as a seventh grader, which she attended for five

years. After successfully passing all thirteen Caribbean examinations, she was enrolled in the University of the West Indies and earned a degree in business education. Unable to acquire employment, Teacher C returned to the University and earned a second degree in elementary education. She taught first grade in Jamaica for eight years before coming to the United States through Teach for America. Teacher C is in her fifth year teaching in her current first-grade classroom. She was named her school's Teacher of the Year in Jamaica for 2015-2016. Teacher C shares the philosophy, "The sky is the limit," as she travels her journey with the mindset that "No man is an island; no man stands alone." While English was the language of instruction in Jamaica, she is not bilingual in the same sense as the two teachers whose first language is Spanish; however, she is bicultural and brings lived experiences to the work that were similar to the two bilingual teachers.

I engaged the three first-grade teachers in this study to implement research-based equity strategies and collect practice-based evidence. During the Pre-Cycle of this PAR research and analysis, I engaged the CPR group, the school's Science Technology Engineering Arts Math & Agriculture (STEAMA) Curriculum Facilitator, and other administrators in professional learning based on the Project I^4 Framework equity-driven stances, practices, and protocols that support a collaborative culture during math instruction. Participatory Action Research (PAR) Cycles One and Two I during the spring and fall of 2022. During this time, I facilitated the Plan-Do-Study-Act (PDSA) inquiry cycles with the CPR members while implementing Effective Practices for English Language Learners and calling-on strategies during math instruction. I observed each first-grade teacher once before they attended the professional development. After each round of observations, the CPR members used the results of the observations to analyze data, look at

outcomes and what happened to the predictions, and glean insights for the next cycle (Bryk et al., 2015).

PAR Pre-Cycle Process

I began work in the PAR Pre-Cycle by engaging the first-grade teachers and asking for voluntary participation in the research study. Once participants agreed, I developed the meeting agenda for the first meeting, held on November 15, 2021. I concentrated on building relationships, understanding the purpose of the focus of practice, and finally securing their permissions. The CPR group met multiple times during the Fall of 2021 and participated in a CLE that included the CPR group and seven other staff members. I designed the CLE to engage the group in dialogue about equitable mathematics discourse. After each interaction, I wrote reflective memos and engaged in coding cycles. After the first CLE, the CPR group began planning the next steps through reflections.

Next, I provide details about the activities and coding process I used during the Pre-Cycle. These details revealed how I discovered emerging categories from meeting notes, biographies, reflective memoranda, CPR group sessions, and CLE artifacts. In the final half of this chapter, I provide greater detail about what I learned from coding and inductively deciding on categories using the codes. As I continue to reflect during this study, I was learning how to be a qualitative researcher in practice.

I built relational trust with the CPR group and determined the research objectives. Building relational trust within the group ensured everyone felt comfortable, respected, and safe, creating an environment conducive to collaboration and change. I gathered data that led to forming of a collaborative team by defining working agreements, creating an environment where participants displayed vulnerability to generate trust, and having authentic engagement by CPR

members. During CPR meetings during the PAR Pre-Cycle, building relational capacity and participating in learning activities laid the groundwork for understanding the overarching research que“tion, "What fosters and inhibits the classroom implementation of academic discourse structures for engaging English Language Le”rners?" Saldaña (2016) defines categories as different grouping codes that are conceptually the same. In the next section, I identify the emergent categories noted from the coded Pre-Cycle data.

CPR Meetings

The CPR group met twice before the CLE (see Table 5). We began by engaging in Bose et al.’s (2016) dynamic mindfulness and exploring what it means to create a gracious space during meetings (Hughes & Grace, 2010). As a result, we began building relational trust, allowing members to clear their minds and focus on the tasks ahead. Transitioning from dynamic mindfulness to the exploration and understanding of gracious space allowed the team to engage further and feel comfortable in the setting and with the research and deciding on the agreements that became a part of our meeting agenda norms. Next, we engaged in a welcome where I explained the purpose of the research study and the CPR's role in the study. The CPR members completed a journey line that reflected four to five key moments that positively or negatively influenced their mathematics learning (see Figure 4). After sharing the journey lines, the group used Flipgrid to listen to each other’s autobiographies.

For the CLE preparation with more teachers, the CPR members reviewed the focus of practice – implement equitable discourse strategies to engage English Language Learners in mathematics in first-grade classrooms – and the overarching question: What fosters and inhibits the classroom implementation of academic discourse structures for engaging English Language

Table 5

Chart of Pre-Cycle Activities and Data

Meeting	Date	Activity	Data
CPR Meeting	Nov 15, 2021	Gracious Space Personal Narrative Journey Lines	Agenda Notes Reflective Memos
CPR Meeting	Dec 1, 2021	Mindfulness Brainstorming for CLE	Notes Reflective Memos
CLE Meeting	Dec 8, 2021	Mindfulness Opening Circle Gallery Walk Closing Circle	Agenda Notes Anchor Charts Reflective Memos

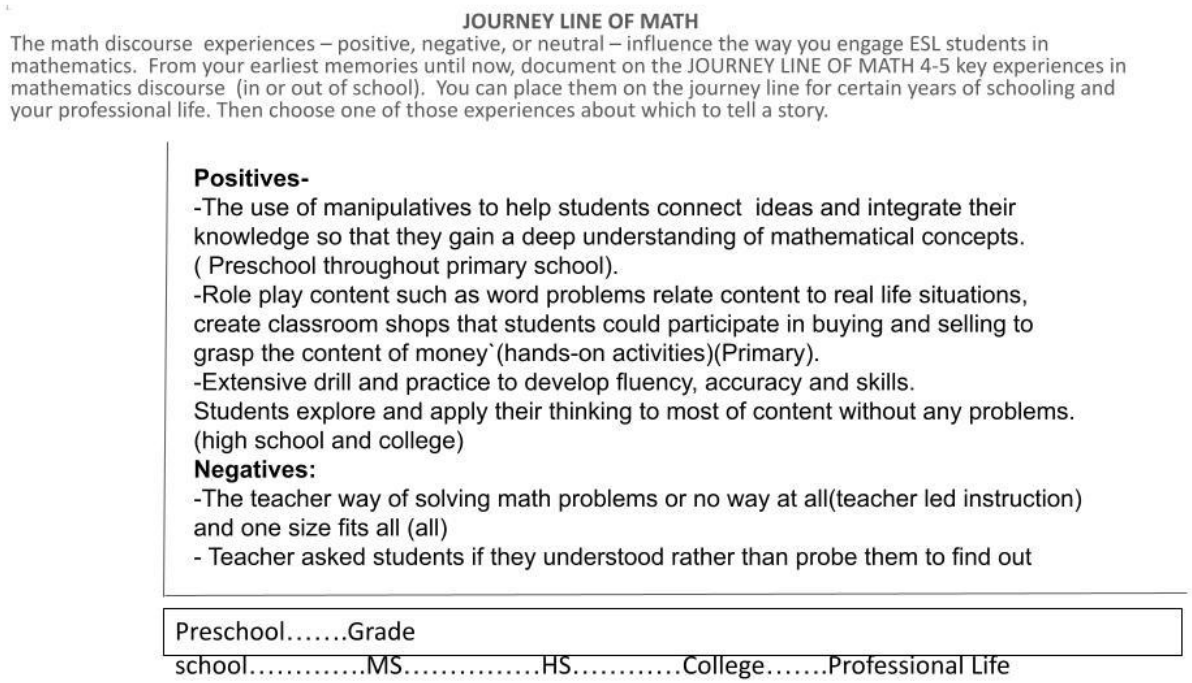


Figure 4. CPR members' journey lines.

Learners? We used these questions on individual posters for small groups to answer: The questions were:

1. What is your understanding of math discourse practices?
2. List three examples of math discourse practices. Furthermore, what does it look like?
3. How do you or could you utilize math discourse strategies to engage ELL students in understanding mathematics concepts?

After the meeting, each participant wrote a reflection thinking about the group's similarities and differences in math discourse practices. They reflected on their current classroom discourse practices and new learning acquired using a group google doc. I found that the teachers had a good understanding of discourse practices and how they can change practices; however, their ability to implement them consistently and with fidelity needs to be improved. We had a second CLE meeting in December, and I collected and analyze the meeting data.

Data Collection and Analysis: Coding and Developing a Codebook

I analyzed several forms of data to examine what happened throughout PAR Pre-Cycle. During the PAR Pre-Cycle, I collected data from multiple sources and then triangulated those sources within the group using member checks. The CPRs and I led the group in an opening circle activity and then transitioned to the gallery walk. Each participant worked with a set of qualitative data using multiple artifacts. First, I collected multiple CPR artifacts and used the data as a starting point and evidence, including individual journey lines, autobiographies (Flipgrid), meeting agendas, and participant reflections. Second, I wrote reflective memos after the CPR and CLE during the Pre-Cycle.

I collected artifacts from the opening and closing circles gallery walk and reflections from the first CLE. I gathered all the documents from the events and my memos, including the

CLE meeting agendas. After collecting all the artifacts, I used in vivo coding, predominantly descriptive, or what Saldaña (2016) refers to as literal or verbatim coding, to code the data inductively. Then I noted variations within each code group, and I had to examine codes to see if I could consolidate some of them into one because their meanings were so similar. I began by making a codebook with a set of codes, then defining or describing each code for myself.

As I began collecting and analyzing the data, I organized descriptions that I collected from each activity the teams engaged in. After organizing the descriptions, I chose the coding method, in vivo coding, to be used during the first iteration. After organizing and coding several artifacts, I completed a second round and began to look for commonalities and organize codes in an Excel spreadsheet that I use for my codebook. Some pieces of data required me to complete a third and fourth iteration of coding and shift to the descriptive or process coding method. The links I discovered in the data became categories, subcategories, or themes. The data analysis process took two to three iterations (see Table 6) before determining the emergent categories mentioned in the next section. During the iterations of the coding process, I realized that the initial categories were too broad. Over time, I became more specific in coding and more able to recognize the difference between a code, a category, and a theme, which I realize is part of becoming a practitioner-researcher.

Emergent Categories

Initial coding led to emergent categories. I observed that the categories were too broad and not specific enough. However, I discuss my original coding and reasoning because this was a necessary step in becoming a practitioner-researcher.

As I facilitated the team in flexible cycles that guided our learning at various stages, we collaboratively used the PDSA cycle during the CPR and CLE meetings to guide rapid learning

Table 6

Code Book Excerpt: Teachers' Beliefs About Math Discourse

Description	First Coding Cycle	Second Coding Cycle
Engaging students in practices of discussing math	Culture of math class	Engaging students
Explaining and justifying	Student thinking	Student explaining/justifying
Student process in solving math problems	Student thinking	Class environment
Creating an environment where all students feel confident expressing their thinking and process to solve problems	Culture of math class	
Respecting and valuing students opinions	Valuing student thinking	Students Input welcomed
Non-threatening environment that promotes varied perspectives	Safe Space	Culturally responsive class

(Bryk et al., 2015). After determining the initial emergent category, I met with the CPR team for input. Then, I built on the developing category and highlighted prospective categories. The codes from the artifacts indicated that co-practitioner researchers had experiences as bilingual students that supported the first two categories: Teachers lived math experiences as bilingual students and teachers' beliefs about math discourse.

Teachers Lived Math Experiences as Bilingual Students

The journey line protocol and process were vital in determining the lived experiences the CPR members had as bilingual learners in mathematics. In examining their journey lines, personal narratives, agenda notes, and reflective memos, while the teachers had positive experiences, there were a higher degree of negative experiences as ELL math learners.

The positive experiences were limited but included using manipulatives to make connections, mastery learning, and talking about mathematics. For example, one member remembered how her math teacher engaged students in discussing why they agreed or disagreed with the answers posed to the class to get them to explain their thinking. Another discussed teacher practices that helped them connect and understand mathematics, including teaching for mastery and making real-life connections. The CPR members further reflected on how important it is to have students talking about their thinking. One teacher's reflective memo suggested that being able to explain her thinking allowed for a better and deeper understanding of mathematics. That aligns with research encouraging student engagement in social interactions about mathematics discourse to help students learn to think and communicate mathematically (Kieran et al., 2002; Moschkovich, 2002; O'Halloran, 2015).

All members discussed teacher practices that were not helpful or were negative experiences in their learning mathematics. These included teachers not checking for

understanding, drill and kill activities, teaching for curriculum completion instead of mastery. During these discussions, one teacher's process of reflection led to this statement: "I realize that I want to teach in a different way than I was taught to be sure I give students what I didn't get to be successful as a bilingual math student."

Participant reflections demonstrated the importance of questioning, calling on students and adequate think time, however, their classroom practices have not shown that they know how to incorporate the skills consistently in classroom activities. One participant stated, "I have not had adequate training in best practices for incorporating equitable math academic discourse strategies," while another participant stated: " I learned there is so much more to academic discourse than just students talking it requires extensive planning and appropriate questioning."

How the CPR members experienced being called on to answer a question supported the need for teachers' lived experiences. "I never got the opportunity to share my answers to the teacher's questions, even when I raised my hand, because of my lack of English Language in school."

Teachers' Beliefs about Math Discourse

This category emerged mainly during the CLE gallery walk when each group answered the following questions during the data collection.

1. What is your understanding of math discourse practices?
2. List three examples of mathematics discourse practices and what it looks like in the classroom.
3. How could you utilize math discourse strategies to engage ELL students in understanding mathematics concepts?

The emergent category, teachers' beliefs about math discourse, resulted from the data collected during the CPR and CLE meetings. All participants held beliefs about the importance of math discourse for English Language Learners. During the CPR meeting, the participants collaborated to define equitable mathematics academic discourse. Participants noted their understanding and developed a working definition. Participants' understandings included the teacher as the facilitator, students actively discussing their thinking and problem solving, making connections, students collaborating about mathematic practices, teacher-to-student collaborating, supporting math academic language, and expressing math learning. The CPRs' collaboration yielded the following definition for equitable mathematics academic discourse: Engaging students in opportunities to discuss mathematics by allowing different representations and tools to explain and develop math academic language that supports ESL students' in-depth problem-solving skills.

These data demonstrated that teachers had a wide range of understanding of effective math discourse practices (see Table 7). As a group, the CLE members listed their knowledge of discourse practices, which was considerable. The group listed the following practices as examples of what they should do: math talks, modeling, creating equitable calling on strategies, pre-planned questioning, question stems, visuals, and allowing the use of students' native language. Teachers indicated that ELL students should use their native language to express their thinking. The ability to develop mathematical academic language and understanding in one's native language strengthens the student's ability to learn language and is consistent with the research about building ELL language and mathematical thinking concurrently. This process, termed translanguaging, (García, 2019 ; Hotaki, 2021); however, the process is new information for most teachers and not yet widely understood as a process for promoting ELL learning.

Table 7

Codebook Excerpt

Question	Responses	Frequencies
List three examples of math discourse practices. What does it look like?	Think-Pair-Share	8
	Partners	10
	Small Groups	10
	Modeling	10
	Questioning	10
	Scaffolding	6
	Restating the Question	7
	Think Time	8
	Math Talks	6
	Journaling	2
	Creating Calling on Strategies	6
	Question Stems	8
	Manipulatives	10
	Planning Questions	6
How do you or could you utilize math discourse strategies to engage ELL students in understanding mathematics concepts?	Student use of native language	7
	Relatable Content	3

According to data analysis, teachers knew what to do based on their answers, reflections, and discussions. However, at this point, I was not confident they knew how to implement and maintain equitable discourse strategies in mathematics effectively. Moreover, although they canarticulate practices, two CPR teachers are new to teaching and are learning and practicing as novice educators. Having bilingual experiences provides teachers with a firsthand account of what fosters the implementation of academic discourse structures for engaging English Language Learners and teachers' beliefs about math discourse. Still, all teachers need support in implementing effective practices.

Reflection and Planning

As I reflected on the PAR Pre-Cycle, I used the evidence to determine the progress in responding to the FoP and the overarching research questions. Based on the current data analysis, the foundation for relational trust and learning in public by building collaborative teams, engaging in discussions around equitable discourse teaching practices, and developing an understanding through gracious spaces is present and continued throughout the research process.

As I planned for PAR Cycle One, the CPR group reflected on the data to plan the next steps for understanding and implementation. As the lead practitioner-researcher moving into PAR Cycle One, I knew I needed to provide the CPR and CLE groups more time to engage in and interact with the research and best practices. I planned to intentionally use the PDSA cycle of inquiry as we shifted instruction toward more sustainable and equitable practices for English Language Learners to engage in mathematics discourse learning opportunities in the classrooms.

I ultimately recognized that enhanced teaching practice needed support and practical coaching on the part of the leadership when we discussed how my leadership abilities and growth played a critical role in guaranteeing the success of our research. Therefore, I shifted my

role as a leader to support the CPR group through this process. While I am comfortable in my leadership role, I realized I was less comfortable as a researcher-practitioner through this process. As I began to write about my role in the CPR group in various activities, I was learning to facilitate CLE protocols and simultaneously learning to use evidence to code and then decide on the next steps.

At the beginning of the action research process, I needed to provide the vital link the group needed to fully understand the process and the connection between what we were engaging in and how it would affect their teaching practices. As the CPR team began working together, I became more comfortable with the group, processes, and my ability to be a researcher-practitioner. I quickly realized that for this research to continue, I needed to be able to use more of the researched-based articles in the meetings and support the CPR members by creating learning opportunities, which is what Grissom et al. (2021) suggest is how principals should support their teachers. I planned to use literature to support monthly meetings and I knew I needed to be more transparent with the group.

Facilitating this process changed my style as a leader. I often get caught up in just getting things done and sometimes, that must happen. However, through the PAR Pre-Cycle, I have had to re-think or re-do because I moved too fast. Using the PDSA cycle helped me with being able to work through each process at a pace that allowed for authentic understanding and data collection to inform classroom practices ultimately.

I struggled as I reflected on the data collection and the coding process. This process was completely new learning and I had no prior experience with coding. As I began coding the first data set, I focused on using in vivo coding, a qualitative data analysis that focuses on the participants' spoken words (Saldaña, 2016). In the first iteration of coding, I focused on ensuring

I captured the source's description. Thus, I found it easier to use a verbatim description and then highlight the parts of that to code. During four coding iterations with the activities completed in the CPR and CLE meetings, I met with an ECU coach who helped guide me to a narrower set of codes. The codes were initially categorized as too broad. Through this process, I narrowed down the two emergent categories previously discussed and began developing my codebook. After further reflection and data review, I noticed the data were limited, as only two emergent types were documented.

