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K-5 Teachers' Perceptions of Culturally Responsive Teaching Challenges in Mathematics

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This is to certify that the doctoral study by

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Abstract

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Project Study Submitted in Partial Fulfillment

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Abstract

The problem for this study was that K-5 teachers in a northeastern school district were challenged to implement culturally responsive teaching (CRT) practices in mathematics instruction. The purpose of this study was to explore K–5 teachers' perceptions about the challenges of using CRT practices in mathematics with culturally diverse students and to identify teacher suggestions for needed resources and training. Gay's culturally responsive teaching theory formed the conceptual framework that guided this study. The research questions focused on providing K−5 teacher perceptions about their challenges of implementing CRT practices with culturally diverse students and about their suggestions for resources and training to improve mathematics instruction. A basic qualitative design was used to capture the insights of nine K-5 teachers through semistructured interviews; a purposeful sampling process was used to select the participants. Emergent themes were identified through open coding, and the findings were developed and checked for trustworthiness through member checking. The results indicated that teachers faced challenges due to time constraints, lack of cultural awareness, access to culturally relevant resources, and inexperience using CRT practices. A professional development project was created to provide teachers with strategies and approaches for implementing and improving CRT practices. This study has implications for positive social change by creating a structure to provide teachers with CRT strategies and approaches for working with culturally diverse student populations.

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Dedication

This dissertation is dedicated to my immediate and extended family. I do not have words to express my deepest gratitude and appreciation for all your support and prayers throughout this journey. To my mom, Cheril Adlam, thank you for your prayers and encouragement. You have been my greatest cheerleader. To my son Jaheim who encouraged me that I cannot give up! To my amazing 8-year-old daughter, who has been there from the start, you have been my rock and inspiration. We endured sleepless nights and limited playtime. You helped me write papers and pushed me to take breaks when needed. You inspire me to be a great mom. You are beautiful, kind, smart, and special. I did this for you, baby girl! So, you could know that you could do it too! Finally, I am thankful that God kept me grounded even when I wanted to give up.

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Section 1: The Problem

Current gaps in diverse students' achievements imply that theoretical ideas such as culturally responsive teaching (CRT) practices are sound yet challenging to translate into everyday practice (Bonner, 2021). Teachers often have challenges conceptualizing what CRT should look like in their classroom and how to use CRT practices that enhance classroom instruction (Bonner, 2021). These challenges make it difficult for teachers to foster an equitable and inclusive learning environment (Abdulrahim & Orosco, 2020). However, as educators increase their understanding of how to support culturally diverse students, they will be able to meet their needs (Williams, 2021).

Although research supports the value of CRT practices, more must be understood about how teachers can apply CRT in their growing and culturally diverse classrooms (Celedon-Pattichis et al., 2018). Abdulrahim and Orosco (2020) and Brown et al. (2021) agreed that there is a need to bridge the gap between CRT theory and implementation in urban science, technology, engineering, and mathematics (STEM) teaching so that teachers can address the challenges of using CRT. Researchers have recommended that teacher preparation is vital for building teachers' competence in CRT (Moore et al., 2021; Muniz, 2019; Pit-ten Cate et al., 2018). There is a need to reframe professional development to meet the needs of teachers who work with culturally diverse learners (Davis, 2021). Specifically, Muniz (2019) noted that professional learning in CRT practices is helpful to teachers who work with students from culturally diverse backgrounds. For clarity in this study, I use the term *culturally diverse students* to represent students from African American and Latinx cultural backgrounds.

The Local Problem

The increase in diverse classrooms requires educators to work more effectively with students who do not share their ethnic, racial, and cultural references (Yoon & Martin, 2019). In this context, teachers face challenges in meeting their students' various needs. CRT practices significantly influence diverse students' learning outcomes (Bonner, 2021; Williams, 2021). As such, the Connecticut State Department of Education (2019) adopted an equity policy requiring educators to use CRT practices that promote learning environments that welcome, respect, and value the strength of diversity to improve student achievement and learning outcomes. According to the equity policy, teachers would get the opportunity to strengthen culturally responsive instructional practices to effectively increase their capacity to teach the diverse student population.

In recent years, a local school district in the Northeastern United States adopted a similar equity policy that required teachers to use CRT practices that promote learning environments that welcome, respect, and value the strength of diversity to improve student achievement and learning outcomes. However, a limited understanding of culturally relevant practices and a lack of knowledge of how to use CRT practices has resulted in poor student performance (Neri et al., 2019; Paris & Alim, 2017). A struggle to understand CRT constructs and practices could also lead to teachers developing resistance to using CRT practices in the classroom (Neri et al., 2019). The problem of this study was that K-5 teachers have challenges implementing CRT strategies in the mathematics classroom in an urban school district in the Northeastern United States. District-wide data and personal communication with administrators indicated that K–5

teachers have challenges using CRT practices in the classroom. It was important to understand how the challenges teachers face influence the implementation of CRT practices and what resources and training could help teachers improve CRT practices used with culturally diverse students in mathematics.

Despite the promise of success in using CRT practices to promote academic success for the growing diverse student population, significant research has shown that the struggles educators have faced in using CRT have determined their effectiveness in the classroom (Brown et al., 2021; Samuels, 2018). Culturally diverse students can have significant academic struggles if they do not receive proper teacher support (Williams, 2021). Therefore, the literature contains information on the importance of problems in the profession.

In this section, I discuss the background, rationale, problem, purpose of the study, and research questions. I also address the conceptual framework; definitions of key terms; and the study's assumptions, scope, and significance. Section 1 concludes with a summary of the main points.

Background

The success of all students depends on a culturally inclusive curriculum design and implementation. However, the challenges teachers face using CRT practices have significantly influenced student academic success (Capper, 2021; Gay, 2018). Successful teachers know their student's abilities and needs and can build trusting connections with them (Davis, 2021; Gay, 2010; Ladson-Billings, 2021). However, being culturally responsive involves multiple components for success (Bonner et al., 2018). For example,

Gay (2018) asserted that explicit knowledge about cultural diversity is imperative but acknowledging students' learning styles also improves learning outcomes for culturally diverse students. Warren (2018) echoed the need for critical reflection, and Samuels (2018) agreed that educators who reflect on their CRT practices made gains in cultivating equitable and inclusive classrooms. Hence, educators who have learned to develop their CRT skills have gained more academic success with culturally diverse students (Ladson-Billings, 1995, 2000, 2021; Tanase, 2020).

According to the Nation's Report Card in 2019, African American and Hispanic American fourth grade students scored 18 to 27 points lower in mathematics than European American students (Nation’s Report Card, 2019). Researchers have indicated that the poor performance of diverse students in mathematics is concerning as their standardized tests significantly influence their success (Carnoy & Garcia, 2017; Michelmore & Dynarski, 2017). Consequently, educators may have low academic expectations of culturally diverse students due to their poor academic performance (Williams, 2021). Gay (2018) argued that a change in the performance of culturally diverse students requires students to use their cultural frame of reference to make meaningful connections to academic concepts. Teachers need to understand the nature of CRT practices and devise the right activities to engage students (Brown et al., 2021). Without proper training and support, even the most well-intentioned teachers can unknowingly offer diverse students irrelevant and ineffective instruction (Muniz, 2019).

Rationale

Diversity continues to increase in American schools, but as more diverse students enter classrooms, instruction must reflect students' various cognitive and cultural needs (Brown et al., 2021; Gay, 2018; Ladson-Billings, 2021). Policymakers and school leaders at the local and global levels have made efforts to create a culturally responsive school environment in which students can succeed. However, there is evidence that teachers have struggled with the implementation of CRT practices because of a lack of cultural competency (Ladson-Billings, 2021; Muniz, 2019), the inability to translate the theoretical ideas into everyday practices (Bonner, 2021; Davis, 2021), and unpreparedness to teach culturally diverse students (Gay, 2018). The challenges teachers face in using CRT practices in the mathematics classroom can influence the mathematics performance of culturally diverse students (Davis, 2021).

According to the National Center for Education annual report, two-thirds of African American and Hispanic American students are behind in mathematics standardized test scores, falling at least 20 points lower than European American students (National Center for Education Statistics, 2019). In 2019, European American fourth grade students had an average mathematics score of 249; African American and Hispanic American fourth grade students had an average mathematics score of 204 and 231, respectively (Nation's Report Card, 2019). The current gap in teacher challenges to implement CRT strategies implies that more research on CRT practices in the math classroom is warranted (Abdulrahim & Orosco, 2020; Davis, 2021).

In the local school district in the Northeastern United States, district-wide survey data indicated that teachers struggle when implementing CRT practices in the mathematics classroom. Teachers stated that they needed more support and time to plan lessons to meet the diverse needs of students in mathematics. In 2020, a school principal at one of the schools in the Northeastern United States indicated that CRT is a challenging topic to discuss, explore, or examine, as teachers understand the definition of the CRT but struggle to use the CRT strategies in their classrooms creatively. Personal interaction and communication with teachers during mathematics planning sessions at the local district indicated that teachers embrace CRT principles; however, they have reservations about how to effectively create student-centered activities that model the instructional practices of CRT in the math classroom. Teachers also noted that they do not believe they have a safe space to discuss their struggles using CRT practices in mathematics. Despite the stated challenges echoed by teachers when using CRT practices during mathematics instruction, the local district has a mandate that CRT practices will be a part of the district's instructional practices.

A review of the local district Board of Education Strategic Plan for 2020-2027 sanctions the need for a culturally responsible pedagogy in instructional framework and practices to ensure an inclusive school and classroom culture conducive to student wellness and academic growth. The problem at this local site was that the district and teachers embraced the need for CRT practices in the math classroom; however, teachers had challenges transferring the theoretical practices of CRT into the everyday mathematics classroom to meet the needs of culturally diverse students.

A project study to address the challenge teachers face when implementing the CRT practice with culturally diverse students in mathematics was necessary for the local site. Abacioglu et al. (2020) noted that teachers' perceptions strongly influenced their culturally sensitive teaching. According to Samuels et al. (2017), having limited exposure to CRT practices and the struggles faced using the framework influence its regular classroom implementation. Therefore, understanding the challenges K–5 teachers face is essential for the effective use of CRT practices in educational settings for students (Bonner et al., 2018; Samuels et al., 2017). Research studies have indicated that teachers' use of CRT practices significantly influences the achievement outcomes for culturally diverse students (Bonner et al., 2018; Gay, 2018; Lewis & Hunt, 2019; Yu, 2022). Lewis and Hunt (2019) proposed that practical strategies, including culturally responsive professional development and student-centered instruction, could reduce the achievement gap for culturally diverse students. An improved understanding of the phenomenon could also help educational leaders understand the barriers that prevent the effective use of CRT practices at the study site. Hence, the purpose of this study was to explore K–5 teachers' perceptions about the challenges of using CRT practices in math with culturally diverse students and to identify teacher suggestions for needed resources and training.

Definition of Terms

The terms used throughout this basic qualitative study are achievement gap, cultural competence, culturally diverse students, and culturally responsive teaching (CRT). The definitions are important in describing the relationship between Black and Hispanic students, teacher perceptions, and CRT practices.

Achievement gap: According to the National Center for Education Statistics (n.d), "Achievement gaps occur when one group of students (e.g., students grouped by race/ethnicity, gender) outperforms another group, and the difference in average scores for the two groups is statistically significant."

Cultural competence: The ability to understand, be sensitive, and be appreciative of the history, values, experiences, and lifestyles of others (Muniz, 2019).

Culturally diverse students: The term culturally diverse can refer to a broad range of human characteristics, including, but not limited to, disability, race, ethnicity, cultural identity, gender, socioeconomic status, immigration status, sexual orientation, and language (Trainor & Robertson, 2022). For clarification in this study, culturally diverse students refer to students from culturally and linguistically diverse communities, specifically African American and Latinx students, focusing on race/ ethnicity, culture, and language.

Culturally responsive teaching (CRT): Gay (2010) defined CRT as "using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them" (p. 36).

Significance of the Study

All teachers must get to know their students. Teachers who learn and value their students' cultural backgrounds are better informed to meet their students' needs by using strategies that allow students to make connections to the real world (Espinoza & Taylor, 2021). In addition, teachers who receive culturally responsive training and resources can

cater to the demands of students from various backgrounds (Davis, 2021). At the local district level, teachers indicated on a district-wide survey that they need more support and time for planning lessons as there are challenges with meeting the various needs of the students. Teachers also echoed that while they value CRT practices, they had limited exposure to the approach and struggled to implement them in everyday mathematics classrooms. Thus, in this study, I sought to address the challenges teachers face using CRT practices in the mathematics classroom and suggest ideas for resources and training needed to help teachers support culturally diverse students during mathematics instruction. I shared the data collected on the professional training needs of teachers with the district leaders and administrators so they could offer teachers opportunities to strengthen their skills in using CRT practices with culturally diverse students. The projected increase in the diverse student population in public schools across the United States (National Center for Education Statistics, 2019) warrants this professional investment in educators (Gay, 2018). It was significant to explore the challenges teachers faced when using CRT practices to identify ways to improve the use of CRT practices in the classroom.