Conclusion

In this chapter, I discussed how the activities that the CPR and CLE group members participated in gave me a good indication of specific focus areas for the CPR members. While unsure of where the data were leading, I developed clear plan for the next cycle, moving toward a more focused understanding, professional development, implementation, and observations. Through the data collection cycle, I concluded that not all of my CPR members fully understood what equitable mathematic academic discourse practices are and how these practices should differ when engaging English Language Learners. This lack of understanding could have negatively affected this research study if I did not address it moving forward.

CHAPTER 5: PAR CYCLE ONE

English Language Learners are now the majority of Roosevelt Elementary school students and area a represented demographic in every classroom. Because the classroom composition has changed, we needed to adapt teaching practices to include strategies that better serve ELL students. To effectively serve English Language Learners, schools must be deliberate and explicit in preparing all faculty members to identify the most effective techniques for engaging ELLs. In the Participatory Action Research (PAR) study, we examined implementing equitable discourse strategies to engage ELLs in mathematics. Based on the Pre-Cycle, teachers had lived experiences that informed how they wanted different experiences for the students they taught than the language experiences they had.

In PAR Cycle One, I focused on the processes in which the CPR members and the CLE groups engaged to generate ideas and decisions about how best to serve students. We used the overarching research question as a guide: What fosters the classroom implementation of academic discourse structures for engaging English Language Learners? In this chapter, I outline the steps I took to build authentic practitioner-researchers through designs that influenced changes in teachers' practices. In the first inquiry cycle, I worked with the CPR group to better understand their beliefs about fostering and inhibiting classroom implementation of English Language Learners' academic discourse structures. During PAR Cycle One, the CPR and CLE engaged in activities that led to data collection, emerging themes, reflections on my leadership practices, and the implications of moving into PAR Cycle Two.

In this chapter, I describe the activities that supported my ability to answer the overarching questions on fostering the implementation of academic discourse structures for engaging English Language Learners. Finally, I review and analyze the data to evaluate common

trends and discuss emerging themes in preparation for a more in-depth implementation of equitable math discourse strategies and necessary modifications for PAR Cycle Two.

PAR Cycle One Process

In this section, I describe the critical activities related to the PAR and the work with the CPR members. Other teachers attended the CLE, but the data on which I report is for the three first-grade teachers in the co-practitioner researcher (CPR) group. Finally, I discuss how I collected evidence and engaged in analysis.

Key Activities

In PAR Cycle One, I collected data by conducting interviews, engaging in professional development on ELL protocols, and conducting classroom observations with CPR members. In addition, I facilitated a culminating CLE to share what we were learning with the staff. Finally, I conducted member checks with the CPR team to share the data analysis. In Table 8, I present the key activities and discuss the importance of each activity and the coding process.

Interviews

I interviewed the three CPR members to begin PAR Cycle One. As a result of the interviews, I clarified teachers' current understanding and implementation of teaching practices that support mathematic conceptual learning for English Language Learners, planning practices, the instructional leader's role in providing feedback and supporting teaching practices, and the appropriate next steps in the research process. By analyzing the notes and reflective memos and conducting member checks, I represented the CPR member's experiences. For example, during the interview, I asked CPR participants to name two or three discourse practices that engage English Language Learners. Analyzing the data, I found that the CPR members' understanding of discourse practices primarily focused on teacher-to-student interactions during whole-group

Table 8

PAR Cycle One Activities and Data

Meetings	Structured Learning Activities	Data Collection	Date
Interviews	Flipgrid	Notes Reflective Memos Member Checks	February 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	February-April 2022
Observations	Question Protocols Effective Practices for Observing ELLs Calling-On Tool Classroom Observation Form	Analysis of data collected from protocols Notes related to observations Notes from reflections	February-April 2022
CLE	Dynamic Mindfulness Revisit/Reflect on the CPR definitions of AD Video showing discourse practices Revisit the gallery walk questions Whole group discussion	Agenda CLE Artifacts Notes Reflective Memos	April 2022

instruction. For example, one CPR member stated, "I think discourse is about communicating and interacting with the teacher." In contrast, another CPR member talked about how she engaged and instructed students in English and Spanish, another example of teacher-to-student engagement.

Co-Practitioner Researcher Meetings

The CPR group had five meetings; we co-constructed an understanding of math academic discourse during the first meeting. Opening up the CPR meeting, I facilitated the team in dynamic mindfulness to build relational trust and cultivate emotional resilience within the group (Bose et al., 2016). Next, we revisited our journey lines from the Pre-Cycle. Since all the teachers are bilingual, I wanted the CPR group to review the key points and experiences they highlighted related to their experiences and abilities to learn math as an ELL. As we moved forward, I captured how those experiences as ELL students may have influenced current teaching practices. We used these data to develop individual anchor charts (see Figure 5), a method for calibrating standard practices. CPR members used the anchor charts to reflect on how they were taught math and their experiences as bilingual students. During the reflection, one teacher discussed how she only struggled in math when she reached the tenth grade because, until then, numbers were a universal language. She remembered math conversations about following procedural math and using specific formulas to arrive at the correct answers. She indicated that any variation from this process was viewed negatively.

During this exchange, this teacher stated, "I am amazed to realize how my educational experience heavily influenced how I conduct my classroom, primarily how I plan and interact with my English Language Learners." After each interaction, CPR members engaged in an overall reflection they can type in an individual google doc. The reflection data helped guide

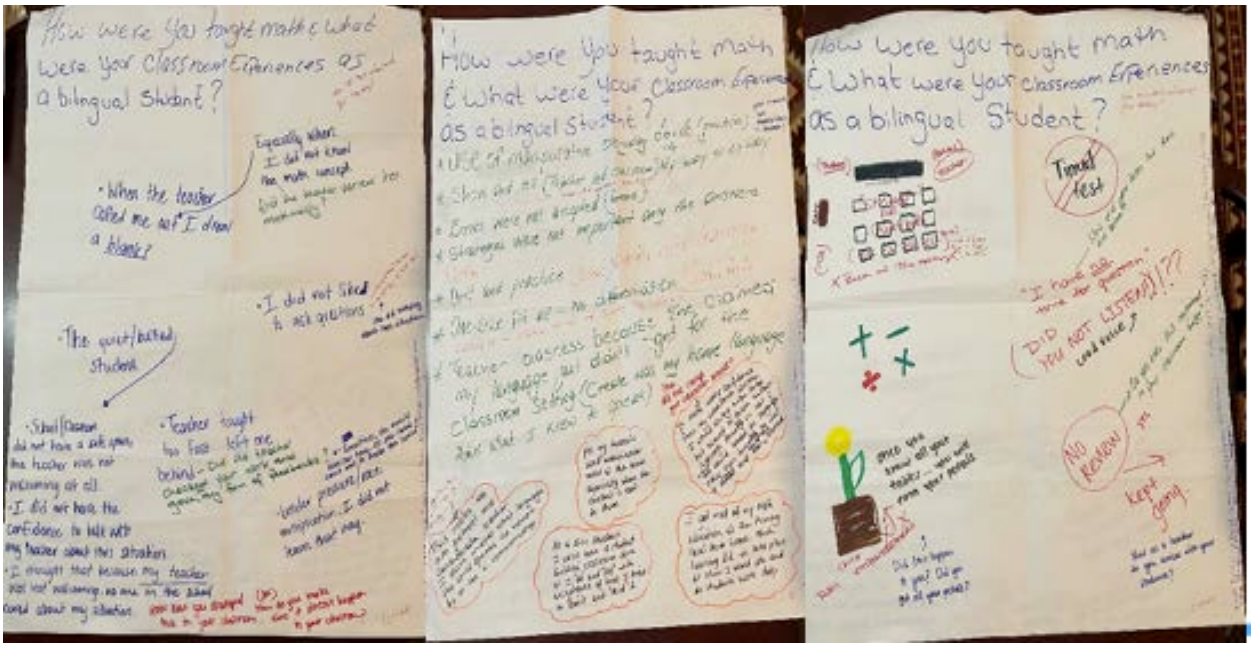


Figure 5. CPR journey lines reflection anchor charts.

the focus for our next interaction. We determined that the CPR needed to develop a working definition for equitable mathematics academic discourse through the reflections and meeting with the coach. To this end, I organized a jigsaw and jam board activity at two of our meetings using recommendations from the National Council of Math Teachers (2014). The NCTM recommendations helped us develop a connection between ELL strategies and math discourse opportunities. Through these two interactions with the research, the team began working on the first iteration of a standard definition.

The team members discussed their understandings of equity at the school/district levels, the increase in ELL population, facilitating meaningful mathematics discourse, the difference in talking about math problems and meaningful discourse, the resources that could support an exchange of ideas, and the role of the teacher is in all of these areas. As a result, the group reached a consensus on the definition of equitable academic discourse in mathematics: Engaging students in opportunities to discuss mathematics and findings while using different representations and tools to explain and develop math academic language supporting ELL students' in-depth critical thinking skills. Then, armed with an understanding what the research says and putting it into a working definition, I introduced the observation protocols.

During one of the CPR meetings, we reviewed the protocols used during the research. Teachers began connecting what they gleaned from the research and the data collection tools and asking questions about the tools, the implementation of equitable practices, questioning, and implementation expectations. I noted from their reflections that they understood that these observations would be shared 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 the check-in meetings with CPR members, we discussed noticing and wonderings reflected in the three

observation tools: Question Form, Calling-On, and Effective Practices for Observing English Language Learners.

Classroom Observations

During PAR Cycle One, I conducted four observations using the various observation tools. I used selective verbatim for taking notes, and then I coded the evidence after the observation. In some cases, I used a seating chart to track student participation. This form of data collection supported the teachers and me in seeing how the data presented evidence of practices that we could discuss.

Evidence Collection and Analysis

I collected and coded data from interviews, the gallery walk, anchor charts, reflective memos, and observations. I initially used an in vivo coding process to identify codes from the data collected. This process was helpful in initial coding as I learned to use qualitative coding and analysis. The codes shifted in later analysis to include process and descriptive coding (Saldaña, 2016). I then analyzed the frequency (see Table 9) of occurrence of the codes and determined specific themes.

This process was helpful in the initial coding; while appropriate for all qualitative studies, this process provided a usable method for a novice researcher. Next, I used descriptive and in vivo coding during the interview coding process to narrow the codes into categories and triangulated the observation data with reflective memos, the gallery walk activity, and CPR discussions. Before focusing on emerging themes, I conducted three iterations of coding. As the analysis continued, the codes shifted over time. Then I analyzed how similarities in the data were consistent across activities and determined specific codes. Table 9 represents the codes from the activities I analyzed and determined the emerging themes. Two themes emerged: influences

Table 9

Influences on Math Teaching

Category	Code with frequency instances	Subcode
Teachers' Lived Experiences as ELL Students (n=90/55%)	Classroom Environment (n=25/15%)	Student discomfort
		Safe space
		Embarrass students
		Teacher-centered
		Teacher questioning
	Relationships (n=28/17%)	Trust
		Efforts to know students
		Social-emotional Learning
	Teachers' Instructional Styles (n=19/12%)	Procedural
		Pacing
		Focus on testing
	Teachers' beliefs about ELL students (n=18/11%)	Mathematical concepts
		Partner
		Culturally responsive
Teachers' Beliefs about Math Discourse for ELL Students (n=75/45%)	Cultrual Inclusion (n=19/12%)	Incorporate Students Cultural backgrounds and knowledge
	Language Supports (n=17/10%)	Use of native language
		Visual use
	Scaffolding (n=17/10%)	Manipulatives
		Questioning
	Engagement (n=22/13%)	Student to student (TPS or turn and talk)
		Student ownership of discussions

on math teaching and instructional practices in school to support teaching ELLs and learning through math discourse (see Figure 6). Themes are supported by categories, some of which emerged in the PAR Pre-Cycle.

Emerging Themes

According to Saldaña (2016), themes result from grouping different codes and categories. The themes support the overarching question: What fosters the implementation of academic discourse structures for engaging ELLs? The two emerging themes included: Influences on math teaching and instructional practices that support ELL teaching in math. Two categories supported what influenced the teachers. First, they had lived experiences as ELL students and had teachers who did and did not support them as language learners in math classrooms. Secondly, as teachers, they developed belief systems about what were helpful teaching strategies for ELL learners in math. Regarding instructional practices that were useful to teachers in supporting ELL learners in math, two categories emerged: Planning effective instruction and evidence-based observations and conversations.

Influences on Math Teaching

Teachers are responding to many factors as they learn to be effective math teachers who rely on conceptual understanding of math instead of algorithms as a primary pedagogical choice. In addition to understanding math curriculum and instruction, teachers of ELL students must support students in language development as they concurrently learn mathematics. As the population of ELL students continues to grow at Roosevelt, we need to understand how the CPR members could be effective language and math teachers. As I analyzed the data, I observed two categories were interrelated: the CPR members' lived experiences as bilingual students influenced classroom structures and beliefs about math discources for ELLs.

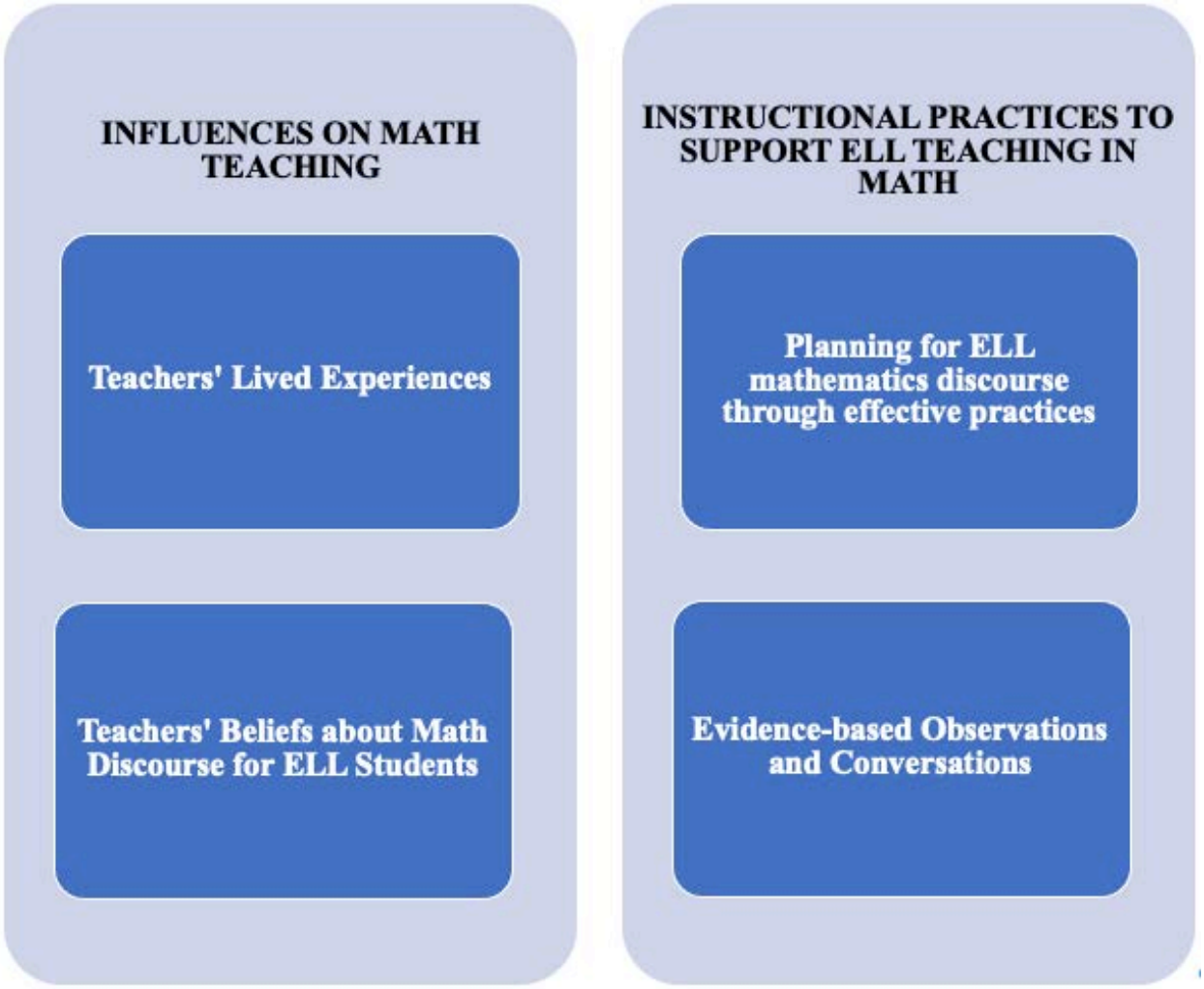


Figure 6. Two emerging themes with categories

Teachers' Lived Experiences as Bilingual Students

The CPR and CLE members used the term safe and nurturing environment to build relationships, cultural inclusion, trust, and a safe space to engage in math discourse fully. In Table 9, the categories and codes support the subsequent analysis. In addition, CPR members indicated how their experience influenced structures in their current classrooms. Members stated that their own student experiences had heavily influenced their teaching practices in ways such as choosing teaching strategies, building relationships, and fostering a culturally inclusive environment. During one of our CPR meetings, Teacher C, who has thirteen years of experience, reflected within the group and realized that she had unintentionally adopted aspects of teaching that her teachers influenced.

Classroom Environment. Teachers shared their experiences about how the classroom environment set the tone for their engagement in the math classroom. These data indicate that 25 instances, or 15% of the data on classroom environment for the lived experiences as bilingual students, could have been more generally positive. For example, CPR members reflected on being uncomfortable speaking in the classroom. The teachers' reflection uncovered the following statement: "My teacher was negative because she claimed my language was not correct for the classroom. I spoke Creole as my first language, and this took away my confidence in math class." CPR members stated that their learning occurred in a teacher-centered math class with little opportunity for engagement in discourse. English Language Learners (ELLs) mathematics education has to be deliberate, offering chances to promote subject and language development (Blanks, 2010; Zwiers & Crawford, 2011). However, the teachers said they did not feel safe sharing without being embarrassed by the teacher. For example, Teacher B wrote in her reflection that "the teacher did not provide a space where she felt safe or welcomed as a bilingual

student." Establishing a nurturing classroom environment and supporting ELL mathematics discourse begins with building relationships between the students and the teachers.

Relationships. CPR members' experiences did not experience positive relationships with their teachers (17% of the teacher's responses). The teachers did not make positive connections with them, make efforts to get to know the students and their families, or build a safe, trusting learning environment where it was ok to take risks learning mathematics. All three CLE members reflected on the lack of social-emotional learning (SEL) activities during their school experience. 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; Gay, 2010a; Hogg, 2011; Moll, 1988; Moll et al., 1992; Paris, 2012; Phuntsog, 2001; Rodriguez, 2013; Yosso, 2005, 2006). Fostering positive relationships between teachers and students creates a classroom environment conducive to learning and meets the needs of the students developmentally, emotionally, and academically.

Teachers' Instructional Styles. The CPR members indicated that they experienced fast-paced mathematics instruction, step-by-step procedural math when solving problems, and drill-and-kill instruction in school (12% of the responses). For example, one teacher commented, "My math teacher taught too fast, and I felt left behind." While analyzing the data collected, the participants mentioned that their math teachers did not take time to answer questions; however, the focus was on students following step-by-step procedures to solve problems and passing the state test, not mastery learning.

Former Teachers' Beliefs about ELL Students. The current teachers had limited English language when they were elementary students, and their former teachers made the CPR members think they could not successfully engage in math content. Their teachers paired them

with other bilingual students during math class to support them, which they agreed was not helpful. English Language Learners (ELLs) need to be immersed and engaged in math discussions that promote the mathematical vocabulary, spoken language, written language, and mathematical expression (Blanks, 2010). In addition, students are more likely to engage in learning when classrooms are well-organized and compassionate, maintain high standards for all students, and reflect their culture (Bennett, 2014).

Through reflections and other artifacts, the lived experiences the ELL teachers had as students significantly impacted them and made them feel as if they were not competent in learning math. Thus, when they learned to be teachers and are now thinking about teaching, they have clear ideas about how students should feel in math classrooms, how teachers should present material to maintain rigor introduced in the classroom, and how they should engage the ELL students in math discourse through questioning and teaching strategies. These experiences as bilingual math learners directly impacted the teachers' beliefs about math discourse and how they engage and structure their classes and interact with ELLs during math lessons.

Teachers' Beliefs about Math Discourse for ELL Students

Teachers discussed how classroom strategies need to change to meet the needs of ELL learners. Participants perceived that cultural inclusion (12% of responses), language support (10%), and scaffolding (10%) in the classroom would increase ELL engagement in mathematics discourse (13%). During the March CPR meeting, the group deeply delved into recommendations from the research (NCTM, 2014).After analyzing the research, the CPR members began to generate questions. For example, Teacher A asked, "How do teachers effectively get ELL students who are just learning English to be fully engaged when the teacher does not know the students' home language?" As the discussion continued, the group decided

that changing teaching practices by becoming culturally responsive teachers would be the best way to start. Culturally responsive mathematics education entails pedagogical expertise, teacher beliefs, and teaching strategies that value students' knowledge resources, foster mathematical thinking, and address issues of power and social justice (Aguirre & del Rosario Zavala, 2013). I discuss the teacher's responses to cultural inclusion, language support, and strategies for engagement and scaffolding.

Cultural Inclusion. Teachers raised concerns about the number of students learning English who were taught by certified teachers with no training regarding English Language Learners or their backgrounds. Through participant engagement in current research, they expressed an understanding of teachers eliminating the language barrier by engaging in culturally and linguistically responsive activities in mathematics. Students' capacity to create mathematical connections to the outside world and their daily lives increases when mathematics instruction and learning connect to their culture, families, and homes (Djonko-Moore, 2020). "We should start by including connections to students' real life." Using students' culture as a vehicle for learning allows teacher practices to become equitable and inclusive (Sleeter, 2012) and value how mathematics embeds in cultural knowledge (Smith, 2017). Preparing teachers to include culture requires a focus on supporting language use in native languages and English so that students develop conceptual understandings in both languages (García, 2019).

Provide Language Supports. When teachers assume language is a hurdle preventing ELL students from fully engaging in math discourse on a deeper level than their classmates, they do not provide the appropriate support so that students can learn language and math concurrently. As challenging as it is to teach math through a language barrier, it could be worse. Math is, after all, a universal language with concepts that are relatively easy to express

nonverbally. Moreover, students' use of their native language, supported by verbal and non-verbal cues, can encourage math discourse. Indeed the use using the native language with English and supports can support bilingualism and math learning (García, 2019).

The CPR group members believed that supporting students in mathematics is a complicated process that requires extensive professional development in math and language learning. For example, teachers made comments such as, "It would help if we were trained to support these students" and "Teachers need to know what strategies to use to support ELLs even if we cannot speak the same language." However, while bilingual, Teacher C is not a native Spanish speaker, which is the first language of most students. The other two CPR teachers can encourage using their native language (Spanish) and English because both teachers speak Spanish and English. As a result, the teachers can ensure that students stay on task even when using their native tongue. Combs et al. (2005) revealed that teachers with more than nine hours of training in this area are more successful in teaching ELLs than those who do not. During the CLE conducted in April, the ELL teachers indicated that using various strategies to teach ELLs math, such as encouraging teamwork, student-to-student interactions, using verbal and non-verbal signals, and creating a language and math-rich environment, supports mathematics discourse and learning.

Scaffolding. In classroom discussions, ELLs should use visual aids such as physical objects, videos, diagrams, and gestures to support their learning (Chval & Chávez, 2011; Kareva, 2013). The CPR group thought that various instructional supports might increase independence in mathematics discourse activities and strengthen their conceptual understandings. During the April CPR meeting, members identified effective practices that support ELLs in mathematics. These included "teachers incorporating manipulatives and visuals during lesson segments" and

"questioning to develop a deeper understanding of mathematics concepts." One teacher said, "effective mathematics teaching includes a strong focus on using various mathematical manipulatives." Another commented that "teacher questions challenge students to think and teachers to discern what level of understanding students have." Without scaffolding in multiple forms, students learning English struggle to access mathematics content and comprehend concepts without scaffolding. Larkin (2002) asserts that teachers help students more as they acquire new learning or have a difficult task. As mastery or proficiency is attained, the scaffold is gradually removed. Various instructional strategies guide pupils toward increased comprehension and, eventually, freedom in the learning process. Questioning is an integral instructional practice that supports teaching and learning.

Engagement. We know that student involvement in mathematics is best supported by teacher instructional techniques that require student dialogue, which creates chances for student-to-student, teacher-to-student, and student-to-teacher conversations (Moschkovich, 2002). In addition, the choice of assignments must allow students to comprehend and synthesize knowledge to provide an engaging mathematics curriculum that encourages discussion (Bransford & Donovan, 2005). However, the teachers were concerned that, despite what we know, several concerns about engaging ELLs in mathematics discourse surfaced during their discussions. Based on their experiences as bilingual learners when they did not particularly like being paired with peers, the CPR group was concerned that ELLs lacked the abilities needed to fully engage with their peers, which, in turn, limited their ability to become owners of the discussion. They believed ELLs should have more opportunities to participate in student-to-student turns and talks with their peers, although they needed to figure out how to support what they believed. The CPR members expressed that the ELL students are eager to learn and hard

workers but lack confidence when participating in mathematics discourse during class. Teachers reflected that some of the lack of opportunities arise from ineffective support given to students during math instruction, and their discussion of scaffolding strategies could improve student confidence.

Students' home languages can serve as a scaffold. Cultural references, home language, and scaffolds significantly influence how ELLs learn academic content in the new language (Hollie, 2012). For example, using a student's native language in mathematics is more complex than just speaking in one's native language. When ELL students speak in their native tongue and apply what they already know about mathematics, they engage in translanguaging – the practice of "using language as a unitary meaning-making system of the speaker" so that students can use their entire language repertoire to communicate (García, 2019). Translanguaging is a practice in multilingual communities that can help students and teachers to select appropriate native language features that assist in communicating and understanding new concepts (García, 2019). However, the use of that term is still abstract for the teachers, and we would need to fully co-construct the meaning of translanguaging to use the processes in classrooms.

The emerging themes related to the influences on math teaching and instructional practices that support ELL students in math. The teachers concurred that effective planning instruction and data analysis of the observations and conversations were useful. Based on these findings, teachers had the necessary knowledge to support language development while teaching mathematical content. However, I found that teachers duplicated practices they had in their lived experiences, even if they could state that certain practices were not helpful. For example, teachers who were bilingual students shared that their classroom experiences were not favorable and limited math discourse. As students, the teachers did not feel they were in a safe

environment regarding social-emotional support and relationships. Due to these experiences, they retained little of what they learned, and learning mastery was not a focus. As a result, the teachers, as students, felt they were not capable of learning math.

The bilingual teachers believed that to engage ELL students in math discourse, there must be an adjustment of culturally responsive teaching practices. Teachers should engage students by connecting math content with the families and their homes. They believed these connections would help bridge the language barriers that may be present. Therefore, the students needed language support at the same time they learned math.

To do so, teachers would benefit from professional development that combined math and language. While teachers felt that they should change, but they reported that they needed effective strategies to make the math content and discourse accessible to all students. The experiences, thoughts, and feelings of bilingual teachers who were once in the same position as bilingual students gave a perspective on what can be done to enhance instruction and foster excellent student achievement.

Instructional Practices to Support ELL Teaching In Math

Meeting the diverse requirements of ELL kids is frequently the responsibility of the grade-level mainstream teacher, who must ensure that the content is in line with the standards. The teacher needs an instructional repertoire that supports language and math conceptual learning to engage the expanding population of students learning English in today's classrooms. Carefully planned lessons and evidence-based observations with follow-up conversations with a school leader or instructional coach can significantly support teacher learning and implementation. Because engaging ELL students in discourse practices can be challenging for teachers, the opportunity to engage with peers and the teacher in a mathematics classroom can be

improved by effective planning and evidence-based observations. Two categories support the theme in analyzing the data from teacher conversations and classroom observations: planning for math discourse (44% of the evidence) and establishing learning communities for students (26%) (see Table 10).

Planning

The CPR and CLE groups were concerned about the extensive planning needed before implementing instructional practices. During the activities, codes emerged around using student data to find out what they know to plan For example, codes noted from the evidence included, "Use data to find out what students know," "Connecting to the World-Class Instructional Design and Assessment (WIDA) strategies the Language of Math," "Make math accessible for students through interactions, questioning, talking stems, and collaboration." Participants made the connection between the talking stems and teachers' line of questioning to strengthen teachers' plans for instruction. Other data directly related to teachers taking the time to construct valuable and practical lesson plans include strategies such as think time, visual aids, and equitable calling on strategies that promote and strengthen practical mathematics discourse in the classroom.

I determined that the participant's experiences as bilingual students affected their current thinking and teaching practices. During the February 14 CLE, the participants were asked about practices that would foster the classroom implementation of academic discourse practices that engage ELLs. Participants outlined beliefs about discourse practices to engage ELLs by developing a sound instructional framework that allows teachers to cultivate adequate mathematics discourse opportunities by establishing learning communities, engaging students in effective questioning, and using students' native language during instruction. They had conversations about how to plan ahead for better questioning.

Table 10

Instructional Practices to Support ELL Teaching in Math

Theme	Code	Subcode
Planning for ELL Mathematics Discourse (n=48/44%)	Planning (n=22/20%)	Data use
		WIDA standards
		Effective practices
		Engaging Tasks
		Effective Question forms
		Using both languages
	Establishing Learning Communities for Students (n=26/24%)	Accessible mathematics
		Student-centered
		Native language
		Improve Instructional Practices
Evidence-Based Observations and Feedback (n=62/56%)	Observations(n=34/31%)	Reflective practices
		Help with content delivery
		Change
	Coaching (n=28/25%)	Increase teacher confidence
		Affirm teaching practice
		Guide teacher learning

Establishing Learning Communities for Students

Participants decided that the practice of learning communities they have participated in could effectively engage ELLs in mathematics discourse. The responses were similar when asked what they consider to be learning communities. The CPR and the CLE members connected the need for learning communities for students to their professional learning communities that they engage in weekly. One CLE participant suggested that if we strategically plan for questioning and talking stems, the student learning communities can strengthen ELLs' mathematic engagement through discourse. Teachers grappled with students not being able to communicate enough for learning during the five opportunities for student-to-student engagement based on the word problem presented to the class. The teacher read the word problem to the students and then had a choral reading of the word problem from the whole group. After the whole group read, the teacher asked students verbatim questions (see Table 11) to engage them in the lesson. I noted during the post-observation conversation that this was an opportunity for student-to-student engagement. While observing Teacher C during a ten-minute learning segment, I noted that this teacher was conducting a whole group lesson on telling time. Students were seated on the carpet, and she would ask them to turn and talk to their neighbors during the lesson at specific intervals. During turn and talk, students manipulated a clock and discuss how the specific time in question should be represented on the clock.

During this learning segment, I noted three opportunities for student-to-student discourse that needed to be included. First, students can better engage in student-to-student mathematics discourse when supported by their native language. After the observations, the CPR members and I began the post observations conferences to discuss and reflect on what I observed. During the complete data analysis, I used observation data, anchor charts data, and reflections to

Table 11

Questions from the Ten-Minute Segment

Teacher Questions	Question Form	Question Form	Question Form	Calling On
How many kids build the castle, Angela?	NTT	SNA	How	RH
What happened after that, David?	NTT	SNA	What	RH
What is the total number of Kids?	NTT	SNA	What	RH
How do you know it is 16?	TT	No name	How	RH
How many more kids came to help?	TT	No name	How	Rh

Note. NTT= No Think Time; TT= Think Time; SNA= Student Name After; RH=Raised Hands.

triangulate the data. The observation data supports the teachers' inconsistency in implementing effective discourse strategies. During the post-observation conferences, the participants reviewed the data. Teacher A wrote, “using what-if questions was a way to increase student thinking and spark more discussion in mathematics." This discussion supported student use of native language during student-to-student and teacher-to-student interactions.

In particular, improving questioning was a topic of conversations. CPR and CLE participants questioned what teachers could do to engage ELL students in discourse opportunities effectively. "We can use talking stems from the WIDA framework and plan questions to support discourse opportunities for students." Another teacher mentioned during the conversation that teachers need to be strategic about how they ask and the types of questions being asked. In this meeting, I facilitated teachers to identify types of question forms and stems that would be beneficial to support ELLs in rigorous mathematics tasks. The group took time to examine the Question Form observation tool to clarify their understanding of its use and how the data strengthened discourse strategies in their classrooms (see Table 11 for a sample of the types of question forms identified during a lesson segment). These follow, to some degree, the preferred format for effective questioning. The questions start with question words: how many and what. The teachers used the students’ names at the end of the question instead of the beginning. However, in three of the instances, the teacher offered no think time between the question and student name. In addition, the question rigor is basic recall or fact level. Only one question required student thinking. Finally, the equity of calling-on was limited as the teacher only called on RH (raised hand). After we used these specific data to discuss questioning, they could identify what they needed to do to shift questioning practices.

Evidence-Based Observations and Conversations

In this category, I focused on evidence during classroom observations, precise actions of teachers to improve instructional practices. For example, as a result of participants engaging in a gallery walk during the CPR and CLE meeting, they listed three examples of math discourse practices that would be useful during an observation: questioning, revoicing, and turn-and-talk strategies—instructional practices they wanted to use in their perspective classrooms. Teachers could articulate types of discourse practices and how effective these practices are in engaging ELL students in mathematics discourse practices. However, the processes they implemented in classroom practices did not necessarily match what they identified as best practices.

During the interview process I conducted with the CPR members I asked each participant how conversations about the observations affected their practices. The participants data included: "It allows me to become reflective," "Helps improve my delivery of content to students," "changes practices," "Increases confidence in teaching using students' native language," and "affirms my teaching and guides me to new thinking and learning about teaching and learning."

Using equitable instructional practices is indispensable when providing opportunities for conceptual mathematics and discourse practices for ELL students. Practices such as planning, learning communities, effective questioning, engaging tasks, evidence-based observations and conversations, and feedback strengthen teachers' knowledge, implementation, and consistency as they blend strategies into lessons and saturate ELLs with opportunities to practice discourse in mathematics. In addition, the teachers were influenced by their reflections as they practiced strategies that may be useful to ELL learners. As the instructional leader, I needed to be aware of the data and effectively guide the teachers in their planning and implementation.

Leadership Reflection and Action Steps for PAR Cycle Two

During the Pre-Cycle, I collected preliminary data and began to learn the processes of coding and analyzing to make meaning. The process required multiple iterations. Because of the limited data collected during this cycle, the evidence was shallow. After carefully reviewing the data collected, the overarching question, and the focus of practice, I outlined a more robust data collection process that allowed for more extensive understanding. Reflecting on my leadership skills, I now clearly understand the statement "going slow to go fast" (Senge, 2006).

In describing how my capacity to lead and evolve as a leader was critical to the success of our investigation, I realized that enhanced teacher practice necessitated support and coaching. Therefore, I changed my leadership role to that of a coach, guiding the CPR group through this process as they collaborate with me and support the work through classroom practices. While I was extremely nervous about the CPR group's willingness to fully engage in this research in the middle of a pandemic, I was more concerned about my ability to lead and coach them during these unprecedented times. My comfort level increased as I returned to my instructional coach methods, helping the CPR team see me as an instructional leader, and they became more comfortable collaborating. As we engaged, the conversations became more organic, intimate, and centered around specific classroom practices.

During the first CPR meeting, I focused on building relationships that would allow for authentic collaboration and conversations. By opening each meeting with Dynamic Mindfulness and exploring the ideas of creating a gracious and comfortable space, team members asked questions, shared thoughts, provided valuable input, and reflected on classroom practices, allowing each voice to be heard and honored while providing ownership within the research.

During one of the last meetings in PAR Cycle One, I had some concerns that the first CPR meeting could have been more productive and that I needed to provide more time for the team to look at the research I had already engaged. I worried that I should have asked the right questions or collected the correct data and that the CPRs needed a more precise picture or understanding of how we were moving forward. During a coaching session with my dissertation coach, I reflected on my actions to provide background knowledge to the team and realized I had missed a critical step. As a result, I planned the next CPR meeting to engage participants in mathematics research. I used selected chapters in the National Council of Teachers of Mathematics (2014) *Principals to Action* to help the team build knowledge through research. In addition, participants read and engaged in a Jam board activity that focused their learning on the importance of academic discourse opportunities in mathematics and facilitating meaningful mathematical discourse during instructional practices. As the facilitator, my role was to help the team get a strong foundation of the research to move forward with learning and implementing protocols. To do this, I intentionally guided them to research or practice literature that would facilitate a more profound understanding. For example, the team responded to the following based on research and learning:

1. How is meaningful mathematical discourse different from having students discuss math problems?
2. How do the five practices described by Smith and Stein (2018) support and facilitate the purposeful exchange of ideas in the mathematics classroom?
3. How does the role of the teacher and student in these discussions impact learning?
4. How can you implement questioning types that elicit mathematical reasoning and justification?