A positive social change might occur for the K–5 teachers as gaining insight into teachers' perceptions of challenges faced using CRT practices with culturally diverse students could improve CRT practices. The findings of this study address the gap in practice surrounding the challenges teachers encounter when using CRT practices in mathematics. Gathering data from K−5 teachers about their perceptions about the challenges and identifying support and resources needed to implement CRT practices

addressed the problem of this study. The findings of this study revealed the challenges teachers face in using CRT practices and can help educational leaders provide training and resources to build teacher capacity to teach culturally diverse students. The increase in students' diversity calls for proper instructional strategies that pull on the cultural references of students to improve their learning outcomes (Suprayogi et al., 2017). The findings of this study also add to the literature that addresses teachers' perceptions about CRT practices used in the classroom.

Research Questions

The following research questions guided this basic qualitative study, which focused on exploring K–5 teachers' perceptions about the challenges of using CRT practices in math with culturally diverse students and identified teacher suggestions for needed resources and training. Gay's CRT theory served as the framework for this study, focusing on teacher attitudes, culturally diverse curriculum content, culturally congruent instruction, pedagogical skills, and tenacity in ensuring quality education. The district data indicated that culturally diverse students have yet to achieve math success on standardized tests. Significant research supports CRT practices in the classroom, but CRT practices are also challenging to translate into everyday classroom practice. In this study, I focused on exploring K−5 teachers' perceptions of the challenges faced using CRT practices and the resources and training needed to support culturally diverse students with math at the study site. The following research questions were as follows:

Research Question (RQ)1: What challenges do K-5 teachers face when using CRT practices in math with culturally diverse students?

Research Question (RQ) 2: What are the perceptions of K-5 teachers on improving CRT practices in math when working with culturally diverse students?

Review of the Literature

Conceptual Framework

CRT theory was the conceptual framework for this basic qualitative study. According to Gay (2010), teachers who use CRT practices draw on students' cultural frame of reference, past experiences, cultural knowledge, and learning styles to make the learning experience more engaging and meaningful. Gay's theory focuses on teaching, developing cultural competency, culturally relevant instructional methods, and describing what a teacher should do to be culturally responsive. Gay considers teacher preparation a fundamental part in preparing teachers with the knowledge, attitudes, and skills needed to implement CRT. Culturally responsive teachers use students' cultural characteristics, experiences, and perceptions as an entry point to teaching them more effectively. However, Gay argued that in CRT theory, teacher attitudes, culturally relevant instructional practices, and skills determine teachers' ability to create meaningful learning experiences to ensure equitable education for diverse students. Therefore, teachers need to have opportunities to reflect upon how CRT practices are used in the classroom, examine their biases, and consider the necessary skills and resources needed to facilitate CRT in the classroom (Muniz, 2019; Samuels, 2018).

The relevant constructs of Gay's CRT theory that guided this study were (a) developing a knowledge base about cultural diversity, (b) including ethnic and cultural diversity content in the curriculum, and (c) responding to ethnic diversity in the delivery

of instruction for teacher preparation. I used the relevant construct of the framework to guide the selection of K−5 teachers who participated in the study. The conceptual framework directly addressed the problem and purpose of this study. I used the CRT theory to guide me in identifying and clarifying CRT practices that are challenging for teachers when teaching math to culturally diverse students. The named framework guided my understanding of CRT resources and training needs that would allow teachers to become culturally competent in teaching math to culturally diverse students. Exploring this phenomenon provided insight into teachers' knowledge of cultural diversity, examined how teachers use CRT practices to inform math instructions, and developed an understanding of the preparation teachers needed to improve the delivery of CRT in the math classroom (see Davis, 2021). I used the framework to develop a knowledge base about CRT practices to develop the need for professional training identified by the teachers. Gay (2010) defined CRT as "using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them" (p. 31). I employed Gay's definition of CRT to develop the data collection interview protocol for this study. I framed the interview questions by focusing on how teachers use their cultural knowledge of students' prior knowledge, frame of reference, and learning styles to make learning rewarding and engaging for culturally diverse students. RQ1 focused on teachers' CRT practices and the challenges teachers face when teaching math to culturally diverse students. For instance, (a) What types of mathematics activities do you use during math instruction to allow culturally diverse students to make relevant connections to their

experiences and math and (b) Have you encountered any challenges in making math engaging and relevant for culturally diverse students? RQ2 addressed how teacher preparation influences how teachers respond to the challenges faced when using CRT to teach culturally diverse students during math instruction (see Appendix B).

I also employed a priori codes from the relevant constructs of CRT to develop codes before analyzing the collected data. This process allowed me to establish themes from CRT to improve the credibility of any themes developed from the inductive codes of teachers' perceptions of the challenges of using CRT in math with culturally diverse students.

Recent researchers have cited and used Gay's CRT framework to inform their studies. Samuels (2018) used CRT theory to frame a study on how teachers' perceptions influence equitable and inclusive classrooms. The author concluded that teachers need opportunities to reflect on their CRT practices and biases to support them in developing culturally responsive skills for teaching and learning. In another study, Moore et al. (2021) used Karatas and Oral's (2017) Culturally Responsive Teaching Readiness Scale influenced by Gay's CRT framework to investigate K−6 preservice teachers' professional readiness for CRT. Moore et al. asserted that professional learning experiences help teachers become sustainable and culturally responsive educators. Likewise, Thomas and Berry (2019) used culturally relevant pedagogy (CRP) and CRT as the theoretical frameworks to conduct a qualitative meta synthesis to understand how researchers interpret mathematics teaching that supports CRP and CRT in prekindergarten through

12th grade. The findings indicated that teachers' care, cultural competency, and high expectations influenced the mathematics classroom instruction types.

Similarly, Yu (2022) used the CRT framework as the background for creating the RQs to investigate the influence of culturally inclusive pedagogy on student achievement in multicultural urban schools. Yu found that CRT significantly improves student achievement in math and science. In addition, Neri et al. (2019) used the construct of CRT to conduct a meta-analysis of teacher resistance to culturally relevant educational (CRE) approaches. The authors suggested that teachers who have a limited understanding of CRT practices and struggle with implementation develop resistance to CRT uses in the classroom.

Research practitioners have also used the constructs of the CRT framework to investigate how CRT practices determine student academic achievement. Thomas and Berry (2019) named CRT practices as an innovative and personalized mathematics instructional approach that can cater to the need of diverse students in the mathematics classroom. The authors agreed that the board of education personnel must allow teachers to develop the required skills to become culturally responsive educators (Thomas & Berry, 2019). There is a need for a deeper understanding of the challenges teachers face using CRT practices (Bonner et al., 2018; Samuels et al., 2017), but teacher preparation is crucial for the effective implementation of CRT practices in the classroom (Darling-Hammond & DePaoli, 2020), which leads back to the purpose of this study. Therefore, understanding the challenges K– 5 teachers face is essential for effectively implementing

CRT practices in educational settings for students (Bonner et al., 2018; Samuels et al., 2017).

Researchers have also examined teachers' awareness, self-efficacy, and the need for critical reflection through the conceptual framework. Karatas (2020) concluded that teachers' awareness of students' cultural and environmental experiences improves their tenacity to increase the quality of the learning-teaching process. However, teachers' self–efficacy influences the delivery of CRT practice (Cruz et al., 2020). Therefore, teachers must reflect critically to improve CRT practices (Warren, 2018). I considered the CRT framework meaningful to this study because the relevant constructs of CRT address why the research problem for this study exists. Gay's theory about CRT aligned the problem, the purpose, RQs, data analysis, and how I interpreted the study's findings.

Review of the Broader Problem

African American students often have vastly different school experiences and require culturally relevant teaching methods to meet their needs (Ladson-Billings, 2021). In this study, I addressed the gap in practice in the literature regarding the challenges teachers face in using teaching strategies to teach culturally diverse students. Despite efforts from the state and local school districts to have culturally relevant instructions in the classrooms, teachers have challenges using CRT practices. The purpose of this study was to explore K–5 teachers' perceptions about the challenges of using CRT practices in math with culturally diverse students and to identify teacher suggestions for needed resources and training. Samuels (2018) agreed that teachers' perceptions inform the strategies and methods currently used to prepare students for academic success

In this section, I discuss the need for CRT in schools and how culturally responsive pedagogy influences culturally diverse students. I share the information on current research concerning the challenges of using CRT practices and teachers' perceptions and reflections of CRT in the classroom. Gay's (2010) theory on CRT, a framework for teaching that addresses culturally diverse learners' needs, is the conceptual framework for this study.

I use multiple databases to find peer-reviewed journal articles published on CRT within the last 5 years. The databases include Educational Resource Informational Center (ERIC), ScienceDirect, Sage Premier, EBSCO Host, Google Scholar, Education Research Complete, Walden dissertations, and Taylor & Francis Online. I also search ProQuest Central to find any doctoral dissertations that I refer to in this study. The literature review contains information on how other scholars have explored CRT practices in the classroom. Gay's CRT theory, the framework for this study, is also discussed.

Although the diversification of the school population calls for CRT practices (Gay, 2002), researchers have indicated that culturally diverse students continue to struggle to close the achievement gap compared to their European peers (Carnoy & Garcia, 2017). The cultural mismatch between students and teachers as a significant factor in determining culturally diverse students' academic success (Carnoy & Garcia, 2017). However, when teachers use CRT practices, it addresses the cultural mismatch between teachers and students (Barnes & McCallops, 2019) because teacher-student relationships, perception of respect, and school experiences determine students' academic achievement of color (Liang et al., 2020). Nevertheless, Gay (2018) contended that

cultural incongruity and educators' struggles in implementing CRT practices might significantly influence culturally diverse students. However, the pedagogy of CRT practices could provide more equitable opportunities for school success among culturally diverse students (Ladson-Billings, 2014, 2021).

Although teachers understand CRT practices (Brookfield, 2019; Murry et al., 2020), they often struggle to effectively apply CRT practices in the classroom (Bonner et al., 2018; Neri et al., 2019; Samuels et al., 2017). CRT is an inclusive practice that requires teachers' competence. According to Pit-ten Cate et al. (2018), "Competencies are the skills and knowledge that enable a teacher to be successful" (p. 51). When teachers have competence in using inclusive practices, it is evident in student learning achievement (Pit-ten Cate et al., 2018). Therefore, more must be done to advocate for culturally relevant instruction that supports the cultural needs of diverse students (Espinoza & Taylor, 2021). Bonner et al. (2018) and Samuels (2018) pointed out that teachers need time to reflect upon their teaching practices and examine the challenges of using CRT practices in the teaching and learning process. In this way, teachers can focus on getting and developing the skills needed to become culturally responsive educators (Gay, 2010). This literature review consists of the common trends found in studies concerning the use of CRT practices in the classroom.

Yoon and Martin (2019) asserted that the increase in diverse classrooms requires educators to work more effectively with students who do not share their ethnic, racial, and cultural references. The introduction of CRT must focus on both theory and field practice (Ozudogru, 2018) because CRT practices in public schools require teachers to

become risk-takers (Myers, 2019), as CRT differs across elementary classrooms **(**Van Ingen et al., 2018). According to Van Ingen et al. (2018), every classroom has a unique blend of history, personalities, and experiences that teachers must consider before using CRT practices effectively. There is also an educational movement calling for cultural diversity to be an educational resource for urban, culturally diverse students (Van Ingen et al., 2018).

The Need for CRT

Culture is a huge part of one's identity (Muniz, 2019). Therefore, when educators include students' cultures in their daily math instruction, they experience greater math success (Thomas & Berry, 2019). As the American student population continues to shift to more racial, ethnic, and linguistic diversity, teachers need to be equipped with the cultural references and pedagogical skills to teach and understand the students' life experiences to meet better their educational needs (Farinde-Wu et al., 2017; Kumi-Yeboah et al., 2021; Moore et al., 2021). According to Gunn et al. (2021) and Farinde-Wu et al. (2017), culturally responsive teachers must seek to identify the best cultural approaches, strategies, and techniques to develop culturally relevant teaching practices. Marrun (2018) stated that effective CRT practices in the classroom work to build inclusive and welcoming educational institutions that validate and affirm the multiple, changing, and fluid identities of students of color while maintaining high academic expectations for all students. Hence, Lewis and Hunt (2019) suggested that student-centered instruction is necessary to promote high expectations, decrease inequitable disciplinary practices, and improve instructional practices to reduce the achievement gap

of students of color. Researchers have called on culturally responsive practitioners to develop instructional techniques, materials, student-teacher relationships, classroom climate, and self-awareness to improve student learning outcomes (Davis, 2021; Gay, 2018; Neri et al., 2019).

Professional development is vital for educators to create culturally responsive classrooms. In the work of Muniz (2019), there was an urgent call for significant investment in the development of culturally responsive educators that goes beyond one-time training or workshops. Through training in CRT practices, teachers develop respect for cultures within the classroom, leading to instructional practices that value student culture (Trumbull et al., 2020). Darling-Hammond and DePaoli (2020) and Trumbull et al. (2020) argued that professional development based on cultural theory and practical exposure to learning strategies could help teachers create culturally relevant classrooms. Teachers who receive CRT practice training are more equipped with the knowledge, skills, and attitudes to meet the demands of their culturally diverse students (Brown et al., 2018; Darling-Hammond & DePaoli, 2020). Teachers need to be prepared to teach students of different races, ethnicities, socioeconomic statuses, and language groups.