5. Why is it important for teachers to have a clear goal when facilitating discussion that focuses on student thinking?

As a result of taking a step back, the CPR team grappled with the research, processed the new learning, asked clarifying questions, and made connections to ELL learning and classroom practices. During the reflection process, the members shared how going back to the research put things in perspective and filled gaps in their understanding. This allowed them to create a working definition for equitable mathematical academic discourse.

During the coding and categorizing of data, I noticed some trends. During the meetings, the CPR team provided artifacts, reflections, and discussions on how their experiences as students and their beliefs impacted their teaching and how intentional instructional practices support academic opportunities for ELLs. The team reported that planning, observations, and feedback have a role in supporting teachers in changing instructional approaches to support engaging ELLs with equitable academic discourse practices. As I moved toward observations, I provided the team with professional development on the protocols, a necessary step to help teachers understand each tool's purpose and determine which tool would help us collect the most valuable data for the PAR. As a result, during PAR Cycle One, I observed each member using the questioning and calling-on strategies. Once I completed the observations, the CPR team and I conducted post-observation conferences and reflections. This process allowed me to sit with each member, clarify the tool and its use, and review the data.

During the observations of the two teachers, whose native language is similar to the students, I observed fifteen teacher-to-student exchanges within a ten-minute teaching segment. The dialogue was one-way and consisted of instructions, reading the problems, and giving classroom procedural instructions with only two student-to-teacher interactions. During the post-

conversation, we looked at data collected during the observations, lesson plans, the Into Math teacher's manual, and the students' sheets used during the lessons. When shown the one-way dialogue data, Teacher B stated, "I did not realize I do most of the talking, and students have limited opportunities to engage in math discussions."

During the CPR and CLE meetings, participants included evidence on anchor charts, in reflections, and during the gallery walk that supports native language use in the classroom. Dialogue procedures should support rigorous academic discourse by balancing teacher-to-student, student-to-teacher, and student-to-student interactions. These dialogue procedures are strengthened by teacher moves (Adams et al., 2020). Again, the data supports teachers' ability to identify the importance of supporting equitable mathematics discourse practices through native languages; however, observation data substantiates teachers' inefficient use of native languages in the classroom.

Moving into PAR Cycle Two, I had two unexpected events that impacted this study. First, one of the CPR members taught through Educational Partners International (EPI) and initially had one more year at the school. However, she was moved at the end of this cycle, reducing the CPR team to two members. Second, I learned that the state-mandated LETRS implementation would begin at Roosevelt for all Kindergarten through fifth-grade teachers. Due to the nature of the rollout, the time I set aside to conduct various CPR and CLE activities was reallocated to allow teachers to complete the extensive training needed for full implementation.

Conclusion

As we moved into PAR Cycle Two, I continued collaborating with the CPR team to strengthen their knowledge, understanding, and implementation of equitable academic discourse practices. As I discuss in the next chapter, I supported the teachers through the cycles of inquiry

and collaboration with CLE members. In addition, I continued observations and allowed teachers to observe one another to augment their understanding of how practices look in action. We continued to have post-observation conversations individually and collectively to discuss implementation n practices. As we discussed the data I had analyzed, we continued improving instructional practices to support ELLs in mathematics. In addition, the themes from the next cycle fortify what we know about the conditions that enhance equitable instructional practices to support ELLs in mathematics.

CHAPTER 6: PAR CYCLE TWO AND FINDINGS

In the participatory action research project and study, the co-practitioner researcher team and I focused on using discourse strategies to support English Language Learners in mathematics. In other words, we wanted to understand how first-grade teachers could better support ELLs in engaging in equitable academic discourse practices in math classrooms. For communication skills and math language development, children must connect socially and orally with teachers and other students during instruction (Kieran et al., 2002; Moschkovich, 2002; O'Halloran, 2015). In the PAR Pre-Cycle, I engaged the CPR group members in activities highlighting how English Language Learners could engage in academic discourse. In addition, during the Pre-Cycle, I sought to understand better the CPR group members' beliefs about teaching ELLs and how personal experiences as ELLs impact current teaching practices. In PAR Cycle One, two themes emerged through the analysis of data. The emerging themes included influences on math teaching and instructional practices that support ELL teaching in math. Moving into PAR Cycle Two, I analyzed data to support the emerging themes further to determine the findings. After collecting, coding, and analyzing data from PAR Cycle Two, the findings are:

1. Teachers have lived experiences, beliefs, and knowledge of practices about effectively engaging ELLs in equitable mathematics discourse opportunities that influence their teaching, and
2. Teachers need consistent support to incrementally transfer their lived experiences and beliefs to classroom instructional practices.

My responsibility as the school leader was to support teachers in improving purposeful academic language instruction for English language learners by observing their teaching

(Sullivan & Glanz, 2013) so that students used academic language, showed their reasoning and understanding of mathematics concepts, and developed confidence in participating in classroom discussions. As a result, teachers could simultaneously build language and math knowledge and skills by supporting the use of language, not just vocabulary. Students who explain, define, and defend ideas using academic language create, edit, communicate, and challenge ideas independently and in collaboration (Chval & Chávez, 2011; Dallimore et al., 2013; Kareva, 2013; Leinwand, 2009). However, PAR Cycle Two proved challenging due to multiple micro and macro obstacles that affected the effective implementation of classroom practices. Despite these challenges, 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 equitable discourse strategies in math classrooms to support English Language Learners. Based on the data analysis, I discuss the themes from PAR Cycle Two and the findings from the three inquiry cycles. The chapter concludes with the implications of the research for the focus of practice and my leadership.

PAR Cycle Two Process

PAR Cycle Two occurred in September-October 2022. Due to district mandates associated with a new literacy program from the district, including extensive training and the school's designation as low-performing, the professional development time reserved for this project was compromised. The North Carolina Department of Public Instruction mandated professional learning for Language Essentials for Teachers of Reading and Spelling (LETRS), a new literacy-focused framework. However, the CPR group and I continued collaborating and working toward implementing effective ELL teaching practices. I conducted four rounds of observations, two for each CPR member totaling eight observations, four post-observation

conferences, two for each CPR member, and a final CPR meeting. Finally, I discuss the continuation of evidence collection to support the findings.

PAR Cycle Two Activities

The Co-Practitioner Researcher (CPR) members now included two first-grade teachers as one teacher was no longer at the school due to complications with her work visa. Activities included one CPR meeting, eight observations, and four post-observation conferences (see Table 12 for timeline and activities). I analyzed data from reflective notes, agendas, CPR artifacts, and post-observation conversations. Using open coding, I fortified the Pre-Cycle and PAR Cycle One data to determine if teachers could transfer their beliefs and knowledge about useful ELL practices to classrooms.

In addition, math instruction often had a secondary role in responding to the state-mandated literacy curriculum. Despite meeting academic growth of 71%, the state assigned a performance grade of an F, moving the school into the low-performing category. With this designation, as the instructional leader, I was required to follow specific guidelines. These requirements impacted the scheduled observations and CLE meetings and pulled the focus away from our ELL students, who were identified as the group with the highest needs. Finally, I was moved to another position in the district without access to the teachers. As a result, I had to shift in-person observations to recordings. I collected data by conducting recorded classroom observations and engaged in post-observation reflections. In addition, I conducted member checks and had a culminating CPR meeting (see Table 12). First, I present the PAR Cycle Two activities and discuss the importance of each activity and the coding process. Then I discuss the activities during PAR Cycle Two.

Table 12

PAR Cycle Two Activities

Meetings	Date	Learning Activities	Data
Back to School Reflection	August 24, 2022	Data Review Member Checks	Reflections
Observations (n=8)	September 2022	Question Tool Calling on Tool Post-Observation	Field notes Reflective Memos Coded Observations
Meeting	October 27, 2022	Dynamic Mindfulness Data Dive/ Observations Jottings	Agenda Artifacts Field Notes Reflective Memos
Post-Observation Conferences (n=4)	September 12, 2022	Individual Conversations	Field Notes

I began PAR Cycle Two by reflecting on the professional development and observations provided during PAR Cycle One. During the August 24th reflection process, we discussed emerging themes from PAR Cycle One. The CPR members reflected on their progress in PAR Cycle One and made commitments for PAR Cycle Two. The reflection served as a springboard for actions and propelled CPR members to modify the ongoing implementation of equitable academic math discourse practices during math lessons.

In September, I began the final round of observations and post-conferences with the two teachers who continued as CPR members. These final observations provided data that supported the change in teacher implementation and practices. CPR members articulated the need for me to focus on how they called on the students during the final rounds of observations. "We have many data on questioning and forms of questions now; I would like to know how we have changed with calling on strategies." I continued to record the questions and calling on strategies during this round of observations. During the post-observation conferences, I talked with teachers about rigor in the classroom through questioning and equity of voice.

The last CPR meeting was a final opportunity to reflect on and celebrate the changes in teaching practices. The group discussed their reflections on the value of taking part in the study. Teacher B began reflecting on the opportunities for her personal leadership growth by continuing her learning and supporting other teachers in her grade level and school. Teachers began collaborating about the next steps and how to continue fine-tuning practices and research others.

Improving Teacher Instructional Practices

The CPR members' did not automatically transition their beliefs and knowledge to using equitable discourse practices. Rather, to fully transfer from discussions and beliefs to classroom practices, we engaged in purposeful planning, collaboration, and observations that supported

instructional practices for teaching math to English language learners and post-observation conversations. During this final round of observations, I collected frequencies of teaching practices that supported the emergent themes from PAR.Cycle One (see Figure 7). The key theme for this cycle fortified the evidence from PAR Cycle One; teachers used equitable calling-on practices but expressed difficulties in changing their teaching practices.

During the final round of observations, teachers used equitable practices to support ELLs during structured discourse opportunities in mathematics. I organized these practices into two categories: talk moves and calling-on strategies. I observed CPR members using talk moves 133 times during the eight observations. During this round, there were 25 student-to-student interactions and 30 teacher-to-student interactions during the lessons. Student-to-student dialogue opportunities noted during the observations were generally think-pair-share or turn-and-talk. Wait (or think) time occurrences during this round increased, and I noted 32 instances compared to no-wait time occurrences of 23.

I noted 157 instances of calling on strategies (see Figure 7), however, in 49 instances, students blurted out to answer the questions while in 11 instances, students raised their hands to respond. Since the teachers directly control discussion management, they reported that they needed to teach them protocols for responding. CPR members used the traditional call-and-response strategy five times during the observations, and only 2 were cold calls. This was a result of the increased use of equity sticks during questioning.

The CPR members and I worked to plan, practice, and implement strategies to promote discourse and equity. Strategically planning to allow each student to participate in dialogue began with teachers incorporating and using equity sticks during the lessons. I noted 45 instances of use of equity sticks, which require the teacher to use specific student names. However,

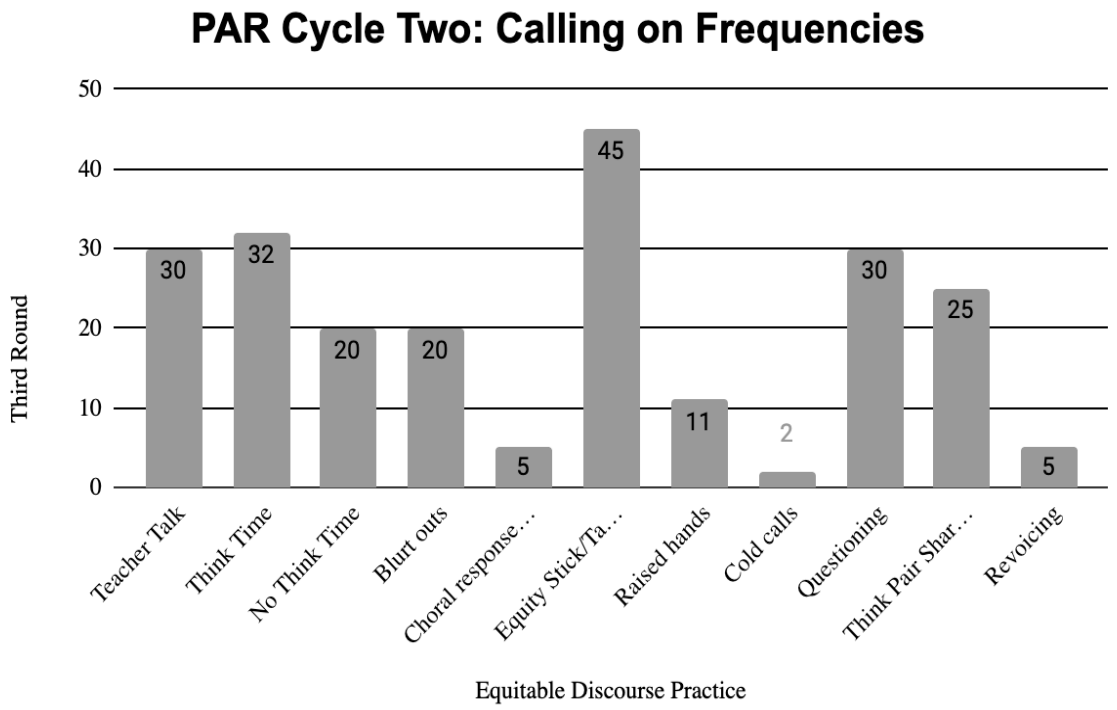


Figure 7. PAR Cycle Two: Calling-on frequencies.

typically, teachers should call on students to use equity sticks after the question and wait **t**ime. If the teacher calls before the question, that may alert one student, but cause other students to disengage from the lesson. The best practice for student engagement includes this process: the teacher poses the question to the whole class, allows all students time to think and process the question and construct a response, and then calls on one student using an equity protocol. However, teachers find shifting to these processes difficult because they are accustomed to other students' responses.

Teachers often continue to teach like they were taught, and those practices seemed to influence their teaching deeply, making shifts difficult. Termed the grammar of schooling, changing teacher practices so that a specific strategy becomes a part of the teaching repertoire is complex (Tyack & Cuban, 1995). Even when teachers can verbalize what they believe, they cannot always enact those beliefs. Data from PAR Cycle Two fortifies the findings. In this research project and study, we see how teachers actually teach and what is required to change the ingrained practices. To effectively support teachers to change, we need to systematically observe and have conversations to incrementally and persistently address the drift to prior practices that are not supporting student learning (Cuban, 2021).

Findings

The Participatory Action Research (PAR) project presents a potential model for a change to support ELL teachers in shifting their instructional practices. The change in teaching requires intentional support from the instructional leader, including a staggered set of supports for teachers. I started with developing relationships with teachers and understanding how their lived experiences and knowledge about useful practices might be a foundation for changing practices. Then, particularly toward the conclusion of PAR Cycle One and all of PAR Cycle Two, I

engaged in evidence-based observation, analyzing post-observation dialogue data, structured professional learning, and instructional leadership facilitation to coach teachers to improve practice. As a result, teachers improved incrementally; however, the process of building trust and establishing an anchor in their lived experiences, beliefs, and knowledge is a critical process for having the trusting relationships to facilitate the observations and post-observation conversations. To a large degree, the process was sequential across three cycles of inquiry. Thus, the first finding addresses our early experiences and foundational activities for the second findings for changing teacher practices.

1. Teachers have lived experiences, beliefs, and knowledge of practices about effectively engaging ELLs in equitable mathematics discourse opportunities that influence their teaching; in other words, teachers' experiences as ELL learners themselves influenced their teaching practices
2. Teachers need consistent support to incrementally transfer their lived experiences, beliefs, and knowledge to classroom instructional practices. Changes in practices required intentional efforts over time.

In this case, the district's choices for professional learning interrupted implementation, but teachers made progress in their teaching practices because of the attention to observations and conversations. Thus, the school leader or instructional coach must conduct regular observations and conversations supporting if teachers are to shift their teaching repertoires. They can articulate what is effective teaching, but they do not necessarily teach in ways that they identify. They tend to drift to teaching practices they experienced as students, even if they can discuss how those practices were ineffective for them as learners.

I support the claims in the two findings with evidence from three cycles of inquiry (see Figure 8 for data across the cycles). Teachers lived experiences influenced their teaching practices, and I documented those experiences and their influences more intentionally in PAR Cycles One and Two. During the Pre-Cycle, teachers expressed how their experiences as English Language Learners heavily influenced their beliefs about how learning should occur for ELLs.

However, in teacher reflections in PAR Cycles One and Two, teachers transitioned beliefs and knowledge about teaching practices into teaching practices because they collaborated with colleagues and the instructional leader. To some degree, CPR members believe that lived experiences influenced teaching practices, and their experiences would inform teaching practices to support ELLs – as if by osmosis, rather then by intentionality of planning and implementation. As I note and the data from classroom observation demonstrates, teachers still needed support in consistently implementing practices. In other words, they needed to understand how to translate their funds of knowledge, including beliefs, to routines in their instructional practices. Secondly, teachers transferred their beliefs to actions by planning talk moves and calling on strategies to provide equity and engagement through math discourse. By providing evidence and facilitating discussions, they recognized what to do and how to do it. By increasing collaboration, observations, and conversations, teachers did change some practices despite a set of challenging external variables.