Researchers have investigated how CRT practices influence academic achievement and student engagement. In a recent study, Yu (2022) explored how culturally responsive pedagogy influences student achievement in a multicultural urban classroom. In the project study, 43 in-service and preservice teachers and 175 multicultural urban public school students at the elementary level participated. Yu found that CRT practices significantly enhanced students' attitudes and academic achievement

in math and science. Yu also noted that integrating students' cultural backgrounds in math and science teaching improved students' attitudes and academic achievement.

Similarly, Portes et al. (2018) conducted a study at the primary level to examine CRT outcomes for diverse learners in elementary school. The authors stated that the CRT method positively influenced students' standardized test scores. Bonner (2021) asserted that researchers who examined culturally responsive mathematics education revealed connections between mathematical cognitive activity and the nuanced cultural existence of diverse students. These findings have been used to develop insight into how to train mathematics teachers (Bonner, 2021). Abdulrahim and Orosco (2020) also reported that culturally responsive mathematics teaching created opportunities for educators to foster equitable and inclusive mathematics instruction for culturally diverse students. When teachers recognize and acknowledge students' cultural backgrounds while teaching, students experience greater academic success (Dee & Penner, 2017).

In addition, Espinoza and Taylor (2021) found that Latinx/ Hispanic American students assigned to teachers who reflect their cultural, racial, and linguistic backgrounds experience substantial benefits in the classroom. Walker and Hutchison (2021) examined how CRT practices influenced the literacy achievements of low socioeconomic status 17 African American male students. The authors pointed out that instructional practices that mirror students' cultural values, beliefs, and lifestyles empower them to make academic gains in their literacy achievement. Educators who are determined to transform the learning experiences of African American students must prepare themselves to provide instructions that value culture and encourage continuous learning (Walker & Hutchison,

2021). Teachers must develop lessons that leverage students' cultural backgrounds to promote student learning (Van Ingen et al., 2018). CRT practices include preparing and delivering the most effective education feasible and considering students' cultural backgrounds to effectively manage the classroom and use appropriate assessment and evaluation approaches (Moore et al., 2021).

According to Thomas and Berry (2019), Hammond's 2015 research on how CRT influences the brain and promotes authentic engagement and rigor for culturally and linguistically diverse students positively influenced teachers who use CRT practices in the classroom. Hammond's study showed that CRT practices stimulate brain growth and build instinctual capacity in students. Bonner et al. (2018) also provided evidence that teachers' strong commitment to CRT, strong self-efficacy, and anticipation of positive outcomes influenced their ability to address diverse students' needs. Teachers need to develop self-efficacy in CRT practices to affect the learning outcomes of diverse students (Bonner et al., 2018). Teachers' confidence level with CRT influences their ability to teach a diverse student population.

CRT practices influence standardization in education (Ramsay-Jordan, 2020). The passing of standardized tests significantly determines the current education system as there is a minimal focus on allowing students to make a meaningful connection with the subject matter (Ramsay-Jordan, 2020). According to Ramsay-Jordan (2020), despite the newly named policies that promote culturally responsive pedagogy, the latter has caused teachers to grapple with using CRT practices. A deep focus on high-stakes testing impedes teachers from developing CRT practices (Ramsay-Jordan, 2020). There are

educational and personal benefits for students who learn in a culturally responsive classroom.

Why Culturally Responsiveness Matter

CRT includes student-centered classroom practices (Woodley et al., 2017). Through student-centeredness and value placed on diverse student experiences, opportunities are provided for students to maintain their cultural integrity (Ladson-Billings, 1995, 2006, 2014, 2021). In a study conducted by Gershenson et al. (2018) in Tennessee, Black students randomly assigned to a Black teacher in the lower elementary grades K−3 were 7% more likely to graduate from high school and 13% more likely to enroll in college than their peers who were not assigned to Black teachers. A similar study by Rosen and Papageorge (2018) in North Carolina found that by having a teacher from the same background as students, every 10-percentage point increase in Black male drop-out rate decreased by almost 5%, and the intention to go to college increased by 2%. According to Ladson-Billings (2021), educators who used CRP produced better results for students of color than their counterparts working in the same school and grade level. Matthews and López (2019) explored the mathematics achievement of 568 Latino children from grades three through five. The authors found that CRT practices that included students' heritage language and high teacher expectations significantly influenced the mathematics achievement of Latino children.

Teachers' high or low expectations of culturally diverse students influence academic outcomes (Matthews & López, 2019). According to the National Center for Educational Statistics, evidence indicates that teachers of color with cultural backgrounds

like their students might have higher expectations than nonminority teachers (McFarland et al., 2019). Teachers of the same race/ethnicity as their students result in higher expectations and positively influence students' attitudes, motivation, and performance (McFarland et al., 2019; Williams et al., 2019). In a recent study, Cadenas et al. (2021) investigated the links between color-blind racial attitudes and CRT self-efficacy and outcome expectations with immigrant students among 323 teachers. The authors define color-blind racial attitudes as the belief that race does not exist, so students should be treated equally. The authors found that teachers' color-blind racial attitudes lead them to have negative expectations of immigrant students.

Researchers have proposed that teachers who adopt a CRT pedagogy create more equitable opportunities for diverse students (Abdulrahim & Orosco, 2020; Hawkins-Jones & Reeves, 2020; Paris & Alim, 2017; Samuels et al., 2017). Therefore, to overcome the challenges of low expectations for students of color, teachers must be willing to take personal responsibility for becoming more effective in culturally relevant practices through deliberate self-reflection and the development of cultural competency (Lubin et al., 2020).

Implementation of CRT

Teachers' instructional practices can influence students' academic achievement (Gay, 2018). Even though there is a wealth of studies on how to improve CRT, its use in classrooms has been demonstrated to be less than ideal (see Lim et al., 2019). Teachers often express struggles with CRT practices despite their good intention. Although teachers are encouraged to use CRT practices, they operate from a deficit perspective

with gaps in knowledge and skills (Murry et al., 2020). Training and practical experience are necessary for teachers to use CRT to determine instructional practices (Cruz et al., 2020; Moore et al., 2021; Trumbull et al., 2020). Clark and Andreasen (2021) pointed out that although preservice teachers expressed confidence in using culturally relevant practices to instruct diverse students while in training, their level of self-efficacy changed after one year of in-service teaching. In another study, Chu and Garcia (2021) asserted that teachers' self-efficacy belief framed their ability to implement CRT in the classroom. The authors noted that preservice teachers recognized the benefits and usefulness of culturally responsive classroom practices; however, doubt influences their ability to use CRT practices successfully. The self-efficacy struggles, and doubts came from their general lack of knowledge surrounding student diversity, culturally responsive pedagogy, practical exposure, and working in a highly diverse environment (Chu & Garcia, 2021). Thus, a better understanding of teachers' CRT self-efficacy can provide information on the resources and support teachers need to promote student success (Chu & Garcia, 2021). Teachers, especially those in training, must be given opportunities to experience the culture and history of the students to connect the curriculum with their students' cultural backgrounds (Wilcoxen et al., 2021). A gap in this practice creates a deficit in cultural self-study and consistency in applying CRT practices (Lindo & Lim, 2020). Examining teachers' perceptions of challenges in using CRT practices can improve culturally relevant instruction in the classroom.

Teachers' Perceptions and Reflection of CRT

To meet the demands of the increasingly diverse student population, teachers have echoed a need for pedagogical and content knowledge of the various cultures to integrate them into the classroom (Allen et al., 2017). Teachers' perceptions are fundamental in creating CRT practices. It is essential for teachers to carefully self-reflect (Howard, 2021) as teacher dispositions and their ability to use effective teaching strategies can affect the teaching of diverse students (Matthews & López, 2019). In a recent study, Bonner et al. (2018) investigated teachers' perceptions of CRT on how it influenced student learning outcomes. The authors concluded that teachers' strong commitment to CRT, strong self-efficacy, and anticipation of positive outcomes influenced their ability to positively influence student learning outcomes (Bonner et al., 2018). The authors further noted that culturally competent educators understand that a lack of culturally relevant instruction prevents marginalized groups from receiving a fair and impartial education.

Teachers' attitudes and beliefs influence the use of CRT in the classroom. According to Civitillo et al. (2018), teachers' cultural diversity beliefs and willingness to self-reflect on their own teaching determine the implementation of CRT practices in the classroom. Karatas (2020) affirmed the importance of instructors' positive attitudes about cultural diversity and using instructional tools to improve cultural responsiveness. Underwood and Mensah (2018) explored the perceptions of 66 Mid-Atlantic science teacher educators (STEs) about teaching through a culturally responsive lens to transform the learning limitations of students. The authors concluded that the high sociocultural awareness of the teachers resulted from their shared set of experiences, teaching

philosophies, and a deep understanding of students' needs and behaviors (Underwood & Mensah, 2018). The teachers acknowledged how circumstances in their students' lives could influence their academic progress. Therefore, the teachers used appropriate instructional practices to remove or alleviate those environmental factors that could prevent diverse students from succeeding (Underwood & Mensah, 2018).

Conclusion

Global studies consistently show that European American students continue to outperform culturally and linguistically diverse students in mathematics (Kuhfeld et al., 2018). Therefore, researchers have continued to explore different instructional practices to mitigate the disproportional achievement experienced by African American and Hispanic students. Practitioners who have successfully use and research CRT practices recommend it as an instructional practice that teachers can use to help African American and Hispanic students improve their academic performance. But CRT looks different across elementary classrooms as each classroom has its unique makeup of a diverse population. However, teachers as facilitators of CRT practices can influence CRT use in schools.

While teacher commitment and knowledge of the CRT practices and theory can lead teachers to use CRT to support students successfully, some teachers indicate that using CRT practices in the classroom can be challenging. Some of the challenges included unpreparedness and self-efficacy. These are crucial factors to consider when using CRT practices. Researchers have also indicated that it is vital to consider teachers' perceptions of CRT and provide opportunities for self-reflection and critical awareness in

preparing them to develop the skills needed to support culturally diverse students in closing the achievement gap in mathematics. Educators who are committed to student success understand the value CRT practices have on helping culturally diverse students maximize their full potential far beyond their time in the classroom.

Implications

The research implications of this study were focused on creating a project study to address the needs of K−5 teachers who request professional development to build their capacity in using CRT practices in the math classroom. Upon analyzing the data collected, I create a 3-day professional development for the K-5 teachers. The goals of professional development are to allow teachers opportunities:

- To develop their knowledge of the different constructs of culturally responsive math teaching by reviewing articles, examining videos, and working with CRT experts.
- To increase cultural awareness by examining the eight competencies of CRT and reflecting on their experiences of using CRT in the classroom.
- To use constructs of twelve culturally responsive math practices and audio literature math books to create mathematics lessons that engage students (see Appendix A project).

After completing the 3-day professional development on CRT math practices, teachers will use at least 4 of the twelve CRT math practices to create a grade-level aligned math lesson. (see Appendix A for a lesson plan sample). At the conclusion of the 3-day professional development, teachers will establish a professional learning

community where they will have a space to continue sharing ideas, creating culturally relevant mathematics activities, reflecting on the successes of CRT practices, and finding new innovative resources that promote how to implement CRT practices in mathematics.

I plan to present a short PowerPoint presentation of the study's findings to the district administrators so that resources and training needs identify by teachers can be sources and provided to teachers to improve CRT practices used for math instructions (see Appendix A). I will share the study's findings with educational leaders to influence how they make decisions about ongoing professional development and training for classroom and pre-service teachers. CRT practices create opportunities for teachers to meet the needs of the growing diverse student population. Finally, the findings of this study will add to the body of literature at the K–5 level that focuses on teachers' perceptions of CRT practices used in math with culturally diverse students.

Summary

Section 1 includes an examination of the local problem of challenges teachers face in using CRT practices in math with culturally diverse students at the study site. The section also includes the rationale for the study, a definition of the key terms used, the study's significance, and the RQs to guide the study. I discuss the conceptual framework that would guide the study with the literature review of scholarly articles from the last 5 years that reported trends associated with the topic. A pivotal conclusion gathers from the literature review is that while teachers' use of CRT practices can positively affect the academic achievement of culturally diverse students, self-reflection and professional learning are necessary to build teacher competence. Section 2 outlines the methodology

in this basic qualitative study, justification of the research design, criteria for selecting potential participants, ethical issues and confidentiality agreement, and the data collection plan.

Section 2: The Methodology

Research Design and Approach

In this study, I aimed to explore K–5 teachers' perceptions about the challenges of using CRT practices in math with culturally diverse students and to identify teacher suggestions for needed resources and training. Section 2 provides information about the processes used to collect and analyze the data. Throughout the document, I discuss the credibility and trustworthiness of this study. Finally, I outline the ethical procedures followed to secure the participants' privacy and provided details on the data analysis results.

Description of the Research Design

Qualitative research, by nature, may focus on exploring a problem by developing an understanding of a central idea (Creswell & Poth, 2016). Qualitative methodology is suitable for studies requiring rich and in-depth data to address RQs (Burkholder et al., 2016). While conducting this qualitative research, I gathered data and interpreted the participants' experiences to find out how their experiences influenced how they viewed the phenomenon (Merriam, 2009). According to Ravitch and Carl (2016), a researcher seeks to understand people's attitudes, opinions, or beliefs about an experience or phenomenon through the basic qualitative design. It is a practical approach to understanding how people make sense of their learning experiences. Merriam (2009) stated that a basic qualitative study is useful for uncovering educators' strategies, techniques, and practices. Worthington (2013) concurred that a basic qualitative design is particularly well suited for an in-depth understanding of an educational phenomenon.

The benefits of conducting this basic qualitative educational research are to improve practices and understanding of teachers' perceptions about the challenges of using CRT in K−5 classrooms. I selected this approach to gain first-hand information from teachers. Additionally, a basic qualitative design aligned with the purpose and RQs that focus on understanding the why and how of human behavior to obtain nonnumerical data (see Ravitch & Carl, 2016). The RQs for this study were descriptive and explanatory, validating the use of a qualitative design rather than an experimental quantitative study that seeks to test a theory (see Burkholder et al., 2016). A single data collection instrument was also appropriate for the basic qualitative approach (see Creswell & Gutterman, 2019).

I did not consider other qualitative designs for this study because they were unsuitable. According to Burkholder et al. (2016), grounded theory research design aims to derive a general, abstract theory of process based on the participants' views of the phenomenon studied. A grounded theory approach was not appropriate because I explored the challenges the participants experienced while using CRT practices in the classroom; no new theories were established in this study.

An ethnographic approach is a descriptive, interpretive of cultural patterns shared among a group (Salkind, 2010). While I explored some aspects of culture in this study, I focused on teachers' perceptions of the challenges of using CRT practices. The participants were from various cultural backgrounds to improve the credibility of the data (see Burkholder et al., 2016).

A phenomenological approach, which involves emotional and often intense human experiences (Merriam & Grenier, 2019), was not appropriate for this study. In this study, I focused more on participants' perceptions of the challenges of implementing CRT practices and soliciting their ideas for professional development and resources rather than the intense and emotional views that mirror ethnographical research. Lastly, a case study design that uses a variety of data sources to produce detailed explanations of difficult research phenomena in real-world settings was considered but not selected. In this study, I used one data source to explore teachers' perceptions of the named phenomena.

I did not consider the quantitative and mixed methodology designs for this study. The quantitative research methodology requires statistical or numerical data analysis to determine if a relationship exists between variables and needs numerical data, which was not the focus of this study (see Burkholder et al., 2016). A mixed methodology would allow for the collection of quantitative and qualitative data for a broader and more complete range of RQs (Mackey & Bryfonski, 2018). In this basic qualitative research, I aimed to explore a phenomenon through interviews (see Burkholder et al., 2016).

Criteria for Selecting Participants

I conducted this basic qualitative study at an ABC school (pseudonym) in the Northeastern United States. The ABC school was a Title 1, high–poverty school serving 475 students; of these students, 80.8% were eligible for free and reduced lunch. The target population included K −5 teachers from the school district in the Northeastern United States. Miles et al. (2015) suggested that participants should be sampled from a larger target to provide the most useful information for the research. Thus, to gain a

diverse sample, I chose teachers from different grade levels and gender identities. The purposeful sampling strategy described by Palinkas et al. (2015) is one in which the researcher selects participants who have detailed knowledge about the phenomenon of interest.

Yin (2017) indicated that conducting a qualitative study with a sample size of about nine to 12 is acceptable because the information gained is more reliable. Palinkas et al. (2015) asserted that the sampling methods determine the efficiency and validity of the research. Based on these recommendations, I invited nine participants to participate in the study. According to Mason (2010), the sample size should not be too large or too small, as it could be challenging to reach saturation. The purpose and assumptions of a study also influence the sampling method selected. In qualitative studies, the researcher can purposefully select participants to gather rich information to answer the RQs of the qualitative study (Palinkas et al., 2015). The criteria for selecting the participants were as follows: The participants must have had 1 or more years of experience using CRT practices, instructed a diverse student population, and taught math.

Access to the Participants

I sought and obtained permission from the district to conduct the study. I sent the consent form to the district personnel, which provided information about the title, purpose, criteria, and RQs related to the study. The personnel then outlined the terms and conditions under which they would grant me a Letter of Cooperation. After agreeing to the terms and conditions, a Letter of Cooperation was granted from the local district. Upon receiving approval from the Walden University Internal Review Board (IRB),

approval number 07-18-22-0773342, I started the data collection process. I emailed the ABC school principal to gain approval to recruit K−5 teachers to volunteer to be in the study. Once the approval was received, I sent an email with an invitation flyer to all the teachers at the local site. The email explained the study's purpose, the participants' role, the data collection process, and the projected length of the study. A few participants responded with concern regarding the length of the interview. I requested the IRB change the interview length from 60 to 30 to 45 minutes, and the IRB approved the request. Upon making the adjustments to the invitation flyer, I resent the invitation flyer again to gain participants.

To ensure the participants' privacy, I asked them to respond to the invite by directly emailing me at my Walden email or by phone from their personal email. This approach protected the participant's identity from school district officials. After the participants made contact, I sent a copy of the consent form via their personal email. Participants who agreed to be a part of the study replied to the email with the words "I consent." Over 2 weeks, three teachers reached out, expressing their interest in being a part of the study. I then asked the district personnel to post the invitation flyer on their website and five more participants were recruited. The flyer was posted two more times on the district website, and the remaining participants volunteered to participate. The consent form was then sent to each teacher for them to review and sign.

Sampling and Sample Size

The work of different educational researchers validated the justification for the potential sample size. Malterud et al. (2016) asserted that sample size influences (a) the

purpose of the study, (b) the experiences and knowledge of the participants, (c) the use of established theory, (d) the quality of the interview, and (e) the analysis strategy. Creswell and Poth (2016) stated that the researcher must determine the sample sizes before starting a study because sample sizes can vary based on the research design. The authors clarified that a researcher could use a small size for a qualitative research design (Creswell & Poth, 2016). According to Mason (2010), the researcher may use participants ranging from five to 350, but the purpose of the study should be the determining factor for a suitable sample size. Mason argued that saturation is essential when determining the sample size for qualitative research. However, saturation as a generic qualifier is not inappropriate for qualitative studies (O'Reilly & Parker, 2013). Therefore, limiting the number of participants is vital to attain the study's in-depth purpose (see Patton, 2014). A small sample size is appropriate for interview data collection (Kim et al., 2017). More importantly, Mason theorized that a smaller sample size could aid in developing relevant themes and valuable interpretations. Based on these recommendations, I conclude that selecting nine participants would be a suitable sample size for successfully examining teachers' perceptions about the challenges of using CRT practices and soliciting ideas for professional development and resources. Participants were given a thank you note and the option of a $10 Dunkin or Amazon gift card based on preference. Participants had the option to accept or decline.

Relationship Between Researcher and Participants

According to Salkind (2010), building strong relationships with participants is essential for a good qualitative study. I strived to build trust with the participants by being

transparent in explaining the study's purpose and assuring each volunteer that their identity or personal information would never be shared with anyone inside or outside the district. The researcher must also create a safe, comfortable, and dedicated space for interviews at the participant's convenience (Salkind, 2010). Considering COVID-19 and the participants' preferences, the interviews were conducted via Google Meetings and Zoom. According to Salkind, the interviewer must consider attitudinal attributes such as friendliness and flexibility when conducting the interviews. It is also important to gain consent from the participant when conducting research (Bogdan & Biklen, 2007). I maintained these ethical protocols throughout this study.

A researcher should establish a working relationship with the participants to gain their confidence and trust (Salkind, 2010). During the interviews, I allowed the participants adequate time to compile their responses and clarify any statements made. In addition, during the interview process, I maintained a friendly demeanor and checked with the participants to ensure they were comfortable.

Ethical Issues and Confidentiality Agreement

Protecting the rights and privacy of the participants is crucial for any study. Alase (2017) asserted that protecting the rights and privacy of the participants shows respect and increases the credibility of the researcher. To create a working relationship with the participants, I shared the interview protocols and explained what I would be doing to secure their personal information and identity. To protect the participants' privacy, each participant received a numbered alphabet code (T1, T2, T3, etc.).

According to Salkind (2010), the researcher must also strive to upload the ethical protocol throughout the research process. I stored all data collected before, during, and after the interviews at home in a secured, locked file cabinet. Electronic data have a secure password only accessible by me and will be kept securely locked in my home file cabinet for 5 years, per the Walden research protocols.

Data Collection

The interview was the sole data collection instrument for this basic qualitative study. Alase (2017) acknowledged that an interview is a conversation with a purpose guided by RQs. During interviews, the researcher can build rapport with the participant and observe their body language for subtle behavioral cues that can reveal crucial information about how they feel about a topic (Ravitch & Carl, 2016). Well-conducted interviews can yield deep, rich, and personalized information that can aid in understanding the participant's perceptions (Ravitch & Carl, 2016) because the researcher can have a deep conversation about the RQs (Merriam & Grenier, 2019).

Instrumentation

Creswell and Gutterman (2019) and Yin (2017) agreed that a basic qualitative study could use an interview to collect data from one or more participants. For this study, I developed an interview protocol using the relevant construct of CRT theory (see Appendix B). Each interview took place at separate times during the summer break and took about 25 to 35 minutes. During data collection, the privacy of the information was protected by conducting interviews via Zoom, WhatsApp video call, and phone, where participants were in the privacy of their homes or an undisclosed location of their choice.

Poor internet connections resulted in two interviews being changed from Zoom meetings to phone calls. I stayed in a private room in my home where no one could hear me. Only the interviewees knew the exact interview date, time, and location. No other interviewee was privy to each other's interview date and time. I conducted the interviews in the early morning and late afternoon because the participants preferred those times. The entire interview process with the nine participants lasted about 5 weeks.

I recorded the interviews on the Otteri.ai recording software program and used my Sony Digital Voice Recorder as a backup recording device. The interview protocol I followed included a proper greeting, an introduction to the study, the information's purpose, and the data's use. During the interview process, I used six semistructured questions to gain the participants' responses. Alase (2017) recommended that creating a rigorous list of semistructured interview questions also enhances the research's trustworthiness. I also asked follow-up questions based on any notes taken during the interview to obtain a deeper understanding of the participants' responses and to help reach saturation of relevant data. Saturation occurs once the researcher receives the depth and breadth of the information from the collected data (Bogdan & Biklen, 2007). After the interview process, I thanked the interviewees and followed up with a thank you email for participation. Interviewees exited the interview after being allowed to ask questions or voice any concerns. The follow-up procedures involved member checking via email, which allowed the participants to check the summary of data findings for accuracy of interpretation.

The quality of the interview guide influences the implementation of the interviews and analysis of the data (Cridland et al., 2015). Therefore, I developed an interview protocol using the relevant construct of CRT theory. Alase (2017) recommended that creating a rigorous list of semistructured interview questions also enhances the research's trustworthiness. I was flexible when asking the preestablished questions, asking additional questions, eliminating questions, or adjusting during the interview.

Role of the Researcher

The researcher has multiple roles when conducting qualitative research. According to Alase (2017), it is the responsibility and duty of the researcher to explore, investigate, and interpret the data collected from the lived experiences of the participants. My role as the researcher was to interview and analyze the data, make recommendations for this study site, and serve in other capacities to complete the study successfully. Salkind (2010) asserted that it is also the role and responsibility of the researcher to ensure that the participant's natural environment does not experience any interruption during the data collection process. I conducted all interviews via phone or video conferencing to effectively execute my role and responsibilities, listen attentively to the participants' responses, and not interrupt, suggest, or offer to complete their statements. This approach helped me to be aware of my explicit or implicit bias that could influence the integrity of the study (see Alase, 2017).

I have been a STEM coach for two schools at the local Connecticut site since 2016. However, although I work in the same school district, I did not have daily interactions with any potential participants from the ABC school. I have never worked in

that specific location, nor supervised or led professional development sessions that could have potentially influenced the data**.** I had no prior relationship with participants; they should have felt comfortable speaking honestly about their perceptions of CRT and their challenges in using CRT practices. As an African American educator, I have thoughts about CRT practices; however, my perceptions did not influence the findings because I engaged in consistent self-reflection and used the ethical research guidelines throughout the research process. My thoughts and biases were also documented during the data collection process. As a member of the Walden Curriculum, Assessment, and Instruction Program, I am responsible for sharing my findings with administrators and educators.

Data Analysis Plan

This basic qualitative study used one form of data collection to obtain rich data. The interview recording was transcribed using the Otter.ai recording and transcription software. Each transcribed interview was downloaded and saved to a word document file on my computer. The participants' names were removed, and each was assigned an alpha-numeric identifier. I then began the data cleaning of the transcripts to ensure that the transcriptions matched the transcribed information. I reviewed each transcript by listening to the audio to ensure the information on the transcript matched what was on the audio. Data cleaning is an important part of the research process before preparing the data for analysis (Salkind, 2010).

According to Saldana (2011), analyzing the data requires that the researcher reflects upon the essential information to answer the RQs and make meaningful conclusions. After concluding the interview process, I used the first cycle and second

cycle methods proposed by Miles et al. (2015) to analyze the qualitative data. Based on Saldana's (2011) advice, I had a provisional list of codes beforehand to harmonize with the study's CRT conceptual framework. This allowed for an analysis that would directly answer the RQs. I aligned each participant's response with a specific RQ in structural coding analysis (see Saldana, 2011).