The best practice for student engagement included the process of the teacher posing the question, allowing all students time to think and process the question to construct a response, and then calling on one student respectively. However, teachers found shifting to these processes difficult because they are accustomed to using raised hands and accepting student responses even when they blurted out. Equitable academic discourse practices for ELLs in math classrooms can

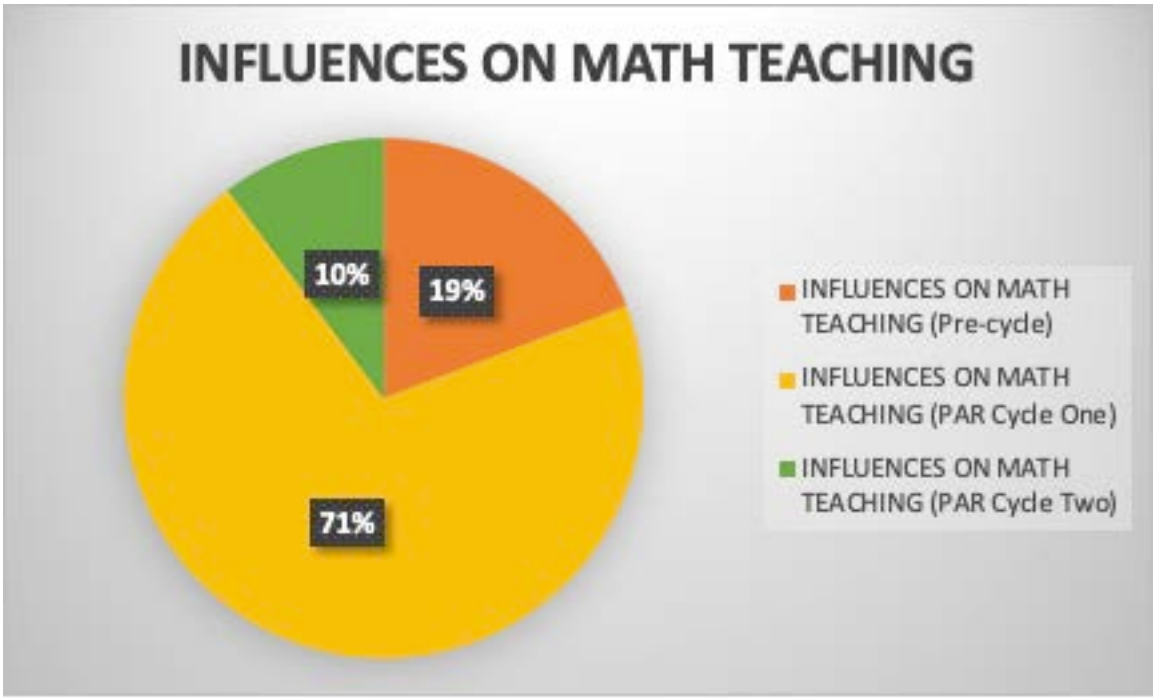


Figure 8. Teachers report influences on math teaching across three cycles of inquiry.

be achieved. Still, the variables of lived taught practices and teaching experiences by CPR members was an anchor to which we could return so that they could become more consistent in using best practices for student engagement. First, I discuss how their lived experiences, beliefs, and knowledge provided a foundation for changing practices.

Lived Experiences, Beliefs, and Knowledge: A Foundation for Shifting Teacher Practices

Teachers' beliefs and experiences are one aspect of implementing culturally and linguistically responsive mathematics instruction (Aguirre & del Rosario Zavala, 2013). Teachers in this study believed that their lived experiences, beliefs, and practices as English Learners directly influenced how they effectively engaged students in equitable mathematics discourse. The teachers wanted to support culturally and linguistically responsive pedagogy, and their lived experiences and growing knowledge of effective practices contributed to their funds of knowledge. However, change requires time and consistency, which was interrupted by the district mandates.

Teachers' Experiences and Beliefs

As documented in the Pre-Cycle and PAR Cycle One, teachers did not generally have experiences in their learning that supported effective teaching practices. Their experiences in K-12 education with teachers was largely not positive, and their teachers by and large used practices that were not conducive to their learning, in particular, the ways they treated students who were English language learners, as two of the CPR group teachers were. In 83% of their comments, they reported practices they had as students that made them feel as if they were not good students or could learn math. For example, one participant said: "Teachers [I had] were more concerned with completing the curriculum than building an inclusive environment that provided rigorous, equitable opportunities to students." The desks were in rows, the teachers

asked questions but called on raised hands from the same students, and, in general, the teachers felt ignored in classrooms. In only 17% of the data did they experience what they now considered positive teaching or teachers.

Because of their experiences, members reflected on the need for more opportunities for cultural connections or experiences for their students and wanted their current students to have different experiences than the ones they had. They believed that they knew how to be better teachers. During PAR Cycles, CPR members consistently referred to their desire to create a nurturing class environment that embedded the cultural experiences of ELL students. In evidence from CPR and CLE activities throughout the research process, members had experiences as math students that needed to include their culture or language, creating an environment that made engaging in discourse opportunities in mathematics classrooms difficult. The teachers reported that they were invisible to the school community and that as they grew up, they felt devalued and unmotivated during instructional activities. Intrinsic motivation frequently includes a strong sense of belonging to a learning community. They wanted, as teachers, to foster a nurturing environment and believed that students would feel a sense of belonging and be more motivated.

As ELL students, none of their experiences included the cultural and linguistic needs that made them feel included enough to engage during instruction actively and comfortably. During the study, members often mentioned how their experiences could have been more inclusive. Their statements expressed early on in the PAR study indicated that they were taught in a "using drill and kill methods" and lecture and they reported that the content was unrelated to their lives. They felt that, by and large, that their teachers "did not understand me" and that their classrooms were not safe spaces where they felt comfortable participating. In addition, they felt that their

teachers often embarrassed them. In CPR meetings and CLEs, and perhaps from their teaching preparation or professional learning experiences, they could name best practices.

Knowledge of Best Practices

To a large degree, teachers believed that they knew what it was like to be in an environment that was not intentional about how ELLs were taught. As a result, they believed they were better equipped to support the academic needs of these students. They expressed that providing students with a positive, nurturing class environment incorporating cultural and linguistically responsive experiences was a better way to teach (Hollie, 2015). While their beliefs did not always translate to actions, which I discuss in the second finding, they did bring what Ralabate and Nelson (2017) discuss -- their background knowledge grounded in experiences directly related to the concept known as funds of knowledge.

Funds of Knowledge

Teachers can more fully engage students if they draw on students' Funds of Knowledge (FoK), the cultural knowledge that students bring to the classroom (Ralabate & Nelson, 2017). In this case, CPR teachers' funds of knowledge were a determining factor in how they structured their classrooms and engaged students. Their experiences as students became a part of their funds of knowledge and impacted their teaching practices. They definitively wanted to draw on students' lived experiences to decide on math content and construct math experiences that were relevant. The cyclical nature of teacher funds of knowledge affects their instructional practices, which directly influences students as both teacher and students benefit from the exchange of new cultural experiences (see Figure 9). However, as teachers determined that they should change practices, they needed more than just knowledge; teachers needed to recognize the importance of family and how "varied background and knowledge affect our thinking and teaching" (Ralabate

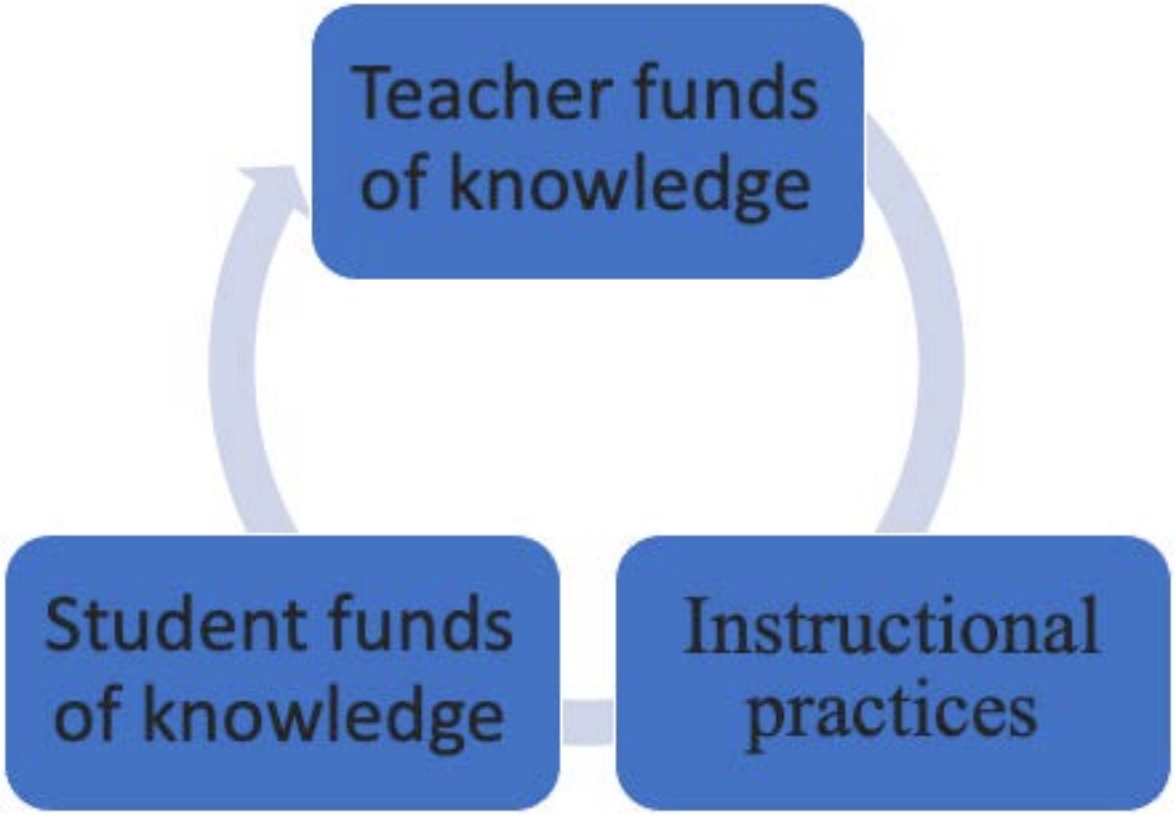


Figure 9. Cyclical nature of cultural experiences in classrooms.

& Nelson, 2017, p. 60). Teachers could name practices that they thought were important: small group dialogue and problem-solving, opportunities to explain their math thinking and perhaps makes errors, but learn from them, and math problems that included content from their students' lives, which are all equitable ways to engage all learners. However, naming and planning did not always correspond to transfer.

In addition, teachers had to focus on math content as well as math academic language to support discourse practices. According to Moschkovich (2002), the emphasis of mathematics instruction for English language learners can be shifted from language development to mathematical content with a discourse approach to learning mathematics. Students from different cultural contexts do not always discuss math in a traditional sequential manner; thus, teachers were aware of how ELL students might construct arguments, present explanations, and learn from their peers' perspectives. They knew that students sometimes needed to have directions or vocabulary or concepts translated so that they could use their first language to learn the new language and math content. As the teachers toggled between their lived experiences as students and their cultural funds of knowledge with knowledge they had about best practices, they articulated what they could and should do to be more effective teachers.

Transferring Beliefs to Actions

The teachers' classroom instructional practices changed to support planning and scaffolding, but the teachers experienced challenges in implementation. While the teachers voiced strong beliefs in not repeating the teaching that they had experienced, the transfer from beliefs and knowledge to actions was inconsistent. The grammar of schooling is pervasive and persuasive (Tyack & Cuban, 1995); despite their lived experiences and growing knowledge base of effective ELL practices, they did not always practice what they valued. While teachers felt

inhibited in their abilities to participate fully when they were ELL students, data collected across all cycles of inquiry indicated that teachers did change some practices due to intentional observation rounds in PAR Cycle Two that supported incremental changes. However, they continued to use traditional practices while engaging ELLs in math problem-solving activities. However, because of district mandates about literacy curriculum, the teachers, both novices, had difficulty juggling the varying demands.

In the CPR group, two of the teachers were English language learners and one was an immigrant; the experiences in schooling of the two English language learners were not entirely positive, but instead of changing practices to respond to more effective ELL practices, at the outset of the PAR, they tended to teach as they were taught. For example, Teacher C said she teaches one of two ways—how she learned or how she was taught. They became aware through conversations in the CPR group how to plan for better instruction and use observational evidence and post-observation conferences to address their use of practices that would ensure equitable instruction for English language learners.

Planning for ELLs

During the implementation stage of the PAR Cycles, participants articulated the importance of ensuring that lessons included strategies that would support scaffolding for ELL students. They understood that planned lessons should consist of activities to help ELLs fully engage and participate in mathematics discourse activities. Planning focused on talk moves, calling on strategies, and analyzing observation data to determine how teachers used selected strategies during instruction.

During early observations, teaching practices were random and unstructured. Teachers organized the classroom in traditional rows and engaged students in whole-group instruction

through questioning. There was no student-to-student engagement through mathematics activities. The only talking students engaged in was when the teacher asked them a question to be answered or if the group answered by coral response. Sharing this information led teachers to reflect on teaching practices and explicitly plan instruction that limited teacher-to-student talk and increased student-to-student talk. According to Teacher A, she did not realize that she was dominating her classroom talk, not giving the students time to think, and not paying attention to the impact of blurting out answers. Teacher-to-student engagement limits students' thinking and follows a common dialogue structure known as the Initiation/Response/ Evaluation (IRE) framework: teachers ask a question, receive a response from an individual student or students, and the teacher evaluates the response (Edmondson & Choudhry, 2018). This teacher-student interaction marginalizes students' opportunities to understand mathematics deeply.

Teachers realized they needed to plan for better questions and calling on students. We used the framework from Project I^4 to ground our discussions (see Figure 10). The teachers did not have any occurrences of authentic student-to-student engagement during the first round of observations. While this talk move seems simple, using the basics of think-pair-share for student interactions requires a reset for teachers and students until they know and are facile with the process. Teachers were interested in understanding how to shift repeating student responses to revoicing to increase dialogue. Teacher B said, "I never knew revoicing was a thing; I just do it [repeating] because I want every student's contribution to be heard, and some students speak soft, and I do not want to make them feel different, so I try to do it for all students." However, the difference between repeating and revoicing is substantial as students do not listen to each other if they know the teacher repeats student responses. On the other hand, if the teacher revoices by

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

Figure 10. Project I^4 academic discourse framework.

paraphrasing a response and using that response to form the next question, students are more likely to engage. If that is coupled with meaningful think time so they can consider responses, which should be longer for ELL students, then they have more opportunities for engagement. Teachers need to create a safe environment for students to share their thinking and for teachers to model the practice (Blanks, 2010). Therefore, our planning focused on moving teachers' participant stance from teacher designed and controlled to teacher-facilitated to student-to-student discourse and responsibility (see Figure 10). In other words, I was interested in moving academic discourse and inquiry teaching and learning from solely teacher controlled to having the students responsible for generating learning through discourse opportunities. However, this shift would require more time and attention.

Classroom Data Supports Teacher Shifts in Practice

As the lead researcher-practitioner, I engaged participants in changing practices through observations and post conversations while including members' beliefs about CLRP to support ELL students. Each member reflected on how they authentically engaged ELLs during mathematic discourse instruction. Table 13 highlights how the teachers changed practices across observations during the observations in PAR Cycle Two – teacher practices increased in areas of more useful practices for equitable discourse and decreased in practices that are not useful for supporting classroom dialogue.

Think Time/Think-Pair-Share. For example, in the first observation for the three teachers, I documented only nine instances of think time. By the third observation with the teachers, they had increased the number of instances for think time to 32. Think time is a fundamental process for supporting equitable student dialogue (Lyman, 2022). This is a valuable talk move as it provides ELLs time to brainstorm, process, formulate ideas, and set the

Table 13

PAR Shifts in Practices

Equitable Discourse Practices	Obs. 1	Obs. 2	Obs. 3	Total
Useful for Promoting Equity				
Think Time	9	18	32	59
Equity Stick/Talking Chips	3	17	45	65
Think Pair Share/Turn and Talk	0	54	25	79
Student Name After Question	15	17	45	77
Not Useful for Promoting Equity				
Teacher Talk	103	70	30	203
Raised hands	63	43	11	117
Cold calls	49	16	2	67
No Think Time	40	33	20	93
Questioning	110	59	30	199
Blurt outs	76	82	20	178
Repeating student comments	10	19	5	34
Student Name Before Question	22	0	0	22
Blurt out Accepted	16	15	9	40
Blurt out Not Accepted	60	67	11	138

expectation that students are required to talk about math (Blanks, 2010; Lyman, 2022). I captured data for think time in two ways: the 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). The teachers asked 199 questions during the three rounds of observations. I noted during the first round of observations that 62 occurrences did not provide think time, and only 9 of the questions specifically included think time. One teacher stated, "wait time was one of those strategies that you have to be explicit about incorporating in your class" because the students have processing time to consider the questions and mentally rehearse (Hammond, 2015).

Adding in the possibility of sharing after think time increases student learning because the student has an opportunity to rehearse a response with a peer. The teachers increased their use of think-pair-share from zero uses in observation 1 to 79 total in the second and third observations They believed and knew this particularly benefitted language learners, and they committed to continuing to use these strategies, but, as noted, when we discussed this immediately after the first observation, they used it intentionally for the second observation, but that diminished during observation three because we did not emphasize it in the post-observation conversation. Thus, teachers need a sustained period of observation and post-observation conversations to ensure that useful practices become a part of their repertoire. Backsliding to the familiar is termed dynamic conservatism (Cuban, 2013). Teachers try something, but do not as easily embed in their teaching repertoires and return to former practices.

Diminishing Blurt-Outs. I observed that the most common form of student response in classrooms was blurting out. Even if students did raise their hands, one or a few students blurted out an answer. Reducing blurt-outs required a shift in teacher practice that would signal a change

for students, but once it is a common practice in the classroom, students do not change easily. Sometimes teachers repeated the blurt-out while other times they ignored them, but in general, the practice disrupted the class dialogue, and only a few students participated.

Blurt-out occurrences increased slightly from 76 in the first-round observations to 82 in the second round. Then they decreased from 82 occurrences in the second round to 49 by the third round. During questioning, teachers allowed students to answer by blurting out, even when they prompted the student to raise their hands. For example, the following sequence is a verbatim scenario from an observation:

Teacher: Raise your hand and wait to be called on before you answer the question

Teacher: What are vertices?

Students: 5 students raise their hands to answer, and one male student starts answering the question before being called on.

Teacher: Corrects the student and accepts the blurt-out, repeating his answer.

The teacher moved on as if the response from one student was evidence that the other students understood vertices, a complex word even in English, as vertices are the plural of vertex, a point where line segments meet. For ELL students in primary grades, the term in Spanish is a cognate vértices. However, understanding such a term requires other strategies for supporting student understanding.

Conversations Promote Change

Coaching conversations explicitly grounded in data that consisted of observation protocols and selective verbatim notes helped teachers decide what to change and how to change. For example, in this interchange between one teacher and me as the observer, the teacher could

see from the data a practice that she recalled from her learning experiences as a student and did not want to continue:

Principal: Hello, Teacher B how are you today?

Teacher: I am good. Excited to talk about the observation data?

Principal: Great, let's look at the data and talk about how you think the lesson went as it related to calling on students to answer questions. We looked at the structure of how she used choral responses for every question asked, meaning that she asked questions and listened for group responses. Then, she began to think out loud and reflect.

Teacher: "This is very low level.

Principal: What do you mean?

Teacher: Well, like it was very basic or traditional.

Principal: What do you mean traditional?