Miles et al. (2015) coding methods include two phases to analyze qualitative data. I employed a two-phase coding method, first and second-cycle coding. While the first cycle and second cycle methods include different coding processes, the researcher has the autonomy to select the best coding method from each cycle that best suits the data analysis (Saldana, 2011). I used the first coding cycle to analyze the respondents' answers to the interview questions, align them with the RQs and draw valid conclusions based on the participant's perspectives (see Miles et al., 2015). I used various coding techniques during the first coding cycle to initially assign codes to summarize data segments. During the first cycle coding process, I took each RQ and turned it into a code; I then read each participant's response to the RQs to familiarize myself with the language and perspective of each participant. I then used In Vivo coding analysis to code the specific words or phrases from the participant's response. In Vivo coding allowed me to focus on the actual spoken words of the participants, since I explored the participants' perceptions of CRT practices. During the second cycle coding phase, the goal was to develop a sense of the categorical and thematic concepts that would be derived from the first cycle codes (see Miles et al., 2015). In the second coding cycle, I used both eclectic and pattern coding. I used the eclectic coding method to refine the first cycle codes and

then pattern coding to attribute meaning to the initial analysis (see Miles et al., 2015). Both cycling approaches will allow me to pull the data into meaningful analysis arriving at themes (see Miles et al., 2015).

In addition to the first and second cycle coding process suggested by Miles et al. (2015), I employed the relevant constructs of CRT theory to do a priori coding beforehand to increase the credibility of the finds. Elliott (2018) theorized that a priori codes create opportunities for research to establish categories beforehand that could align with categories defined from the data set. This coding process can provide a context for the additional codes that emerge during the analysis (Patton, 2014). I used Gay's CRT framework during the coding process as a method to validate the interpretations of the data to increase content validity (Elliott, 2018). I coded the data to find common themes, patterns, and differences among the participants' interview responses.

Once I completed the coding process, I analyzed the data for emerging themes among the participants' responses about their perceptions of the challenges of using CRT practices in mathematics with culturally diverse students and identified teacher suggestions for needed resources and training. The emerging ideas were coded and categorized based on the keywords in the RQs. The coding process aims to identify the emerging themes that capture and summarize the data to recognize patterns to create categories from the themes for the findings (Elliott, 2018; Miles et al., 2015; Saldana, 2011). I shared the summary of the data finds with the participants to verify the validity of the information and to ensure that my findings were not prejudiced. This practice is known as member checking and adds credibility to the qualitative research process

(Creswell & Gutterman, 2019). Cross-referencing the initial findings with the participants also increased the internal validity to establish credibility (see Salkind, 2010). Microsoft Word and Excel 365 software were the two programs that I used to keep track of the data analysis process, as, without both, it would have been hard to keep track of the codes and categories. I used the 6-steps thematic analysis proposed by Braun and Clarke (2014) to analyze the data collected for this basic qualitative study. Braun and Clarke (2014) argued that the thematic analysis method provides clear guidance on how to analyze the data set qualitatively. All the steps are also essential in evaluating and successfully interpreting the research findings (Creswell & Poth, 2016). The thematic analysis follows a 6-step process: (a) familiarization with the data, (b)generating initial codes, (c) searching for themes, (d)reviewing the themes, (e)defining and naming the themes, and (f)writing up. I used the 6 -steps analysis process as a guide to show how the data set was analyzed to identify the emerging themes.

Step1: Become Familiar With the Data

I began the data analysis process by first familiarizing myself with the data. Once the interviews were completed, I copied them from the Otter.ai transcription program to a word document. The interview recordings were compared against the transcripts to ensure they matched them. Then I printed the transcripts and began to read each participant's responses to the interview questions. To familiarize myself with the data, I played the recording multiple times to get a deeper understanding of the thoughts and perceptions of the participants before assigning any codes.

Step 2: Generate Initial Codes

After familiarizing myself with the data on the transcripts, I began to utilize open codes by reading the transcripts and underlying keywords that the participants repeated. I then turned each interview question into a code. I then copied each interview question onto an Excel sheet, using rows and columns to create a space for each participant identified by an alphanumeric identifier. The data analysis process began with the use of In Vivo codes to extract the participants' exact words to create initial codes.

In Step 2, as I began identifying the open codes, I kept the RQs in mind to ensure that I was looking at the “big picture” to find the emerging themes that would bring meaning to the data set. I coded the data by posting excerpts of each participant's response on the Excel Sheet with the open codes. I reread each participant's response and checked my codes to see if I captured the participant's perceptions. I then went back through each transcript to ensure that the emerging themes answered the RQs. The codes that had the potential to answer the RQs were color coded. I did not assign any color to codes that I considered not helpful in answering the RQs. Table 1 shows a sample of the open codes I did for the data set.

Table 1

Examples From Data Sources Open Codes

		Open codes	
Interview questions	Structural codes	Excerpt	Open codes
Describe your experiences using culturally relevant teaching (CRT) practices in the mathematics classroom.	Experience	I haven't had a lot of training in this area (Participant T3).	Haven't had a lot of training
		My experiences Well, to be frank with you, Ms. *. It has not been easy (Participant T7)	Not been easy
Have you encountered any challenges in making math engaging and relevant for culturally diverse students?	Challenges	A challenge might be if I didn't have a frame of reference for their particular culture. (Participant T2).	Don't have a frame of reference
		Enough time is not there to really spread yourself to deliver the lesson as it ought to be done. And so that is one of my major challenges (Participant T7).	Enough Time
Have you received training on using culturally responsive teaching practices in teaching math with culturally diverse students?	Training for CRT in math	I feel like there's a difference between received and sought out. So I have not received training (Participant T2).	Not received training
		I believe we had some training a while back, but the fact that I can't remember probably means that it wasn't as effective as it could have been (Participant T9).	Not effective

I used a data-driven approach as opposed to a theory-driven approach. The a priori codes pulled from the relevant construct of Gay's CRT theory were the starting point for coding the data set; however, it was more important to use an inductive approach to analyze the data. By using an inductive approach, themes would be more valid in accurately representing the data. Once I completed the open codes, I then began using pattern coding to organize the codes into categories to see what connections exist among the codes. I needed to see what patterns were emerging from the data set as different participants had similar perceptions about the RQs and issues being explored by this study. On the same Excel Sheet used for the open coding, I added another column to create second coding to see the patterns and trends that emerged from the data set. Table 2 shows how I created categories for each RQ using pattern coding.

Table 2

Example of A Priori and Pattern Coding Categories

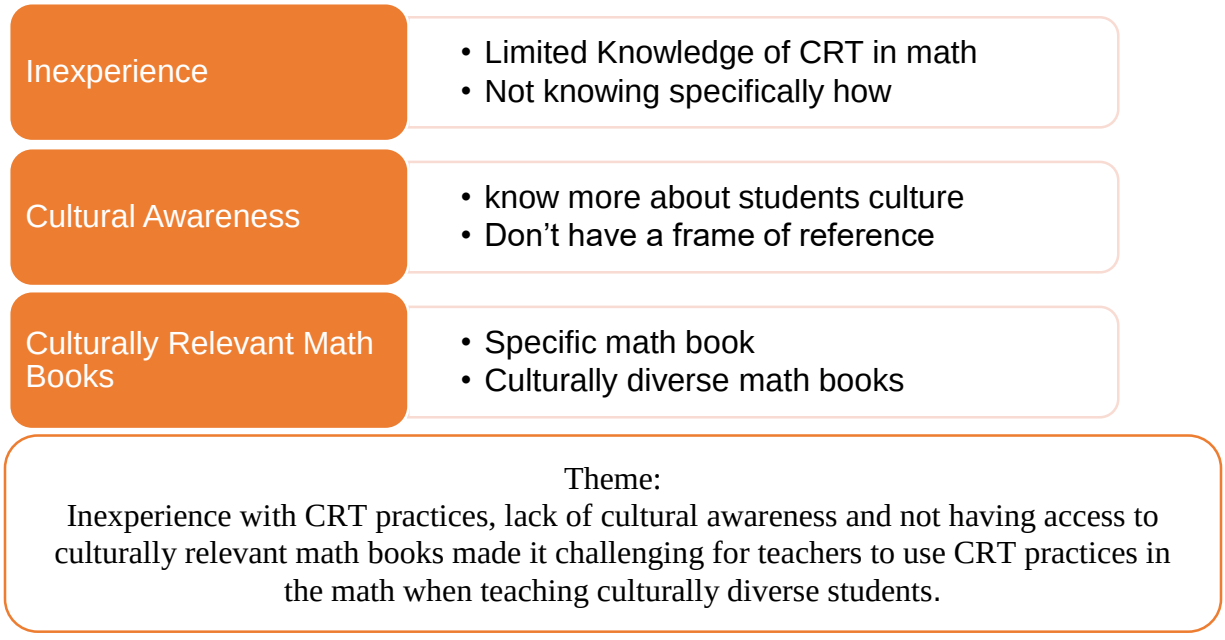
A Priori codes	Codes	Category	Excerpt
Developing knowledge	Limited knowledge of CRT	Inexperience	I feel like there's, I don't know, specific culturally responsive (Participant T2).
Ethnic and cultural diversity	Know more about students	Cultural awareness	I would like to know more about these students and their backgrounds (Participant T3).
	Students to feel valued	Student engagement	I believe that getting students to feel that they are equally valued, and their input is meaningful (Participant T8).
Instruction for teacher preparation	Supplies needed	Resources	Certain supplies I needed were not working for my little ones (Participant T4).
	Enough time	Time constraint	Enough time is not there to really spread yourself to deliver the lesson as it ought to be done (Participant T7).
	Coaching and training	Professional development	So whether that's coaching or like training or even just a book that I could read (Participant T1).
	More training	Professional development	Maybe how it looks like, or how, how to bring it into math (Participant T 6).

Step 3: Search for Themes

In step 3 of the thematic data analysis process, I sought to identify the patterns and emerging themes from the categories. To do this, I reviewed the Excel Sheet and highlighted the codes and categories formed from the pattern coding. I then reviewed the RQs along with the relevant construct of the conceptual framework to give meaning to the categories to form the themes. I had to sort and refine the categories; this process was not easy. I had to create thematic maps to show the connections across the categories. By making thematic mapping, I was able to develop the themes. Figure 1 shows an example of thematic mapping for generating a theme.

Figure 1

Sample of Thematic Mapping



Note. Codes and categories that were used to develop the theme. Own work.

Step 4: Reviewing the Themes

Once I completed creating the thematic mapping to identify the themes. I began to review and refine the themes according to RQ1 and RQ2. I reviewed each transcript again to make sure that the excerpts I extracted aligned with the themes I generated. Once I felt confident that the codes and categories were relevant and aligned, I coined themes to create meaningful concepts about the data in relation to the research purpose (see Braun & Clarke, 2014).

Step 5: Defining and Naming the Themes

After completing the previous four steps, I generated four themes from the data set to answer the RQs. Two themes emerged for RQ1, and two themes for RQ2. I used excerpts from the participant's responses to validate the themes' conclusion. Table 3 shows the alignment across the categories, themes, and RQs.

Table 3

Alignment of Categories, Theme, and Research Question

What challenges do K-5 teachers face when using culturally responsive teaching practices in math with culturally diverse students?	
Categories	Themes
Inexperience culturally response math teaching Lack of cultural awareness Culturally relevant math books	Inexperience with CRT practices, lack of cultural awareness, and not having access to culturally relevant math books made it challenging for teachers to use CRT practices in math when teaching culturally diverse students.
Lack of collaboration time Student engagement Student discourse	Teachers felt that time constraints impede their ability to collaboratively plan math activities that incorporate CRT practices needed to facilitate student engagement and student discourse.
What are the perceptions of K-5 teachers on improving CRT practices in math when working with culturally diverse students?	
Professional development	Teachers need ongoing training, modeling of lessons, and coaching guided by timely feedback to improve the use of CRT practices in math.
Culturally relevant resources Support	Administrators need to support teachers by providing access to prepared culturally relevant resources (books, classroom décor, and digital data-based) to meet the needs of culturally diverse students.

Step 6: Write Up

In this step of the data analysis process, I reviewed the categories and themes to ensure they were relevant to answering the RQs. After I felt confident that I had accurately completed the analysis process with fidelity, I concluded that four themes adequately addressed RQ1 and RQ2. The four themes developed from the data set elucidated the challenges faced by K-5 teachers when using CRT practices in math with culturally diverse students and provided teachers' perceptions about what they needed to improve CRT practices in math.

Data Analysis Results

The purpose of this study was to explore K–5 teachers' perceptions about the challenges of using CRT practices in mathematics with culturally diverse students and to identify teacher suggestions for needed resources and training. The themes that developed from the revealed teachers' perceived challenges about using CRT practices and suggestions for training needs were instrumental in understanding how these challenges impede the use of CRT practices in the math classroom when teaching culturally diverse students.

The themes that developed from teacher's perceptions, experiences, and challenges using CRT practices in math and ideas for needed resources and training with culturally diverse students;(a) inexperience with CRT practices, lack of cultural awareness, and not having access to culturally relevant math books made it challenging for teachers to use CRT practices in math when teaching culturally diverse students;(b) teachers felt that time constraints impede their ability to plan math activities that

incorporate CRT practices needed to facilitate student engagement and student discourse; (c) teachers need ongoing training, modeling of lessons, and coaching guided by timely feedback to improve the use of CRT practices in math; and (d) Administrators need to support teachers by providing access to prepared culturally relevant resources (books, classroom décor, and digital data-based) to meet the needs of culturally diverse students. During the data analysis process, developing contextual understanding, building relationships, and providing real-world connections surfaced as CRT practices that teachers utilized when teaching culturally diverse students to evoke student engagement and understanding.

Research Question 1

What challenges do K-5 teachers face when using CRT practices in math with culturally diverse students? The RQ asked teachers to share the challenges they experience when using CRT practices in math with culturally diverse students. In analyzing the data, two themes emerged that answered the RQ.

Theme 1

Theme 1 was inexperience with CRT practices, lack of cultural awareness, and not having access to culturally relevant math books made it challenging for teachers to use CRT practices in math when teaching culturally diverse students.

The participants shared similar experiences about the challenges faced when using CRT practices in math when teaching culturally diverse students. The challenges included: inexperience with culturally responsive math teaching, lack of cultural awareness, and culturally relevant literature related to students' cultural backgrounds.

The teachers expressed that these challenges made it difficult for them to effectively use CRT practices in the math classroom to meet the needs of culturally diverse students. The teachers indicated that CRT practices could evoke excitement, build student confidence, create student engagement, and stimulate academic growth. Still, the challenges they face could impede the use of CRT practice in the math classroom. Participant T1 shared this experience:

> It feels kind of more awkward or forced in math compared to how it would be in like, you know, ELA or something similar. I don't have that much experience. I don't think there's like enough guidance or say technique, you know.

Participant T3 shared a similar experience: “My experience would be that I've never had the opportunity to put a label on specific practices in the math classroom based on culturally responsive teaching not having specific training, and what those practices might be that I think.” Participants T1 and T7 emphasized how their inexperience with culturally responsive math teaching influenced their self-efficacy. Participant T1 shared, “I am sure that being culturally responsive will help meet the roadblocks, but just not knowing how to do it makes it tricky.” Participant T 7 affirmed, "So with my limited knowledge, it sometimes makes me feel a little incompetent at times.”

> Participant T2 echoed the concern about the lack of awareness of student culture: So, a challenge might be if I didn't have a frame of reference for their particular culture. So then, if let's say, I feel like I've learned a lot more recently, but let's say originally, you know, 10 years ago, I never had a student that was from India. And so, I might not have a basis for understanding that culture. So that would be a

> challenge that then I would, you know, I need to do my own work to figure out and look into, but that would be a challenge me not having the same life experiences as the students or having a frame of reference for what their culture is, would be a challenge.

Participant T9 voiced a similar concern: “There are different races, ethnicities, and cultures in my class. You know, also like that there's African American, Jamaican, Albanian. So, I think a challenge for myself would be to become familiar with their cultures.” Participant T4 explained how cultural awareness influence student engagement, creating a challenge for them: “I mean, I've had challenges, yes. I really, I really think, and I know I've said this over and over again, is that it's that buy-in, it's getting them interested or engaged in the activity.”

Participant T6 response, summarized how teachers' inexperience with culturally responsive math teaching and lack of cultural awareness create challenges in using CRT practices in math when teaching culturally diverse students: “I think first of all, like culturally relevant teaching, to me means like, incorporate the student’s culture into teaching I don't think we do that enough in math. I think the challenge is that we don't do that enough.”

Access to culturally relevant resources was another challenge expressed by teachers as they shared their perceptions about the challenges of using CRT practices in the math classroom with culturally diverse students. The culturally relevant resources named by teachers included math literature and math curriculum. Teachers highlighted that having access to these resources influences their ability to effectively create

culturally responsive math activities because they might not know exactly what to incorporate into the activities. One teacher explained that if the resources were already available, she would be more ready to incorporate them into the math activities. Participant T7 voiced,

> I also find that I don't have enough resources as it relates to delivering in my lessons. I was thinking that I need to have more books, you know, with information that that embodies, you know, the cultural diversity because my district * you know, that it is very diverse.

A similar sentiment was shared by participant T1, who echoed,

> In * we have Wonders that will have little to do with culturally responsive teaching in their actual curriculum, but i-Ready doesn't specifically, unless they do and just don't explicitly state it and not that you're only going to rely on the curriculum books but having it there as a reference is often helpful. I think this leads just back to there not being any familiar like books specifically for math that I'm aware of that are like or even that the district provides.

Theme 2

Theme 2 was that teachers felt that collaborative time constraints impede their ability to plan math activities that incorporate CRT practices needed to facilitate student engagement and student discourse

Teachers communicated that collaborative time constraints influenced their ability to effectively create engaging math activities and provide the opportunity for student discourse. The respondents voiced that student engagement and time for student

discourse were struggles encountered when using CRT practices. The open codes I used to generate the theme included student interest, enough time, time-consuming, student sharing, student involvement, time restraint, the challenge to incorporate CRT strategies, and being developmentally appropriate. I then categorized the codes as enough time, student engagement, and student discourse.

Participant T7 conveyed, “Enough time is not there to really spread yourself to deliver the lesson as it ought to be done. And so that is one of my major challenges.” Participant T8 shared,

> I love them to feel equally valid then it may tend to be time-consuming because each student needs time in which to express themselves give everyone a chance. So, time-consuming, it may be time-consuming, but it is something that has to be done.

Participant T9 stated, “I don't know how diligent teachers will be given the time restraint and, you know. I don't know how they will go about exposing themselves to different cultures.”

Furthermore, Participant T 8 explained the challenges encountered when offering opportunities for student discourse:

> So, students from various backgrounds, you'll find that some students will feel that their voice is not heard based on where they are from. So, you will find that some students need and believe that their voice is more dominant..... So, most of the challenges surround that sort of setting, and then sometimes, to get the students involved, as I've said before, I love them to feel equally valid then, it

> may tend to be time-consuming because proving each student with a time in which to express themselves give everyone a chance. So time is one of my greatest challenges.

Participant T4 conveyed her challenge of getting the students engaged: “Well, yeah, just like I said, sometimes they just don't speak. They shut down. And then, because they don't feel as if they know as much as their peers, but they do, they actually do.” Participant T5 shared a scenario of how her challenges with student engagement and discourse determined the use of CRT practices in the math classroom:

> Yes, they might not quite understand what I'm saying. And that means I have to really; modify my teaching style. Because I might start up, though, with what's for the majority as if we want to call them the majority, and then I can look and see the kid is not responding, and you know how you can read body language, and that's just not working. So, I will start backing down and modifying it, and if that does not work with the whole group, then I will pull those little ones into small groups and start working one on one with them and checking to try to see where the missing link is that I am not reaching. I'm observing what they are doing. So, I'm also learning from them.

Participant T3 summed up the perceptions of the teachers by saying,

> I mean, I've had challenges, yes. I really, I really think, and I know I've said this over and over again, is that it's that buy-in, it's getting them interested or engaged in the activity. I think it's just about making the activity developmentally appropriate as well as, like what we're talking about here, culturally.

In summary, teachers agree that inexperience with culturally responsive math teaching, compound with the need to learn more about the culture of their culturally diverse students, contributes to some of the challenges they face. Access to culturally relevant literature and insufficient time to create lessons incorporating students' cultural frame of reference that allow for student engagement and discourse also makes it challenging for them to use CRT practices in math with culturally diverse students.

Research Question 2

What are the perceptions of K-5 teachers on improving CRT practices in math when working with culturally diverse students? The second RQ was designed to determine what the K- 5 teachers thought could improve CRT practices in math when teaching culturally diverse students. After analyzing the data, I deduced two themes that answered the RQ.

Theme 3

Theme 3 was that teachers need ongoing training, modeling of lessons, and coaching guided by timely feedback to improve the use of CRT practices in math

After analyzing the data set, I assigned the following codes to refine the theme: do not have those experiences, have not received training, limited training, model teaching, more culturally responsive coaching, coach and training, collaborative training, and more workshops. From those codes, I generated one theme of professional development that included three subcategories: modeling lessons, coaching, and CRT training for math. Seven of the nine teachers expressed that the district offered some aspect of equity training, but it was not specifically targeted at math or how to work with culturally

diverse students. Participants T9 and T2 summarized the agreed teachers' perceptions of CRT training received from the district. Participant T9 said, "I believe we had some training a while back, but the fact that I can't remember probably means that it wasn't as effective as it could have been." Participant T2 concurred,

> I feel like there's a difference between received and sought out. So, I have not received as in I have not been given. We did have some equity stuff, but I don't feel like I've not been given training on culturally responsive teaching practices on teaching math with culturally diverse students because this is math based.

T2 highlighted that the training received generally focused more on teachers owning their biases, which did not really speak to the problem of using CRT practices in the math classroom. T1 shared, "I don't. I honestly don't really find them effective because they focus too much. On a teacher recognizing their biases….and I don't think it actually likes it gets to like the actual like problem."

All the participants shared a desire for more professional development that was specifically targeted at math, as using CRT practices in math was more challenging than using these same practices in ELA. They explained that training was needed to improve their ability to effectively use CRT practices in math when teaching culturally diverse students. Teachers expressed that they needed to see what it looked like in the classroom alongside professional coaches. Participant T5 stated, "We need more professional developments," and Participant T9 echoed a similar sentiment: "I would like additional training because maybe we can have a PD that can focus on one type of culture and

maybe expose the teachers to what those cultural practices." Participant T1 explained it like this:

> I personally, for me, I'm the type of person where if I want to learn how to do something, I want to read something that says like, this is how you do it something very explicit……So whether that's coaching or like training or even just a book that I could read on my own. It's something that gives real-world examples.

Most participants expressed a need for math lessons to be modeled so they could see what CRT looks like in the math classroom. A veteran teacher explained that most of the CRT practices used in the classroom were self-taught. The participant explained that while the district was making strides in providing equity training for teachers, more needed to be done to prepare them to meet the needs of their culturally diverse students. One newer teacher echoed that the district needs to put more emphasis on preparing teachers to use CRT practices in the classroom, as teacher colleges are not doing it. While teachers' colleges discussed the importance of the CRT framework, no real lessons were ever given to allow for an understanding of what it looked like in the classroom. Participant T7 expressed,

> For me personally, I would prefer if I got some model teaching experts come in and show me how it is done in our classroom where I see diverse culture because it's easier to tell me how to do it, but to show me in the real-life situation, you know, to me, that would make a difference.

Participant T2 shared a similar sentiment:

> So we need coaches to share what this looks like in the math classroom. And, and, of course, the more culturally diverse people we have in those roles helps, but I think even if someone isn't necessarily culturally diverse, they need to care.

Participants indicated that more needs to be done to prepare teachers to effectively use CRT practices in the math classroom when teaching culturally diverse students. The participants articulated wanting a better pedagogical understanding of CRT math practices, clear knowledge of the needs of culturally diverse students, culturally relevant resources, and coaching to improve the use of CRT practices in the math classroom. Participant T8 explained, “I believe that teachers need to be better instructed and better prepared to implement CRT and provide, let's say more, more coaches who are aware of CRT practices and can model so that teachers can copy.” Participant T3 expressed, “I would like to know more about these students and their backgrounds, and you know, what, what I can give them as an educator that would help them.” Participant T2 summarized the need for professional development by sharing, “There are things I think I do innately, but I don't know specific research-based practices. You don’t know what you don’t know.”

Although only Participant T7 communicated the need for parents to have some exposure to culturally responsive math activity, Participant T6 explained the importance of parental involvement to improve CRT practices in math when working with culturally diverse students. The participant communicated how parental involvement is one resource that may help her overcome the challenge of understanding students' cultural

backgrounds to better support culturally diverse students in the math classroom. Participant T7 said,

> I think they need to have workshops for parents, you know, have workshops for parents, wherein they come in, and they are taught because children don't only learn at school, they learn at home, and whatever they might not have gotten at school, then the parents could be able to reinforce that at all.

Participant T6 explained,

> Maybe have the parents, you know, give us some feedback on how they did things back in their country or how they're working with their kids at home, you know, I mean because maybe we didn't like also get some ideas from their parents too. You know, we're always learning.

Participant T4 stated, “It is important “to include the parents make sure they are a part of this child's academics and learning.”

Theme 4

Theme 4 was that administrators need to support teachers by providing access to prepared culturally relevant resources (books, classroom décor, and digital data-based) to meet the needs of culturally diverse students

The participants believe having culturally relevant resources would improve their ability to use CRT practices in math when working with culturally diverse students. They communicate that premade resources would make it less time-consuming to find culturally relevant information to integrate into math activities when working with culturally diverse students. Participant T1 expressed, “I would need even just a book that

I could read on my own. Something that gives real-world examples here's a teacher who wasn't using it. This is what they did to use it. It was effective." Participant T8 said,

> So, in terms of teaching and learning materials, teaching and learning materials need to reflect this level of diversity. So, for example, if we are looking at some mathematics concepts or whatever the scenarios are and problem-based learning scenarios, you would want to have scenarios from different backgrounds with students with different experiences. So that they all can relate, we do not want these teaching and learning materials to be skewed towards one set of students.

Participant T9 explained,

> Yeah, as I read somewhere where they have, like, culturally responsive manipulatives. May be manipulatives, books. Kind of think like maybe a short curriculum or something that you know has resources, you know, like a culturally responsive curriculum…. Like one database form or something that you know, we can all use as a reference just to incorporate at least some type of culturally responsive element in each lesson, maybe or at least a couple of times a week. The district could provide, I don't know, classroom decor, you know, or something where children can see images of their reflection around the classroom.