Teacher: It is the way my teachers asked questions and the way I said I would never ask questions.

Principal: Okay, could you determine if each student understood the concepts of 2D and 3D shapes?

Teacher: No.

Principal: How can we restructure the questioning strategies to allow more students to participate in mathematics discourse opportunities and give you valuable student data?

Teacher: I can call on individual students to answer the questions.

Principal: Okay, that is teacher-to-student dialogue opportunities, but how can we move even further, allowing students to discuss math?

Teacher: um, well, I guess by letting students talk to each other.

Principal: How?

Teacher: I could let the students talk together in groups or pairs.

Principal: That will be a good place to start. I will come back and do another observation after you have planned it.

Teacher: Okay, I will see you soon.

During the second round of observations, members decreased choral response occurrences from 123 in the first round to 20 by the second round, a decrease in occurrences. They decreased from 20 occurrences in the second round to five occurrences by the third round. In addition, exchanges began to look more structured during the second and third-round observations. For example, the teacher read the word problem: Amy sees a small garden with six tomato plants, two pepper plants, and three strawberry plants. How many plants are in the garden?

Teacher: Before we begin working towards the answer, take some time and think about the problem. If you need to re-read it, it is in front of you and on the smart board.

Teachers: Gives 10 seconds of think time and pulls an equity stick. All right, are you ready?

Students: All have thumbs up to signal they are ready.

Teacher: How many tomato plants do you see, Amy?

Amy: 6

Teacher: What do we need to know next? Think about it……. The teacher gives 10 seconds of think time and pulls an equity stick. All right, are you ready? Students' hands go up and back down when the equity stick is pulled.

Teacher: What do we need to know next, Isabella?

Student: Peppers.

Teacher: What about peppers, Isabella?

Isabella: That there are 2.

Teacher: Isabella, are you saying we need to know that there are two pepper plants next?

Isabella: Yes, ma'am.

Teacher: Good Isabella, class; the next piece of important information is that there are 6 pepper plants. Ok, class, now how many strawberry plants are there? No think time given.

Students: Choral response 3.

Teacher: Ok, class, now I want you to turn to your talk partner we have been practicing with and build your equation from the information we just pulled out of the word problem.

At this point, all students were paired with peers, and students talked through how to build the equation. The teacher visited each group to listen, offered help, and engaged students in their native languages. While observing, I heard the ELLs speak in their native language with their partners. During the post-conference, I asked the teacher if the ELLs were talking about math, and she said, "yes; since I began pairing and grouping students, I noticed my ELLs speak more, at least in Spanish."

Documenting the finegrain of classroom practice and having conversations with teachers using street data are necessary steps in supporting teacher change. Although we have only scratched the surface of change in these observations and conversations, the data indicate that regular iterative conversations promote teacher shifts in practices. Teachers had strong beliefs and knowledge about equitable practices, but they need support in building these practices into their teaching repertoires. Principals need to follow the advice of Grissom et al. (2021) in which

they identified how effective principals work. School leaders need to intentionally and systematically build these practices into their instructional leader practices: Engage in instructionally focused interactions with teachers using evidence-based observation tools and facilitating productive collaboration and professional learning communities.

Conclusion

In detailing the PAR Cycle Two themes and study findings, I supported claims with evidence to support the theory of action: If the teachers identify equitable mathematics discourse protocols for ELLs, then teachers will be able to implement academic discourse strategies to support ELLs in the mathematics classroom. However, identifying required delving into their lived experiences and discussing their beliefs about teaching math to English language learners. While they could identify the practices they should use, they did not fully implement them. Through this PAR, I created a safe space for collaborative conversations to focus on data collected during observations. During Pre and PAR Cycle One, members collaborated to develop relationships and anchor their practices in their beliefs and knowledge. As a result, they began to incorporate equitable teaching practices to support ELLs' engagement in math discourse opportunities. While members struggled to find momentum in the beginning, they identified and implemented strategies that supported ELLs in math discourse opportunities. However, change in teacher practice requires that school leaders engage in intentional and intensive observation and conversations to support incremental shifts in teacher practice.

In Chapter 7, I discuss the extant literature that supports these findings and describe the implications for practice, policy, and research. Finally, I discuss what I have learned as a school leader.

CHAPTER 7: DISCUSSION AND IMPLICATIONS

In the Participatory Action Research (PAR) study, I aimed to examine the extent to which first-grade teachers could improve equitable academic discourse practices to support English Language Learners (ELLs) in mathematics. I intended to provide a foundation for teachers to address and ameliorate the inequities and disparities for ELLs in math performance. The PAR project and study was predicated on the following theory of action: IF the teachers identify equitable mathematics discourse protocols for ELLs, THEN teachers will be able to design and implement academic discourse strategies to support ELLs in the mathematics classroom.

The theory of action was essential to the school, the population of students, and the district's focus on equity. In Chapter 1, I identified the assets and challenges to focusing on ELLs, mathematics, teaching practices, and equity. However, the national COVID epidemic was a challenge for which we were unprepared. The virtual teaching and learning period was difficult for students, parents, staff, and researchers and influenced our ability to move as quickly as we planned.

I completed the PAR project and study over 18 months and three PAR cycles. In Table 14, I summarize the PAR activities that supported efforts to improve teachers practices for implementing equitable mathematics academic discourse. In the Pre-Cycle, I focused on engaging CPR and CLE members in activities that built trust and encouraged communication and collaboration while building their background knowledge. To comprehend and apply academic discourse strategies to support English Language Learners in mathematics consistently, I engaged the CPR in activities that helped create a safe public space to share and learn and facilitated the professional development activities for the CPR members.

Table 14

Key Activities: Three PAR Cycles of Inquiry

Activities	PAR Pre-Cycle Fall 2021 (Aug-Dec, 2021)	PAR Cycle One Spring 2022 (Jan-Apr, 2022)	PAR Cycle Two Fall 2022 (Aug-Oct, 2022)
Meeting with CPR members (n=9)	***	*****	*
Community Learning Exchange (n=2)	*	*	
Classroom Observations - Formal (n=13)	*	****	********
Coaching Conversations with CPR members (n=8)		****	****
Conversations with ECU Professors (n=12)	****	****	****

During PAR Cycle One, I transitioned from creating a safe space for participants to having authentic conversations. We discussed their knowledge of equitable discourse practices to engage ELLs and improve teaching practices; based on their experiences and their teacher preparation programs, they had sufficient knowledge about what to do. The issue was implementing what they believed and knew. They agreed to use an observation tool to collect evidence about equitable instructional practices in their classroom and have conversations with me as the school leader. Additionally, in CPR and CLE meetings, participants discussed how their experiences and beliefs about math discourse influenced teaching and instructional practices that support ELLs. We concluded PAR Cycle One with a plan for observing teachers in action.

In PAR Cycle Two, I collected data through observations, data dives, and reflections. This round began in August 2022 and ended in October 2022 with a culminating CPR meeting. During this cycle of inquiry, participants connected culturally and linguistically responsive instruction with influences on math teaching and instructional practices that drew on the teachers' current funds of knowledge and fortified their knowledge and skill about ELL practices.

In discussing an overview of the PAR project, I connect the findings to the extant literature. Then, I share conclusions to connect the findings to the research questions and offer a framework for implementing equitable discourse strategies to change teacher practices in supporting English Language Learners (ELLs) 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 in relation to the literature, I review sources from the original literature and new sources that provided more understanding of the themes and findings. Then I respond to the research questions. To reiterate, the PAR findings are:

1. Teachers have lived experiences, beliefs, and knowledge of practices about effectively engaging ELLs in equitable mathematics discourse opportunities that influence teaching; and
2. Teachers need consistent support to incrementally transfer their lived experiences and beliefs to classroom instructional practices.

After I connect the findings with the existing body of literature, I propose a framework for change that consists of five key components to change mathematical teaching practices, impacting English Language Learners one classroom at a time.

Teachers Lived Experiences, Beliefs, and Knowledge

Throughout three iterative cycles of inquiry, members engaged in CPR collaboration that supported their individual and collective experiences, beliefs, and teaching practices for engaging ELLs in equitable mathematics discourse practices. In the case of this project and study, the teachers were English language learners as students, therefore, I consider teachers' funds of knowledge as an important part of the findings. In this case, teachers' lived experiences, beliefs, cultural practices, and knowledge comprise their funds of knowledge (Moll et al., 1992).

The concept of funds of knowledge is founded on the straightforward tenet that people are competent, possess information, and have acquired that knowledge via their experiences in life (Gonzalez et al., 2005a). As defined by Moll et al. (1992), funds of knowledge are culturally unique bodies of knowledge, which include skills and methods that support household growth,

functioning, and well-being. The skills include ways of thinking, learning, and approaches to learning (Hedges, 2012). In the research, the teacher's learning and approaches to learning were heavily influenced by their experiences in school as bilingual or bicultural learners. Their experiences in habitual institutional patterns of teaching practices influenced their knowledge as their lived experiences in the classroom socialized them to the patterns and routines of from their teachers. Certain patterns and practices were engrained and difficult to undo -- how they were called on to answer questions, how the teachers did not actually provide much thinking time for them to process when asked a question, or how the classroom was set up in traditional patterns that did not encourage collaboration or student discourse opportunities. These ineffective strategies became routine and part of their FOK and inhibited their use of the ways they felt as learners during learning. Emerging during the first two cycles of inquiry, the teacher's actions revealed that they often engaged with their ELL students in the same traditional ways they had experiences as students despite their beliefs in different and more effective ways of teaching and learning. The research posits funds of knowledge as positive cultural elements, and those funds of knowledge should be a part of classrooms. However, for teachers, the knowledge and skills they develop through participation in K-16 schooling is often deeply engrained, and they practice as teachers as they were taught, instead of what they know, even from their experiences, might be more effective for students.

The evidence is clear that teachers' experiences as ELL math students shaped their beliefs and knowledge about structuring learning for students in mathematics. The National Council of Teachers of Mathematics (2014) confirms that teachers' views and perceptions about teaching mathematics influence their teaching. As I determined through CPR meetings, observations, conversations, and reflections, the CPRs' beliefs and knowledge about how they should teach

exemplified what they gained from their experiences and what they knew. By tapping into the participants' native and indigenous knowledge (Benham, 2002), teachers revealed their strong beliefs about providing opportunities in the classroom:

1. ELL students should have the opportunity to engage in discussing math.
2. ELL students should have the opportunity to explain and justify.
3. Teachers should incorporate think-pair share, think time, questioning, small groups, partners, and question stems.
4. Teachers should allow ELLs to use their native language in classrooms.

CPR members' beliefs and experiences about effectively engaging ELLs were apparent in the Pre-Cycle and continued throughout the study. For example, the participants' journey line activity clearly showed what they believed to be effective for them as ELLs. They noted these strategies as necessary -- student participation and discourse by using "role play with word problems to relate content to real life", "providing talking stems for supports", and "supporting students with pairs or small groups." Teacher A noted that she learned more math at a young age when she connected cooking with her family to math content. They brought ecologies of knowing with them as immigrants and English language learners (Guajardo et al., 2016), but they may have experienced a secondary level of oppression themselves as English language learners and immigrants in a school in which their cultural experiences were not fully valued. Thus, they adapted to the institutional pressures and, despite what they may know or believe, they did not feel they could act on what they knew and believed.

They had experienced many years of schooling in environments that did not respect their learning or funds of knowledge. Math became a chore for each of the teachers, and they reported that, after fourth grade, they lost interest and teachers ignored them if they were quiet. Thus, the

beliefs and knowledge they had were often confounded by their experiences as math students in which traditional classroom structures predominated. They could state definitively that they believed in the opportunity for all students and were particularly interested in ensuring that English language learners had access and rigor (Boykin & Bailey, 2000). However, their experiences seemed to determine why they returned to the unproductive teaching practices – what Cuban (2021) terms dynamic conservatism meaning that teachers act differently temporarily, but in large part return to traditional practices despite what they believe or know.

During CLE activities, I recognized the differences in the community of people (Benham, 2002), their beliefs, and experiences. The CPR members' beliefs, experiences, and knowledge were grounded in a combination of honoring what they learned from their native cultural experiences and what they learned from the culture of the American system of education. The grammar of schooling – meaning the way we have organized classrooms physically and pedagogically – is strong; giving up desks in rows and changing to teacher-facilitated dialogue is a complex change for many teachers, and the teachers in this study were two novice teachers and one teacher from another country with traditional systems (Cuban, 2013; Tredway et al., 2019; Tyack & Cuban, 1995) Although they were aware of the pedagogical strategies that might increase student dialogue, they did not often use them. As we progressed through PAR Cycles One and Two, enacting their beliefs and knowledge followed an uneven pattern. Often they tried to enact what we discussed in post-observation conversations, and, at other times, they reverted to more traditional practices.

In addition, during the last cycle of inquiry, all teachers in the school were mandated to engage in professional learning for a new literacy curriculum, which was a contextual factor that inhibited their progress in math. The professional learning environment for the literacy

curriculum followed traditional patterns of telling and not discussin, without opportunities for making meaning, which simply reinforced pedagogy that was not productive for the teachers or as a model for what they should be doing to support English language learners.Not only did the pedagogy run counter to what they believed and knew to be best practices, all of the professional learning time was devoted to the new literacy curriculum, which compromised their ability to concentrate on math in their classrooms and exacerbated what we were trying to accomplish. Thus, meso and macro factors can undermine the local school initiatives, leader availability to promote implementation dips in the previous areas in which they were working, and confuses teachers as to what is best practice (Fullan, 2002).

Institutional habits can be labor-saving methods that help systematize difficult tasks; however, educators and students who have become accustomed to certain routines find adjustments challenging (Tyack & Cuban, 1995). Even with changes in teacher demography and preparation, the emergence of hybrids in classroom teaching, the decided tilt toward teacher-centered instruction rather than student-centered instruction, remains (Cuban, 2021). Unfortunately, the daily teaching practices in schools and external pressures, such as societal norms and cultural beliefs, solidify teachers' experiences and as ELL learners themselves, they did not fully rely on their funds of knowledge, which 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 they respond as teachers and show up in their classrooms and their knowledge and skill for implementing Culturally and Linguistically Responsive Pedagogy (CLRP).

First, the CPR members were ELLs as students and had substantial experiences with the teaching practices that did not include culturally and linguistically responsive teaching (Tredway,

et al., 2019). As a result, they felt strongly that they did not want to repeat those practices. During the meetings, they discussed how they could better incorporate the essential aspects of CLRP in classroom instruction to support equitable teaching practices. However committed they were, members found it difficult to transition due to the durability of the "standard grammar of schooling" deeply rooted in the political agendas and state and local mandates (Bolman & Deal, 2009; Tyack & Cuban, 1995). They continued to revert to the teaching habits they were familiar with as ELLs themselves; termed isomorphism in the organizational theory literature, they did not fully have the capacity to shift their learned habits to their beliefs about how to teach (DiMaggio & Powell, 1983). Instead, they morph or return to familiar routines, long engrained from their own schooling – hand-raising, for example, as the primary student discourse model, but widely known to be ineffective (NCTM, 2014). They viewed their experiences of being taught in traditional rows, lectures, and drill-and-kill methods as ineffective. However, during initial observations, I noted that teachers' classroom environments were organized in traditional rows with only teacher-to-student engagement. Even though the classroom environment was well-organized, even the organization of the classroom supported a teacher-generated stance, which stifled students' ability to share ideas, clarify understanding, construct convincing arguments, and develop language (NCTM, 2014; Tredway et al., 2019). The instructional practices noted were all teacher-led and provided no effective student engagement, which was limited to answering questions when asked. They used random or whole-group responses. While these practices may have a place in teaching, overall, they inhibited the implementation of effective instructional practices and became the teacher's go-to – perhaps because of familiarity and comfort. While their experiences as students were helpful in pointing out what to do, their

practices hindered the implementation of effective students' access to mathematics content (NCTM, 2014; Ralabate & Nelson, 2017).

CPR members assumed their strong beliefs and knowledge would automatically transfer into culturally and linguistically responsive teaching practices that support math discourse. However, the evidence suggested that the teachers needed support from school leaders and professional development and practice to understand and implement equitable discourse practices in mathematics fully.

Leadership Support for Shifting Classroom Practices.

Institutional norms, in addition to their experiences as students, deeply influenced their teaching behaviors. Their beliefs about how they should teach ELLs did not change and provided an asset and an anchor for conversations about changing practices. With consistent principal support through affirming their beliefs, professional development, observations, CPR and CLE collaborations, and equitable discourse strategies, CPR members were able to make incremental changes in planning and implementing ELL participation in math discourse opportunities and turn their beliefs into actions.

This finding supports and provides insight into Cuban's (2013) query: Do teachers choose how to teach or are they driven by their beliefs and values? Do they teach the way they were taught or can they teach differently? This study added to his body of work and supports a way to support teachers. The teachers had strong beliefs and values about how they wanted to teach; however, deep-rooted habitual institutional practices inhibited the consistent implementation of changed practices, in this case, equitable discourse practices in math classrooms. I observed teachers in their classrooms and had conversations with them about their practices; I did not give them feedback or tell them what to do, but based on evidence from the

classroom observations, I guided them to make decisions about what to change. CPR members acknowledged that it was easier to transfer beliefs into practice when supported by the leader. "This [type of] accountability was better than having a PD and then being left to figure it out in the classroom alone." Just as the research acknowledges the role of beliefs and life experiences teachers bring into the classroom, the leader can shape whom they become as teachers by attending to adult learning principles (Drago-Severson, 2009, 2012; Knowles, 1990).

The principal role of the instructional leader was essential to shifting teaching practices – from those practices embedded in the fabric of school through traditions and repetition, the teachers needed to shift toequitable practices that supported students to access culturally responsive instruction. This requires a shift in the principal's role as leaders have often used checklists to observe teaching practices and provide feedback to teachers (Tredway et al., 2019). Instead, the tools I used to collect and analyze classroom data fostered more effective observations and post-observation conversations about teaching practices to support change (Tredway et al., 2019).

Based on the observations, teachers observed that their initial practices did not provide equity in supporting students to respond to questions and participate in classroom discussions or question-answer segments. When we analyzed the data more closely, we found that the students who always blurted were white males, usually considered the top students. Questioning practices were a contributing factor to how teachers engaged students. They only called on students to answer questions who raised their hands, who were largely the same students. When teachers acknowledged that students disengaged from the lessons, they determined the inequities in their classrooms and generated ideas and made decisions about what to change so they could elicit more equitable calling-on and more student-to-student engagement. With my support, they

planned lessons that included talk moves and calling-on strategies to support equitable practices during instruction. As a result, teachers' classroom environments reorganized desks in rows so students could talk collaboratively. Teachers made progress, but at times the progress was inconsistent, which required iterative observations and conversations to support them to shift the engrained habits.