Participant T2 highlighted that buy-in from leadership, and feedback is important to support what she needed from the district to improve the use of CRT practices in math when working with culturally diverse students. Participant T2 articulated,

> You have to have that buy-in as well for it to be successful. So, you need to have a leadership of a building that buys into this. It's, you know, just should be a way

> of life, but you need to have people that are willing to support this and see that it's being implemented for it to work. So we need coaches to share what this looks like in the math classroom. And, and, of course, the more culturally diverse people we have in those roles helps, but I think even if someone isn't necessarily culturally diverse, they need to care like well, I just I know that there I can see some buildings that would be very successful with this as a building.

In summary, the respondents voice that professional development alongside timely feedback from leadership and accessible culturally relevant resources and support from math coaches will improve the use of CRT practices in math when teaching culturally diverse students.

Credibility and Trustworthiness of Research

In a qualitative study, credibility and trustworthiness are crucial factors that the researcher must consider when collecting and analyzing the data to present the findings (Saldana, 2011). I cited CRT's relevant current and seminal work in the literature to ensure the study's credibility. To investigate the phenomenon carefully, I devoted adequate time to collecting, analyzing and interpreting the data. I created a word document of the data collection log for each interview. The completed interviews were transcribed by the Otteri.ai computer software and compared against the audio recording to check for transcription errors and reviewed for accuracy. The transcript review process served as a participant validation strategy (see Ravitch & Carl, 2016).

I used multiple coding methods to uphold the ethical protocols of the data analysis. The themes and findings were shared with the participants for verification and

confirmation to prevent misunderstandings from any subjective assumptions of the inferences and comments made about the study's outcomes. The researcher must corroborate the data analysis findings with the participants (Saldana, 2011). I cross-referenced the data analysis findings with the conceptual framework's relevant constructs. These steps ruled out contradictory evidence and ensured the credibility of the coding (Linneberg & Korsgaard, 2019). I asked my peer reviewer to review the data and research process to check the coding and themes to conclude the findings. The results were written and presented objectively using direct quotes from the data collected as supporting evidence. The four themes generated from this study came solely from the responses provided by the participants.

Transparency of the Study

Being transparent throughout the research process also increases the study's credibility (Saldana, 2010). By providing the detailed steps of the research methods, analysis, and reporting the findings to various stakeholders in the education field, I would have made this study transparent, a credibility check proposed by (Saldana, 2011). The findings from this study could be transferable (Ravitch & Carl, 2016) or result in a positive social change for K−5 teachers using CRT practices to support diverse students in improving their academic success. Administrators and school board personnel might be able to transfer the information solicited about the professional development and resources provided from the perceptions of the participating teachers to help with the implementation of CRT across K-5 schools in the local district. I wrote the details of the study so that readers and stakeholders could transfer the findings to a similar context.

Discrepant Cases

I am responsible for reporting any cases of discrepancies with the data. During the data analysis process, I identified two cases of discrepancies, Participants T1 and T4. The majority of the participants had a shared view on the challenges they face when using CRT practices in the classroom when teaching culturally diverse students. However, one of the nine teachers, Participant T1, perceived that a lack of college preparation contributed to his challenges in teaching culturally diverse students. While the work of practitioners and researchers (Gay, 2018; Muniz, 2019; Warren, 2018) validated the perception of T1, it did not align with the rest of the data set. As such, I did not use T1 perception as a challenge to generate any of the themes.

Participant T1 responded,

> But I think, you know, being new or to the teacher, I can't call myself really new anymore, but it's something that I'm going to learn to deal with time. I think it's definitely not something we covered in college. I can tell you that.

Participant T1's second reference to college:

> I think training focused on the app side of things really doesn't do it. I don't really get anything out of it. And I was saying that all throughout college too because we did all that in college, and I was kind of like, this is dumb, because, like, like, you're not telling me how important this thing is. But you're not like helping me actually to apply it.

A participant that I would identify as an outliner would be Participant T4. Four of Participant T4 responses to the interview questions did not have any rich information to

answer the RQ. I found it challenging to gain insight from T4's responses about the challenges of using CRT practices in the math classroom when working with culturally diverse students. The respondent had difficulty providing direct answers to the interview questions, even after I offered prompts and repeated the interview questions. As such some of the respondent's answers were not used in the data analysis. I followed the recommendation of Ravitch and Carl (2016) and documented the two cases of discrepancies found in the data set.

Summary of Outcomes

The results show the participants believe their professional knowledge of successfully using CRT practices in the math classroom is limited. They also indicate that not having enough time to collaboratively plan culturally relevant activities influence their ability to allow culturally diverse students to have student discourse in the math classroom. The participants further express that they had challenges with student engagement during the math activities. Participants share that access to culturally relevant literature was a common challenge. In this study, the findings reveal that the participants understand the benefit of using CRT practices in teaching math to culturally diverse students. They communicate that these practices build confidence in students, create excitement, and stimulate academic growth. However, the participants believe they need professional development in culturally responsive math teaching by modeling lessons, coaching, and ongoing feedback from their leadership team to ensure that the CRT math practices used with culturally diverse students are successful. They also specify that having prepared culturally relevant resources that include math literature books, digital

resources, culturally appropriate classroom decor, and a diverse math curriculum will help to improve the use of CRT practices in math when working with diverse students despite the challenges. These findings are comparable to prior research that found that teachers sometimes struggle to understand how to use CRT practices in mathematics when teaching culturally diverse students (Brown et al., 2019; Gay, 2018; Rubel, 2017). However, Abacioglu et al. (2020), Ramsay-Jordan (2021), and Wachira and Mburu (2019) found that teachers who were culturally aware of their students' cultural background were more equipped to use CRT practices in the classroom. Teacher preparation is vital when transferring CRT practices from theory to practice (Brown et al., 2019).

Gay's (2010) CRT practice provides a framework for these findings. The participants' perceptions about cultural awareness, using culturally relevant resources and pulling on students' prior experiences to use CRT practices in the math classroom reflect the constructs of Gay's CRT theory. During the interviews, the participants express how inexperience with CRT practices, lack of cultural awareness, and access to culturally relevant literature influenced their ability to successfully use CRT practices in math when working with culturally diverse students. They further express that not having enough time to collaborate and plan culturally relevant activities further challenges promoting student discourse and engagement among culturally diverse students. They also highlight the importance of getting professional development geared toward providing opportunities to become culturally sensitive to the needs of culturally diverse students.

The participants also share that they will benefit from observing math lessons where a teacher integrates CRT math practices.

Although the teachers encounter challenges using the CRT practices in the math classroom, they express that if given support from coaches and feedback from their leadership team, they will be equipped with the skills to support culturally diverse students when teaching math.

In response to the first RQ about the challenges K-5 teachers face when using CRT practices in math, the participants express that the challenges include time restraint, lack of culturally relevant resources, and unpreparedness. These results share similar findings to studies conducted by Cruz et al. (2020) and Samuels (2018) on teachers' perceptions of the challenges of using CRT practices. The teachers also believe that student engagement and student discourse challenged the use of CRT practices in math. Both findings differ from past research that did not suggest that student engagement and student discourse would create a barrier when using CRT practices with culturally diverse students.

For the second RQ involving teachers' perceptions on improving CRT practices in math, participants emphasize that professional development from experts with opportunities to observe actual lessons incorporating these practices was necessary to improve CRT use in the math classroom. The teachers also identify a culturally responsive curriculum, culturally relevant books, and a digital database with accessible resources that will improve the use of CRT practices in the math classroom. Participants note that they need math coaching, opportunities, and feedback from administrators to

build their self-efficacy in using CRT practices with culturally diverse students. Some participants highlight that limited knowledge of CRT practices in math creates a sense of incompetence on their path. The respondents suggest a need for improvement corresponds with findings in previous research (Brown et al., 2018; Davis, 2021; Muniz, 2019). There are benefits to using CRT practices in math, but inexperience with CRT practices creates challenges for K-5 teachers.

Based on this study's findings, a professional development workshop is appropriate to address teachers' needs to improve CRT practices in math when working with culturally diverse students. The professional development is a 3-day workshop for teachers. On Day 1, the teachers have the opportunity to develop their knowledge of CRT math practices. Day 2 includes teachers watching videos of what CRT practices look like in the classroom and teachers reflecting on their experiences using CRT practices. Day 3 will consist of interactive sessions for teachers to collaborate with their colleagues to plan activities using CRT math practices.

Section 3: The Project

Introduction

The purpose of this study was to explore K–5 teachers' perceptions about the challenges of using CRT practices in math with culturally diverse students and to identify teacher suggestions for needed resources and training. According to prior research and findings from this study, there is a need for K−5 teachers to develop CRT practices in the everyday math classroom (Nolan & Keazer, 2021). The findings revealed that the teachers believe CRT practices are necessary strategies for the math classroom. Still, they perceived that their inexperience and access to culturally relevant resources made it challenging to use CRT practices in math when working with culturally diverse students. Teachers were also concerned about the time constraints to collaboratively plan culturally responsive math activities to foster student engagement and encourage student discourse. More importantly, teachers emphasized the need for professional development to understand CRT math practices better to improve its use in their math classroom. They felt that professional development needs to be ongoing with timely feedback from educational leaders. Based on teachers' responses, the project study delivery method was a professional development geared toward teachers' stated need for more training to improve CRT usage in math. Teachers voiced that they would benefit from developing cultural awareness, as it is the first step in building culturally responsive practices (see Abdulrahim & Orosco, 2020; Karatas, 2020; Underwood & Mensah, 2018).

This professional development project aims to improve teachers' knowledge of CRT math practices, model CRT practices in math, and allow teachers to incorporate

what they have learned to plan culturally relevant math lessons to support culturally diverse students (See Appendix A for project study goals and learning outcomes). While I did not include administrators' perceptions about this study's phenomenon, teachers believed they needed support from their leadership team. Therefore, I will invite administrators to participate in professional development to develop an understanding of CRT math practices to better support teachers.

The professional development will begin with a 3-day professional learning session before the start of the school year to implement research-based CRT practices in the math classroom when working with culturally diverse students. An outside organization specializing in training educators in CRT practices will be the facilitator of the first day of professional development. After completing the 3-day professional development sessions, I will set up a professional learning community (PLC) to support teachers and provide a space where teachers can share ideas and revise CRT practices in math. The ongoing monthly sessions for teachers to collaboratively plan and discuss culturally relevant math activities will ensure that novice and veteran teachers have continuous support to improve CRT in math.

Rationale

I created the professional learning project to help build teacher capacity to effectively use CRT practices in the math classroom with culturally diverse students. The teachers participating in the 3-day professional development and four follow-up sessions will expand their knowledge, build their "teacher toolkit" for success, and increase their confidence to use CRT practices effectively in the math classroom. The design of this

project will focus on teachers being collaborators, administrators being observers, and culturally responsive experts being supporters. Professional development is an inclusive, practical learning experience for K−5 mathematics teachers of culturally diverse students as it addresses the two RQs.

Review of the Literature

The study findings indicated the need for professional development, as teachers requested more training on CRT practices in math to improve the use of CRT practices in the math classroom when working with culturally diverse students. This professional development (PD) project focuses on professional learning, modeling of lessons, and establishing a PLC for ongoing support for K-5 math teachers of culturally diverse students. The topics I explored for this literature review were andragogy, effective PD, professional learning communities, coaching, and culturally responsive math teaching. To locate the 30 peer-reviewed articles published within the last 5 years, I searched Educational Resources Information Center (ERIC), ProQuest Central, Sage Journals, and ScienceDirect. I also used Google Scholar to identify relevant studies for this literature review. I used the following search terms: *adult learner, math coaching, professional development, professional learning experiences, professional learning communities, culturally responsive math teaching, andragogy, teacher preparation for culturally responsive math teaching,* and *teacher training.*

Effective PD

Brigandi et al. (2019) defined PD as an array of learning opportunities created for teachers, administrators, and district leaders to improve their educational skills for

positive student outcomes. Teacher PD is at the core of successful instructional practices to improve student learning outcomes (Popova et al., 2022; Sancar et al., 2021). However, teachers' characteristics significantly determine the PD process and the benefits gained from participating in professional training (Sancar et al., 2021). According to Housel (2020), offering adult learners effective, relevant, and individualized instruction prepares them for success. Popova et al. (2022) agreed that PD should have a specific subject focus, offer teaching practice enacting lessons, and be in-person to provide an opportunity for collaboration. Therefore, educational leaders must consider adult learning characteristics to provide effective PD (Korthagen, 2017).

Knowles's (1984) research on adult learning theorized that adult learners seek opportunities to learn when there is an opportunity to improve their academic knowledge and teaching practices. According to Egan (2020), Knowles emphasized that adult learners are self-directed and desire to take responsibility for decisions. The assumptions theorized by Knowles were fundamental in designing the 3-day PD for this project study. The data collection process was instrumental in determining the teachers' required needs. District personnel, culturally responsive experts in the field, and I will review the culturally relevant resources for PD. The teachers will evaluate the effectiveness of the resources that the presenters will share during the professional training.

Adult learners learn better by applying lessons to real-life situations while having some say in planning their learning activities (Egan, 2020). As teachers collaboratively plan culturally relevant math activities during the PD sessions, they can include their learning experiences and use their autonomy while planning. This will also create an

environment for them to discover new CRT ideas and knowledge. Knowles (1984) also emphasized that adult learners are motivated by understanding that what they are learning is relevant. During the PD sessions, the facilitators will create opportunities for teachers to develop their knowledge and the importance of CRT practices in the classroom. The PD will focus on developing teachers' CRT practices to meet the needs of culturally diverse students (see Mellom et al., 2018).