Dewey (1938) argued that learning is a social activity and should be based on reciprocity and continuity. We established reciprocity through the iterative conversations and continuity through consistent observations and using the evidence from observations to make small changes. The community learning exchange axiom, which states that "learning and leadership are dynamic social processes" (Guajardo et al., 2016, p. 30) supports Dewey's theory of learning. With an emphasis on CLRP and guiding principles, we steadily co-generated knowledge and processes over the 18 months. Participants collaborated, and I supported changes in teaching practices through structured CPR and CLE meetings, coaching conversations, observations, and feedback.

These iterative small cycles of inquiry with pragmatic data were the source of change, referred to as street data by Safir and Dugan (2021). In these teacher circles, we can institutionalize change over time with consistent and iterative observations and conversations between the leader and teacher, promoting a recommendation of the Grissom et al. (2021a) meta-study on effective school leadership: Engage in instructional focused interactions with teachers by coaching and developing a data-driven school-wide instructional program.

Framework for Change

As a result of this PAR project and study, I developed a framework for supporting teachers' implementation of equitable academic discourse protocols and practice changes. Based

on the results of this PAR, the framework for changing teaching practice is shown in Figure 11. To address teacher practice and promote equal academic discourse, we engaged in focused learning. In this instance, equitable mathematics academic classroom practices were the main focus.

As an equity leader, I used improvement science, 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). The first goal was to provide support in uncovering teachers' funds of knowledge (Moll et al., 1992). Understanding how their experiences could connect to their teaching practices provided an anchor as a collaborative team to draw on assets, diagnose, and co-design a support system (Spillane, 2013). Furthermore, encouraging transfer to classroom practice required incremental support to teachers through data-driven observations and post-observation discussions (Grissom et al., 2021). I concentrated on equitable practices, trust, teacher learning, and reflection as a leader who wanted to create culturally responsive first-grade teachers. The observational data helped CPR members to see their practices more clearly and decide to use more equitable practices and modify their calling-on and 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 improve instruction, another of the Grissom et al. (2021) recommendations.

The instructional leader is the linchpin of providing direction and facilitation for teacher change. Leadership is a social process based in community (Drago-Severson, 2012) in which the leader should guide reflection and facilitate and model dialogue and practices that teachers can use in classrooms. The framework takes advantage of being grounded in interactions of the CPR

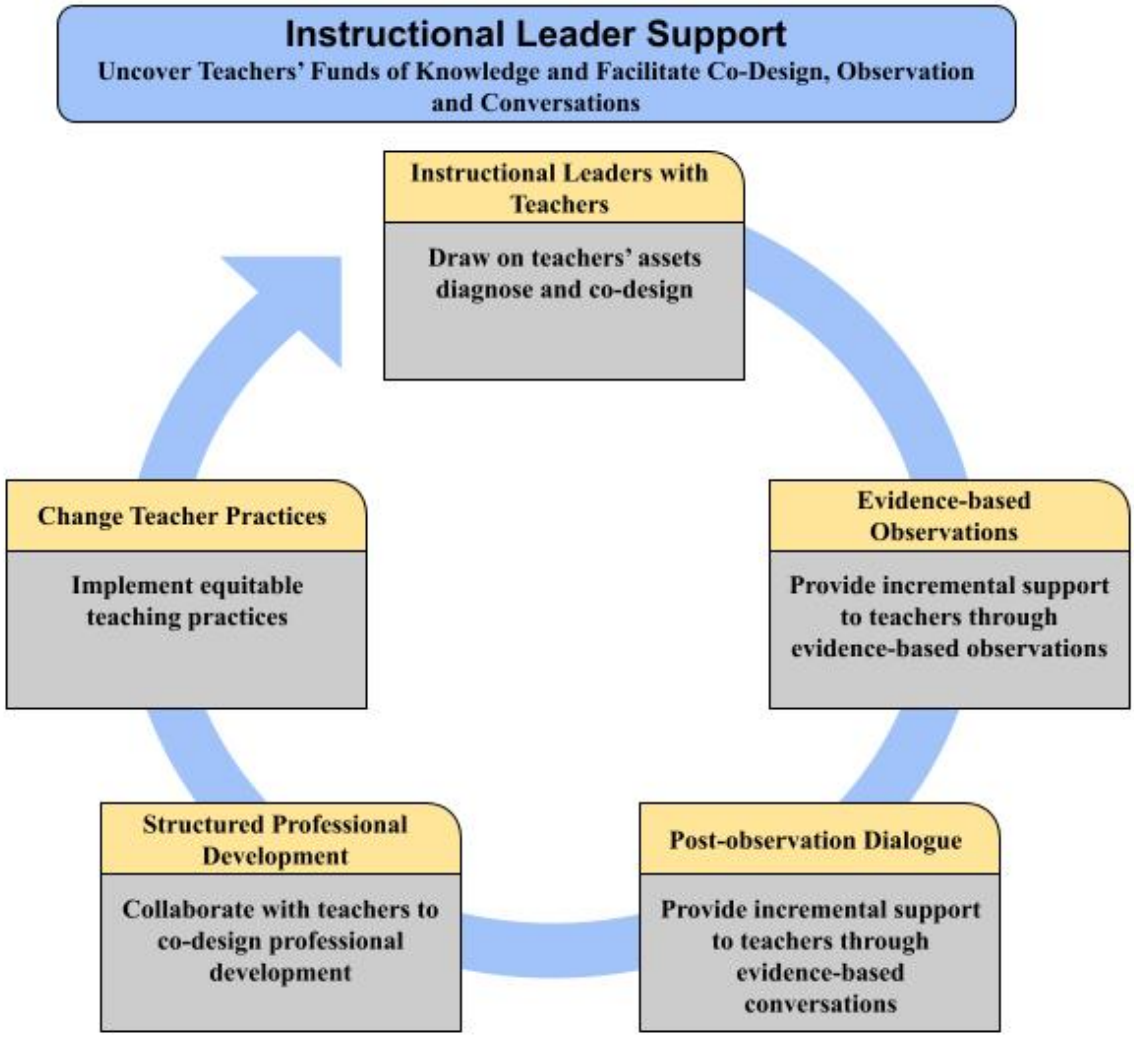


Figure 11. Framework for change.

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 catalyst. The post-observation conversations support the leader and the teacher to analyze and reflect on the data to determine the assets and challenges of teaching practices.

Review of Research Questions

The overarching question guiding this study was: What fosters and inhibits the classroom implementation of academic discourse structures for engaging English Language Learners? The three sub-questions were:

1. To what extent did teachers funds of knowledge transfer to their teaching practices?
2. To what extent do teachers design and implement equitable discourse practices for engaging English Language Learners?
3. To what extent does engaging and supporting teachers in equitable mathematics discourse strategies affect my role as an instructional leader?

Over 18 months, as the co-practitioner researchers (CPR) and I met and engaged in professional learning, we used Principles to Action: Ensuring Mathematical Success for All from the National Council of Teachers of Mathematics (2014) as an anchor text. In our learning community, CPR members reflected on practices and research. I facilitated the Professional Development (PD) through cycles of inquiry using the PDSA improvement science (Bryk et al., 2015). I supported the professional learning with coaching conversations and reflective memos to create understanding and generate meaning regarding culturally and linguistically responsive strategies to support academic discourse in mathematics. In the regular CPR meetings, I facilitated by establishing gracious space, cultivating relationships, and reflecting on teaching practices. As a

result, we improved practices by implementing academic discourse focused on equity. Through observations, conversations, and reflective practices, we created a common meaning and understanding of equitable mathematics academic discourse and how to implement practices in the classroom.

Secondly, how teachers' beliefs and experiences affect the implementation of equitable teaching practices adds to Cuban's (2021) work on school reform; he observes that too frequently, efforts are made to advance what teaching should be without first fully comprehending how instructors already teach and have been teaching. We have found that teachers' exposure to the habitual nature of schooling and their experiences combined with funds of knowledge as ELLs directly influence how they teach in their classrooms. These teaching practices are usually traditional methods and those they were exposed to as ELLs, such as teacher centered instruction. These exposures, interactions, and 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 among learners, their environment, and their behaviors. In this study, participants were shaped by the environment, and they engaged as active participants and agents of change. And, they needed the consistent support of the instructional leader to maintain their forward progress.

Implications

The findings and conclusions are specific to the context of RES Elementary School, a rural Title I district in the coastal plains of North Carolina. However, the study may offer implications for other districts, educators, policymakers, and researchers in similar areas. In three areas, this study has specific implications for instructional practices: teachers' equitable discourse practices for ELLs and the school leader's role. Secondly, the study has implications

for policy. Finally, more research on the connection between teachers lived experiences and how they teach is necessary.

Practice

The PAR findings highlight promising implications for practice for teachers and principals. The findings emphasize teaching strategies and the leader's role. The CPR members' abilities and knowledge of equitable discourse practices to address ELL conceptual mathematics knowledge and involvement in math discourse opportunities have improved due to their participation in this PAR. By anchoring the conversations in what the teachers knew to be best practices based on their experiences as ELL learners, they could see the disconnect between their beliefs and their ELL practices. As a result, they began to restructure the classroom environment to be more conducive to student-to-student interactions. However, many obstacles challenged this improvement, and teachers were not always able to maintain consistency in implementation.

Thus, the school leader's role is significant as the leader must maintain a practice of iterative observations and conversation that helped teachers as they transferred 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 change in teacher practices that leaders and teachers can adapt to their school and district levels. The findings demonstrate that teachers have experiences and knowledge about practices that they do not fully implement. The improvements in practice are a result of the consistent involvement of the instructional leader in the following areas: drawing out teacher funds of knowledge and experiences as an anchor for change, data-driven observational practices, frequent collaborative conversations, and facilitated professional learning. The framework with the four components to changing mathematics teaching practices

could impact teaching practices. In particular, the use of evidence-based observations, post-observation dialogue that includes leader coaching and guidance coupled with teacher decisions, and structured professional development is critical.

Policy

The PAR was designed to address a specific equity challenge. The lack of opportunities for ELL students to engage in equitable mathematics discourse was identified at the national and local levels. The CPR members named a meso-level policy that hindered equitable teaching practices, which was the instructional pacing required by the district. These pacing practices are inequitable when comparing the processes ELLs need to acquire, understand, and speak another language. In addition to learning language requirements, students must learn social and academic language and the language of schooling. The narrow lens used to design pacing guides does not consider different cultures moving into the schools, the level of preparation that teachers need to engage ELL students effectively, or the time students need to become proficient enough to engage in academic conversations in math.

Secondly, while teachers are often told to differentiate for students' needs, teachers do not automatically know and understand how to do this. Differentiation is a task that requires a deep understanding of what a specific group of students needs and advocates who are willing to learn and grow in the practice to engage ELL students effectively. ELLs receive information in one language, translate it to another language for understanding and translate it back to construct a coherent, meaningful answer. District policy decisions do not always take these factors into account when designing policy or districtwide professional learning.

When I began my study in 2020, CLE members identified one macro-level challenge: no state requirements for aligning regular ed teachers' and ELL curricula. However, on "March 4,

2021, the North Carolina Department of Public Instruction approved the English Language Development (ELD) standards as the ELD Standard Course of Study for implementation in the 2022-2023 school year" (NCDPI, n.d., p. 1). With this change and adoption, Dolphin County Schools began training all teachers on the ELD Standard Course of Study. Similar to the common core academic standards adopted years ago, the training is designed to be implemented in stages to ensure teachers know what the standards are asking and how to use the tools provided effectively. With this adoption and implementation, the challenge that the teachers listed as micro-level can be partially addressed.

As researchers and practitioners continue to investigate how best to teach students who have more than one language in their repertoire, they are moving away from referring to ELL (English language learners) or bilingual to using the term multilingual. The term infers that all languages are assets to student learning. Too often, we have referenced English language learners with deficit language and isolated students who are learning a language when our work should have been more inclusive (Valdés, 2020). Instead, we need to support the assets that multilingual learning brings to all learners -- the creation and appreciation of cultural awareness, adding academic and educational value, and appreciation of local languages (Okal, 2014), including in our case and in many schools in North Carolina-- African-American vernacular and Spanish as a *lingua franca.* English has become the lingua franca worldwide, but, at times, theusage is colonial and hegemonic.

Research

As a result of the PAR study, I introduced practitioners to a hands-on approach to making decisions and improving teachers' implementation practices. I engaged participants in Community Learning Exchange 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 community learning exchange 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 using a school-based project with a small group of teachers. A participatory action research approach that uses iterative evidence to make decisions can help practitioners gather and analyze data to make decisions and improve school and district circumstances. We can act as activist researchers committed to including others to solve challenges with equitable academic discourse for ELLs at the school level by engaging in inquiry cycles focusing on observation data and reflecting on data to determine instructional next steps (Hale, 2017). For this type of research to inform instructional approaches, more school level research by practitioners who are closest to the work is necessary.

A second research recommendation would be to look more closely at the relationship between how multilingual teachers' funds of knowledge from their educational experiences as ELLs are ingrained in teaching practices. There are multiple studies on students' funds of knowledge and their importance in the educational setting however, we need more on systems of education influence on multilingual teachers' funds of knowledge and how it transfers into teaching practices. Some additional research questions that I would offer to future researchers as a result of this study include:

1. How can educators support and encourage the use of native language as a common practice for multilingual learners?
2. How can teachers capitalize on students' funds of knowledge for improving student engagement?
3. How could changing the state-mandated observation tool result in more equitable teaching and learning practices?

Limitations

Several limitations had an impact on the study. First, I acted as both the lead researcher in the study and the co-practitioners' supervisor in my capacity as the principal and instructional leader of the school where this research was conducted. The national COVID pandemic created an unprecedented challenge for this research study. Faced with the nuances of virtual learning and the restrictions on gatherings, I had difficulty in observing and conducting CPR and CLE meetings effectively. A second limitation was the size of the study. I focused on the practices of three bilingual first-grade teachers whose classrooms were majority ELLs. Thus, the findings are not specifically replicable. However, the processes we used in the study would be useful to other school leaders and teachers in changing their practices.

Finally, outside and district decisions interrupted what was happening in the school. For example, first, the focus of LETRS mandates and its implementation took precedence over the scheduled time for CPR and CLE meetings. Second, one of the teachers on participating in the research was not allowed to return due to the contractual obligations between the district and the teaching agency. Finally, the decision that was made to move the principal to another position in the district contributed to the changes in implementation practices. Due to the meso and macro challenges, I could not facilitate an important part of the research in which teachers could

observe one another, use the tools in practice, and have conversations after each observation. Decision-makers at the the meso and macro levels often interrupt local efforts to change practices despite their usefulness. State or local LEAs do not contact or confer wih the school or the teachers to make decisions that affect them (Grubb & Tredway, 2010). They do not trust the CLE axiom that the people closest to the work must be a part of decisions and solutions that affect them.

Leadership Development

Only principals who are equipped to handle a complex, rapidly changing environment can implement the reforms that lead to sustained improvement in student achievement" (Fullan, 2002).

Reflecting on my leadership growth, I return to the Summer of 2019 when I became a part of the Project I^4 Cohort and learned about the CLE axioms (Guajardo et al., 2016). The CLE axioms provided a foundation for my understanding as I embedded them in the PAR work. I understood how maximizing my leadership and interacting with teachers relied on living the axioms as a foundation of my leadership work. I learned to enact the axioms in new ways.

Over the course of this participatory action research project, I examined my role as a practitioner-researcher and instructional leader. 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 this research as an experienced Instructional Coach who understands the principles of providing adult professional development. While these were both assets to the research, they did not prepare me for the authentic, collaborative process I experienced or my personal and professional growth. The PAR taught me that being a leader is not a position to hold; rather leadership is a place to come from by meeting people at their readiness levels and providing the tools and support to stretch their ideas, strengths, weaknesses, and dreams. We often overlook

the adult zone of proximal development – their readiness is fundamental to change (Drago-Severson, 2012; Vygotsky, 1978).

The PAR taught me to collaborate with those close to the problem, ask tough questions, and co-construct solutions. Letting those who believe in 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 work and believed in supporting the ELL students in mathematics discourse, I quickly learned that beliefs do not equate to change in practices. Relying on Community Learning Exchange axioms, I built pedagogically rooted relationships, allowing for collaboration. This type of collaboration took time. 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 still nervous and afraid that I was looking for a specific answer or that this process could be evaluative.

Over the 18 months, I intentionally opened each meeting with a Dynamic Mindfulness (DM) session. The members began to expect it as time passed and welcomed the practice. I noticed that over time, I did less talking and more listening and note-taking and acted as a facilitator of learning, modeling exactly what teachers should do in the classroom. This was a major shift in my leadership because I am used to doing the talking and fixing. However, as the participants still looked to me for reassurance, I realized I needed to ensure they saw me as 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 could ask better-clarifying questions leading the CPR and CLE members into deeper discussions. As a

practitioner, I was guided by data than individual thoughts, community and district pressures, or perceptions.

Through this PAR process, I have found my voice as a leader who happens to be a woman of color. Unfortunately, in education, I am seen as a woman of color first and a leader second. I realized I had been a distracted leader, letting the small, managerial things pull me away from being a true change agent and equity warrior. This journey taught me that, although we could know the research behind teaching practices and we could effectively identify these practices, implementing new ideas and changing practices is still difficult. With all the changes made during the last PAR cycle, I realized I had been a silent leader. During this research, I became more vocal and forthcoming about my leadership values and what is best for the school community.

Looking back at my leadership preparation, I have realized that most of it was in theory and surface-level training. Learning leadership in a classroom is far different from educational 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 address the fact that a true leader in education will not let policy, resources, power, or partnerships determine what is best for students, no matter the language, color, or ethnicity.

Being a Black woman in leadership has been challenging, to say the least. I have to fight differently, or as Mitchell (2018) describes as a warrior, "one who sacrifices himself for the good of others" (p. 152), or tread lightly, so I do not get labeled an angry black woman. As a Black woman in a male-dominated career, I often felt my voice was never heard. My ideas and goals were never good enough until a male colleague repeated them. I have learned that my thoughts, ideas, and opinions matter. I have learned that I do not fight for the sake of fighting—I 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. I am "strong, balanced, and unafraid" (Mitchell, 2018, p. 153). I am an equity warrior, and it is for them I fight.

Conclusion

As an instructional leader, I have learned to reflect critically on my why. Why is my fight for equity important, and who is it for? Growing up, I was always the underdog and felt out of place. I did not fit in with any particular group and was unsure about my purpose. I was sure of one thing. I was sure I would work in education and be an equity warrior for students of color. This is my why! My fight began as a teacher influencing young minds and continued as principal influencing teachers. Reflecting on continuing to provide students of color with the same opportunities for access led me back to changing teachers' practices by improving equitable instructional practices one classroom at a time.

During this journey, I was able to collaborate with teachers to build on the assets of the team. Through collaboration, mindfulness, and personal narratives, we learned to trust one another and our collective knowledge. By truly understanding the problems we seek to address, we can change how teachers plan and implement equitable discourse practices for ELLs. With this change, we understand that language should not be a hurdle, and we must improve equitable instructional practices one classroom at a time.

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APPENDIX A: IRB CERTIFICATE

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: Robbin Cooper
CC: Matthew Militello

Date: 11/9/2021
Re: UMCIRB 21-001669
LANGUAGE IS NOT MY HURDLE

I am pleased to inform you that your research submission has been certified as exempt on 11/5/2021. 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 C(0.01)	Consent Forms
APPENDIX C CONCENT FORM CPR GROUP ADULTS.docx(0.01)	Consent Forms
APPENDIX I.docx(0.01)	Interview/Focus Group Scripts/Questions
APPENDIX K.docx(0.01)	Surveys and Questionnaires
Cooper_Dissertation ch1-3.docx(0.01)	Study Protocol or Grant Application
ELL Observation Protocal(0.01)	Data Collection Sheet
Email script.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 elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

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

APPENDIX B: CITI CERTIFICATE

CITI PROGRAM

Completion Date 03-Jan-2021
Expiration Date 03-Jan-2024
Record ID 40005750

This is to certify that:

Robbin Cooper

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Human Research
(Curriculum Group)
Group 2.Social / Behavioral Research Investigators and Key Personnel
(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/?w7156eac2-1d0f-4473-ba68-d96922500d25-40005750

APPENDIX C: 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: Language is not my Hurdle: Improving Equitable Instructional Practices One Classroom at a Time.
Principal Investigator: Robbin Cooper
Institution, Department or Division: East Carolina University, Department of Educational Leadership
Address: 1329 Brooks Quinn Rd, Rose Hill, NC 28458
Telephone #: 910-289-3667
Study Coordinator;
Telephone #

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 how first-grade teachers use of discourse strategies supports engaging English Language Learners in mathematics. You are being invited to take part in this research because you are a first-grade math teacher. The decision to take part in this research is yours to make. We hope to learn, "What fosters and inhibits the classroom implementation of academic discourse structures for engaging English Language Learners?"

If you volunteer to participate in this research, you will be one of about ten 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?

APPENDIX D: DISTRICT APPROVAL LETTER

Duplin County Schools

July 19, 2021

Board Members:

Brent Davis,
Chairman

Reggie Kenan,
Vice-Chairman

Pam Edwards

David Jones

Claudius Morrisey

To Whom It May Concern:

Duplin County Schools recognizes the benefits of participating in relevant, well-designed research studies proposed by qualified individuals. Approval for conducting such studies is based primarily on the extent to which substantial benefits can be shown for Duplin County Schools and its mission of educating students. The purpose of this letter is to notify you of the approval to use conduct your dissertation study titled, "Language is not my Hurdle: Improving Equitable Instructional Practices One Classroom at a Time" with participants in our schools. We also give permission to utilize the following spaces at Rose Hill-Magnolia Elementary school to collect data and conduct interviews for this dissertation project: The first-grade classrooms, media center, and principal's office.

The project meets all of our school/district guidelines, procedures, and safeguards for conducting research on our campus. Moreover, there is ample space for Mrs. Robbin Cooper to conduct her study and this project will not interfere with any functions of Rose Hill Magnolia Elementary School. Finally, the following conditions must be met, as agreed upon by the researchers and Duplin County Schools:

- Participant data only includes information captured from local and state data collection strategies and, participatory action research processes associated with the study.
- Participation is voluntary.
- Participants can choose to leave the study without penalty at any time.
- Any issues with participation in the study are reported to the school administration in a timely manner.
- An executive summary of your findings is shared with the school administration once the study is complete.

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In addition to these conditions, the study must follow all of the East Carolina University IRB guidelines.

We are excited to support this important work.

Respectfully,

Daren Tyndall
Assistant Superintendent of Human Resources
Duplin County Schools

APPENDIX E: DATA COLLECTION INSTRUMENT - OBSERVATIONS

Effective Practices for Observing English-Language Learning

The list contains codes for observation practices for ELL classrooms.

Abbreviation	Full Code	Tally
TTa: I	Teacher Talk: Idiom	
TTa: V	Teacher Talk: Vocabulary	
TTa:CL	Teacher Talk: Content language	
TTa:P	Teacher Talk: Pace (slows down pacing)	
TTa:Cog	Teacher Talk: Cognates	
STa:FS	Student Talk: Full Sentence	
STa: SV	Student Talk: Subvocalizing	
TT	Think Time	
NTT	No Think Time	
TPS	Think Pair Share	
SF:TL	Scaffolding: Translanguaging	
SF:PK	Scaffolding: Prior Knowledge	
SF:MR	SF: Multiple Representations	
SLP	Structured Language Practices Use abbreviations for naming	

Teacher Talk (TTa)

Be sure to be careful about time as a key variable in observing for ELL accommodations and modifications is the amount of time students have to produce language. Time code the observation to be able to get close to the ration of teacher talk: student talk. Often, the teacher talks too much or too quickly. Teacher example is necessary, but student talk is critical. Pace of teacher talk is difficult to put in selective verbatim, but the pace, tone, and nonverbals are all critical components of supporting students who are ELL to be less anxious.

1. Idiom or expression (**TTa:I)** – teacher may use an unfamiliar idiom or expression

2. Vocabulary / choice of words (**TTa:V)**
3. Content language embedded in instruction and is repeated and explained **(TTa:CL)**
4. Pace of teacher talk **(TTa:P)**
5. Use of cognates to support language development (A cognate is a word that is quite similar in English and another language; this applies well to romance languages, but not well to Arabic, however) **(TTa-:Cog)**

Student Talk (STa)

The teacher supports **full sentence** output and students forming questions for each other (**STa:FS**) The teacher encourages that all students help each other (see scaffolding of concepts by translanguaging below). The teacher supports **sub-vocalizing** key words **(STa:SV)**

Wait Time/Think Time (TT + number of seconds or NTT= no think time)

WT/TT should increase in ELL classrooms so that students have more processing time, even for less complex questions. The typical WT/TT is 3 seconds for recall and up to 10 seconds for higher cognitive questions. Increase by 2-3 seconds for ELL use.

Think Pair Share (TPS)

Use of TPS supports students to produce language. The teacher can use TPS to have immediate feedback on student understanding by listening to pairs after posing a question.

Scaffolding (SF)

Often translating concepts or key ideas into the students' home languages is a scaffolding support for ensuring understand (aka **translanguaging SF: TL).** Letting students translate for each other so there is understanding of concepts is often critical for full comprehension. As well, the teacher's familiarity with the students' cultures, history, and is critical. The teacher builds on students' **prior knowledge** (not of the current content , but using analogous experiences or examples that could promote understanding. Scaffolding includes using the **multiple representations** of Bruner: kinesthetic, visual, and oral or written language.

Structured language practices (SLP)

Structured Talk Protocols and Collaborative Structures (click on this reference to see multiple examples)

https://www.scoe.org/files/el14-structured-student-talk-handout.pdf

Ex. Lines, of comm., number heads, gallery walks, jigsaws, etc.

A number of specific practices can help all students to comprehend and engage, and these are necessary for effective ELL instruction. These can be called structured language practices or these might be termed something else in your school or district. Use these terms in the selective verbatim script to describe what the teacher is doing. Some are part of the lesson and others are a part of the teaching environment.

a. Graphic organizers (SLP: GO)
b. Realia (manipulatives, visuals, objects) (R)
c. Frontloading vocabulary (F)
d. Sentence frames (SF)
e. Print rich environments (word banks, walls)
f. Choral responses or call and response (C&R)
g. Equity Stick/Talking Chips (ES)
h. Lines of Communication (LC)
i. Give one, get one (GOGO)
j. Role play (RP)
k. Clock Partners (CP)
l. Agree/Disagree (A/D)

Classroom Observation Form

Utilize the chart to take selective verbatim notes. It is important to note the time of all notes. After the observation, analyze the selective verbatim notes and create initial codes.

Time	Selective Verbatim	Code

APPENDIX F: DATA COLLECTION INSTRUMENT - QUESTION FORM

Question Form Protocol

The tool is designed to collect basic information for the teacher to record question forms. 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's 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 INSTURUMENT – CALLING ON

Observation Tool Calling-On Tool 1

<u>Type One of Calling On: Make a seating chart</u>.

Using a seating chart to determine equitable calling on is critical. Too often, some students are 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 (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	St 2 (M/L) /B-I/TR
St 3 (F/W) /R/R/R/R/R	St 4 (M/AsA) /R/TR
St 5 (M/L)	St 6 (F/L)

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

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.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								
13.								
14.								
15.								

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 H: DATA COLLECTION INSTRUMENT - CONVERSATIONS

Post-Observation Conversations Protocol

After a researcher conducts classroom observation, the researcher facilitates a 15-minute post-observation conversation with the teacher. Next, the researcher takes notes on the observation and then codes the post-observation notes using a set of pre-established codes and open coding.

Date of Post-Observation Conversation:

Teacher Identification Code:

Brief Description of Lesson Focus:

TIME	Notes of Conversation	Coding

FOR DATA ANALYSIS

Researcher uses four categories with 23 possible codes for evidence from post-observation conversation. The codes and categories have been validated by calibration by other researchers (Saldaña, 2016; Policy Studies Associates 2020).

Opening and Coaching Stance

1. Greeting
2. Quick turnaround on analyzing evidence
3. Transparency of conversation
4. Collaborative approach
5. Direct informational approach

Processes and Strategies in Conversation

6. Follow-up questions: paraphrasing teacher responses
7. Question form: open-ended and clarifying questions
8. Ratio of talk time (observer: teacher)
9. Redirect to focus on teaching and learning
10. Responding to ideas from teacher
11. Positive feedback on key parts of the lesson
12. Acknowledging tensions of roles; emphasizes support and development role
13. Teacher knowledge: checks teacher knowledge about instructional practices
14. Observer summary: frequently summarizes conversation

Focus on Evidence

15. Opening question: related to equity data
16. Focus on evidence throughout, particularly equity data
17. Teacher has data in advance of conversation
18. Use of tool and factual evidence
19. Next steps teacher-driven & related to evidence and equity focus

Body Language, Tone and Setting

20. Sitting side by side
21. Nonverbals: looking at teacher, nodding, sub-vocal responses (hmm)
22. Asset-based
23. Supportive

APPENDIX I: DATA COLLECTION INSTRUMENT - INTERVIEWS

Promoting Academic Discourse through Implementation of Common Equity-Based Protocols

Individual Interview Protocol

Introduction

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

My name is Robbin Cooper, and my study is participatory action research (PAR). With a team of Co-practicioner researcher (CPR), I will examine What fosters and inhibits the classroom implementation of academic discourse structures for engaging English Language Learners? I hope that this study will show the importance of common instructional practices across all content areas. This study will be used to inform decisions for the entire school.

Disclosures:

- Your participation in the study is voluntary. It is your decision whether or not to participate and you may elect to stop participating in the interview at any time.

- The interview will be digitally recorded to capture a comprehensive record of our conversation. All information collected will be kept confidential. Any information collected during the session that may identify any participant will only be disclosed with your prior permission. A coding system will be used to manage and analyze the interview data with no names or school identifiers associated with any of the recorded discussion.

- The interview will be conducted using a semi-structured and informal format. Several questions will be asked about both the individual knowledge and skills gained and the organization practices used.

- The interview will last approximately one hour.

Interview Questions

TURN RECORDER ON AND STATE THE FOLLOWING:

"This is Robbin Cooper, interviewing _____ on _____ for the common equity-based protocols problem of practice study.

First Round:

1. Can you name 2 or 3 discourse practices that engage English Language Learners?

2. What is your current understanding of instructing ELL's?
3. How does feedback provided from observations affect your practice?
4. How do you plan for teaching ELL students?
5. How are ELL students getting access to rigor in your classroom?
6. How does the support of the instructional leader change how you engage ELL students in equitable mathematics discourse strategies?

Second Round:

1. Can you name 2 or 3 discourse practices that engage English Language Learners?
2. What is your current understanding of instructing ELL's?
3. How does feedback provided from observations affect your practice?
4. How do you plan for teaching ELL students?
5. How are ELL students getting access to rigor in your classroom?
6. How does the support of the instructional leader change how you engage ELL students in equitable mathematics discourse strategies?

APPENDIX J: DATA COLLECTION INSTRUMENT - CLE

Protocol for Community Learning Exchange (CLE) Artifacts

Each semester for the duration of the participatory action research study, the researcher will host a Community Learning Exchange on a topic related to the research questions in the participatory action research (PAR) project. At the CLE, the researcher will collect and analyze artifacts that respond to the specific questions listed below. In addition, the researcher will collect qualitative data based on the activities in which the participants engage at the CLE. The data will be in posters and notes that participants write and drawings that participants make in response to prompts related to the research questions.

Participants will include the CPR members who sign consent forms and other school or district community members. All information will be collected, analyzed, and reported in aggregate form without attributing responses to any individual. All responses will be anonymous, and no names will be attached to individual written or visual responses.

Date of CLE: Fall 2021/Spring 2022/Fall 2022

Number of Participants: 10

Purpose of CLE: The purpose of the Community Learning Exchange is to provide insight into how teachers demonstrate an understanding of equitable access for English Language Learners in the classroom and how they use classroom practices to promote access in their classroom. Questions for Data Collection: 1. What is equitable access? 2. What strategies do you use that promote equitable access in the classroom? 3. How do you work with others to help understand student access in the classroom? 4. How do you plan instruction so that equitable practices for ELLs? 5. How does feedback play a role in your instruction? 6. What type of feedback is most effective in making changes in the classroom? 7. How does reflection play a role in your instruction?

Sample Agenda

Rose Hill-Magnolia Agenda
Date: November 15, 2021
Time: 3:30 pm -4:30 pm
Location: Library
FOP: Implement equitable discourse strategies to engage English Language Learners in first-grade mathematics.

Learning Outcomes	Agreements
1. Understand the purpose 2. Understand Gracious Space 3. Shared personal narratives 4. Schedule next meeting	1. Work with urgency and purpose 2. Only constructive criticism 3. Honor each other's voices and opinions 4. Communicate needs and wants

Time (60 min)	Activity	How
10 mins	Welcome/Purpose Sign consent forms	Explain the purpose of the research study, understand the CPR group and background "why" dynamic mindfulness."
5 mins	Relational trust: Dynamic Mindfulness	Mindful breathing (pp.305-306)
15 mins	Participants will explore Gracious Space (Relational Trust) and develop agreements/non-negotiables	Gracious Space
5 mins	Journey lines	4-5 key moments that were influenced your math education/experience (+/-)
20mins	Biographies	Typing/writing/or recording on zoom and sharing with the group.
5 mins	Share information about the Focus of Practice	Answer questions, collect

APPENDIX K: CODE BOOK EXCERPT

	Fourth Codes	Emergent Categories
math talks	Instructional practices	Teacher beliefs on math discourse for all
Journaling	Instructional practices	Teacher beliefs about math discourse for ELL
calling on	Instructional practices	Teacher beliefs about math discourse for ELL
student supports	Instructional practices	Teacher beliefs on math discourse for all
question stems	Instructional practices	Teacher beliefs about math discourse for ELL
manipulatives	Instructional practices	Teacher beliefs on math discourse for all
relatable content		Teacher beliefs about math discourse for ELL
partner ELL with English Speakers	Instructional practices	Teacher beliefs about math discourse for ELL
conversations	Instructional practices	Teacher beliefs about math discourse for ELL
same opportunities		Teacher beliefs equity
Explain student thinking		Teacher beliefs about math discourse for ELL
practices that promote routines		Teacher beliefs about math discourse for ELL
student thinking		Teachers' beliefs about math discourse
multiple ways to solve		Teachers' beliefs about math discourse
probing for understanding		Teachers' beliefs about math discourse
agree or disagree and why		Teacher beliefs about math discourse for ELL
peer interactions	Instructional practices	Teacher beliefs about math discourse for ELL
talking about math to promote thinking	Instructional practices	Teacher beliefs about math discourse for ELL
discourse promotes language		Teacher beliefs about math discourse for ELL
probing for understanding	Instructional practices	Teacher beliefs about math discourse for ELL
explain thinking process		Teacher beliefs about math discourse for ELL
teacher-learner		Teacher beliefs about math discourse for ELL

"fixed" students' words		Teacher beliefs about math discourse for ELL
build on student knowledge		Teacher beliefs about math discourse for ELL
gesturing	Instructional practices	Teacher beliefs about math discourse for ELL
gesturing	Instructional practices	Teacher beliefs about math discourse for ELL
opportunity		Teacher beliefs about math discourse for ELL
Think time & solve	Instructional practices	Teacher beliefs about math discourse for ELL
Teacher modeling	Instructional practices	Teacher beliefs about math discourse for ELL
opportunity		Teacher beliefs about math discourse for ELL
peer to peer discourse	Instructional practices	Teacher beliefs about math discourse for ELL
peer to peer discourse	Instructional practices	Teacher beliefs about math discourse for ELL
peer to peer discourse	Instructional practices	Teacher beliefs about math discourse for ELL
peer to peer discourse	Instructional practices	Teacher beliefs about math discourse for ELL
popsicle stick strategy	Instructional practices	Teacher beliefs about math discourse for ELL
Revoice student response	Instructional practices	Teacher beliefs about math discourse for ELL
popsicle stick strategy	Instructional practices	Teacher beliefs about math discourse for ELL
Think aloud	Instructional practices	Teacher beliefs about math discourse for ELL
explain the content in your native tongue	Instructional practices	Teacher beliefs about math discourse for ELL
talking about how they got their answers		Teacher beliefs about math discourse for ELL
practice student talk		Teacher beliefs about math discourse for ELL
think pair share, turn & talk	Instructional practices	Teacher beliefs about math discourse for ELL
paired students		Teacher beliefs about math discourse for ELL
think pair share	Instructional practices	Teacher beliefs about math discourse for ELL