Educators must know the equity constructs (Holliday, 2021); PD effectively builds this knowledge (Sancar et al., 2021). According to Sancar et al. (2021), effective PD is time sensitive, attentive to assessment, research-focused, comprehensive, goal-oriented, offers support, and collaborative. This PD is aimed at enhancing teachers' understanding of culturally responsive instructional practices to promote student learning (see Lekwa et al., 2019). Therefore, the PD facilitator will be debriefed on the training needs requested by the teachers to prepare themselves to address any barriers that may arise during the sessions (see Baker, 2022). Lack of time, the absence of blending theory and practice, and the influence of a fixed mindset are some barriers to effective PD (Chuckry, 2019). To address the possible barriers, I will schedule enough time during each PD day for teachers to explore the PD content, take breaks to refresh themselves, and reflect on their learning. The PD sessions will offer opportunities for the participants to connect CRT theory to practice enabling professional growth through collaborative inquiry, which could lead to a shift in teachers' mindsets about CRT practices.

A recent meta-analysis reviewed by Sims and Fletcher-Wood (2021) revealed that PD is more successful when there are opportunities for collaboration, subject

specification, the inclusion of external expertise, and buy-in from teachers, and when the PD is practice-based. The findings of this study showed that teachers requested ongoing coaching and collaborative PD with a focus on developing their understanding of CRT math practices. Other researchers concurred that ongoing PD helps to mitigate new and veteran teachers' gaps in their knowledge and skills (Brigandi et al., 2019). Ottenbreit-Leftwich et al. (2020) shared six characteristics of effective PD that could directly address teachers' needs, as identified in this study. The authors communicated that the training should (a) be sustained over a period, (b) be situated in a specific teaching context, (c) be personalized to the learning content, (d) provide opportunities for modeling and in-class support, (e) be authentic and include hands-on activities, and (f) offer learning community for collaboration and support. Researchers have also considered coaching as an effective pillar of professional training to help support changes in their teaching practices (Darling-Hammond et al., 2017; Ottenbreit-Leftwich et al., 2020). Coaching can be effective in supporting teaching practices because coaching helps to build the relationship between coach and teacher (Darling-Hammond et al., 2017) as well as provides individualized, consistent, and concentrated support (Ehsanipour & Zaccarelli, 2017; Knight, 2017). Coaching provides ongoing support. In contrast, according to research by Bates and Morgan (2018), a one-time PD does not give teachers the time to modify their instruction or provide the support they need to keep track of their practice or learning. Thus, PD organizers must strive to incorporate the elements of these features when designing professional learning opportunities and coaching, as both approaches can build teacher self-efficacy (Darling-Hammond et al., 2017).

PLCs have also significantly contributed to improving teaching practices and student learning (Johannesson, 2022). PLCs create a space that brings teachers together to learn and support each other and strengthens the school community's vision (Admiraal et al., 2021; Johannesson, 2022). In a recent study, Slack (2019) explored how professional learning that incorporates PLCs enhances the accessibility of instruction for English learners. According to Slack's research, effectively facilitated PLCs can create learning cultures and shared efficacy that provide equal access to learning for students from various cultural and language backgrounds. The author further implied that PLCs facilitated effectively result in meaningful changes in teachers' mindsets and practices. Serviss (2021) emphasized that PLCs allow educators to improve teaching and learning, build stronger relationships with colleagues, stay informed about new research and emerging tools for the classroom, and help teachers reflect on ideas. Based on the evidence gathered from the literature and the request from the respondents for ongoing training, the creation of PLCs will be a part of this PD.

Current literature on multicultural education has indicated that teachers working with culturally diverse students need to be equipped with the essential knowledge, skills, and competence to deliver culturally relevant practices (Lorenz et al., 2021). Parkhouse et al. (2019) indicated that PD developers should pay close attention to the theories related to teacher learning and multicultural education. Effective PD can lead to changes in knowledge and beliefs (Gorter & Arocena, 2020; Kirsch & Aleksić, 2018). However, supporting teachers in planning and modeling instruction that draws on students' frames of reference increases the academic achievement of culturally diverse learners (Cenoz &

Santos, 2020). PD providers should create a safe space for teachers to discuss or share their resistance or challenges when working with culturally diverse students (Parkhouse et al., 2019).

Teacher participation in PD can improve cultural competence toward culturally diverse learners (Lorenz et al., 2021). The delivery of culturally relevant PD is a concern for teachers. Szelei et al. (2020) argued that teachers who received PD on cultural diversity indicated that the training was inadequate and resulted in them feeling unprepared to provide culturally relevant instruction for student success. Leeman and van Koeven (2019) proposed that PD focused on cultural diversity aims to broaden teachers' knowledge of people, cultures, languages, and abstract concepts and theories related to diversity. The authors further concluded that culturally relevant PD allows teachers time to reflect on cultural diversity on a broad or individualized spectrum and how it relates to teaching and learning. Finally, Leeman and van Koeven concluded that culturally relevant PD should address the emotional aspect of cultural diversity to develop cultural sensitivity through interactive and cooperative activities.

In summary, effective PD provides multiple opportunities for teachers to develop the knowledge and skills that focus on their identified needs. PD may include coaching, modeling, reflection, and practice review opportunities to build teacher capacity and self-efficacy. PD with a PLC component fosters collaboration to support student achievement as teachers can share best practices and brainstorm innovative ways to improve learning.

Based on the literature review on effective PD, I design this project to allow teachers to develop their knowledge about CRT math practices as they work

collaboratively with experts who will model lessons and establish PLCs for ongoing learning. This approach provides teachers with ongoing professional learning experiences to improve the use of CRT practices in the math classroom when working with culturally diverse students.

Project Description

This PD project aims to increase teachers' knowledge of CRT math practices to support them in helping culturally diverse students. Using the local school district K-5 teachers as the participants' pool, I will invite participants to participate in the PD. I will also communicate to the participants in the invitation that I am actively seeking a grant from the school district to compensate them for participating in the PD. However, if the district does not award the grant, teachers will still be encouraged to participate in PD to engage in a meaningful learning experience. The participants will be invited to participate in a 3-day PD before the school year begins and four follow-up sessions aligned with math CRT practices over 6 months. I will also invite administrators to be part of the PD sessions (see Appendix A). The invitation will include the agenda, an overview of each session, and the location of the PD.

On the first day of the 3-day professional training, the Capital Region Education Council (CREC), an agency that provides comprehensive professional learning collaborative where developers lead, facilitate, and support districts in identifying and expanding their knowledge of culturally responsive pedagogy and inclusive school culture will be one of the facilitators. In the morning session, the participants will discuss, share their experiences, and develop a deeper understanding of CRT math practices when

working with culturally diverse students. The PD activities will focus on exploring the following:

1. What is CRT?
2. Who benefits from CRT?
3. What are teachers' competencies that promote CRT?
4. What does the research say about CRT?
5. Why is CRT important in math?

During the afternoon session, the participants will watch a 14-minute TEDx Talk video on *Culturally relevant pedagogy in mathematics: A critical need.* Teachers will then share their experiences using CRT in the math classroom. The day will end with teachers reflecting on the relevance of CRT practices in the classroom (See Appendix A for factsheet).

On Day 2 of the PD, teachers will reflect on the importance of CRT practices in the math classroom. Teachers will view a video on *Successful Teachers of African American Children* presented by Dr. Gloria Ladson-Billings. Teachers will then be asked to reflect on their experiences using CRT practices in the classroom. Teachers and administrators will then break into groups to read and discuss the article *Twelve Ways to Make Math More Culturally Responsive* (see Appendix A). They will participate in a question-and-answer session on takeaways or clarification about the CRT practices explored. Firstly, allowing teachers to develop their understanding of culturally responsive pedagogy will ensure the successful use of CRT practices when working with culturally diverse students. Secondly, administrators who participate in this PD will have

some background knowledge of CRT math practices to better provide teachers with support and feedback during teacher evaluation snapshots.

On Day 3 of the PD, the participants will view a video on *Culturally relevant math tasks in the classroom* (See Appendix A). Teachers will review a digital list of CRT audio math books they could integrate into math lessons (See Appendix A for a digital list of culturally relevant audio math books). The participants will collaborate on grade levels to create five math lessons aligned with Unit 1 of their math curriculum. The following four CRT math practices will guide the activities.

1. Make it social—create math experiences that connect with others.
2. Incorporate culturally responsive literature.
3. Embed the local community into the math instruction.
4. Build bilingual communication into presentations of math instruction.

The district's STEM (Science, Technology, Engineering, and Math) coaches will support each grade level in creating the activities for the math unit. They will also provide feedback on the completed math activities. The day will end with each grade level presenting at least one math activity designed to allow the other participants to get a wide range of ideas. Teachers will leave the 3-day PD with a Factsheet, examples of CRT math lessons, and a digital list of culturally relevant audiobooks they could use during math lessons. Teachers will also leave with these takeaways:

1. What are twelve CRT math practices, and how to integrate at least 5 of the CRT math practices to create math lessons?
2. Why is CRT math practice critical in teaching culturally diverse students?

3. What does it mean to be culturally aware?
4. What are the eight competencies of CRT?

I will work with the participants to establish a PLC to meet once per semester via Zoom so they can reflect on their current practice. During the PLC Zoom meeting, the teachers will share their experiences using CRT math practices. They will share innovative ideas of activities they have created to use CRT math practices and discuss challenges or struggles and how they could overcome them. The PLC will meet after school hours to allow teachers to attend in the comfort of their homes. I will also create a blog: Culturally Responsive Teaching in Math, where teachers may share CRT math activities, post ideas, or ask questions about using CRT practices in the math classroom.

One possible challenge to the successful implementation of the project is participant attendance. The PD series will be voluntary and completed before the start of the school year. Teachers may not be willing to participate unless they believe the training will improve their knowledge and instructional practices to use CRT in the math classroom.

Another obstacle is teachers making the time to attend the PLC ongoing Zoom meeting. A potential solution is to have the Zoom PLC meeting in the evening so teachers can participate from the comfort of their homes. Another solution is to create a Blog so teachers may share their ideas, activities, and testimonials about using CRT math practices in the math classroom (see Appendix A).

The Proposal for Implementation and Timeline

I would first share the study's findings with the local school district board of education personnel and administrators to execute the proposed PD. I request that the district's PD coordinator review the PD plan aligned with this study's findings. To compensate the teachers for taking the time to participate in the PD, I intend to seek funding from the Grant Coordinator in the local district to provide a gift card or stipend to the participating teachers. Information regarding the outside organization CREC that will facilitate the first day of PD will also be presented in the proposal to the local school district board of education. By sharing the study's findings and the intent to use CREC as a facilitator, the board of education leadership team will get an opportunity to understand the perceptions, experiences, and challenges K−5 teachers face in using CRT practices in math. The findings will also indicate what teachers perceive would help improve CRT practices in the math classroom when working with culturally diverse students.

By presenting the study's findings to the educational leadership team, they will be able to consider the proposed PD and ongoing PLC sessions on culturally responsive math teaching. Suppose the district leadership team agrees to move forward with the proposed PD. In that case, I will set up a Zoom meeting to provide them with more details on the goals, PD focus, and CREC agency being considered to facilitate one of the 3- day's PD. The district's board of education will also get a chance to review the videos and articles used during the PD days. However, the district leadership team will decide on the culturally responsive agency, videos, and articles to be included in the PD. I will also propose to the board of education that teachers who attend the PD be awarded a

certificate and become culturally responsive support teachers in their school buildings. This will allow new teachers and other staff to have a resource person in their building who could support them with CRT needs. Finally, I will offer my time to collaborate with district STEM coaches to prepare them to model lessons that use CRT math practices.

Project Evaluation Plan

I will use formative and summative evaluations to determine if K−5 teachers gained some knowledge and skills from the PD that they could use to improve CRT math practices in the classroom. Firstly, I will use formative assessment during the PD sessions to ascertain teachers' takeaways, understanding, or misconceptions about CRT math teaching. For example, I will set up an opportunity for a gallery walk where teachers will use post-it notes to answer questions regarding their learning, misconceptions, or need for clarification, and some helpful strategies they can use when working with culturally diverse students. (see Appendix A).

On the summative evaluation, teachers will respond to both closed and opened ended questions on the last day to determine the overall effectiveness of the PD. The summative assessment presented in Google form will help determine teachers' further learning needs, overall experience, and how the training could improve. I will also use the assessment to gather information about teachers' interest in establishing a PLC for ongoing collaboration and support using CRT math practices (see Appendix A for the summative evaluation). Teachers will also leave the PD with at least four culturally relevant math activities that incorporate CRT math practices aligned to unit one of their math curricula.

This culturally responsive math PD aims to help K−5 teachers improve CRT math practices to ensure that culturally diverse students are successful in math. To capture teachers' successes, failures, thoughts, questions, concerns, and ongoing learning of the CRT strategies, they will attend one PLC Zoom meeting once per semester. Teachers will also access a CRT Blog Website with links and testimonials to resources on CRT math practices. The continuous support received through the PLC Zoom meeting and the Blog on CRT practices in math after the PD will ensure that K−5 teachers become more equipped with the skills and resources needed to use CRT math practices when working with culturally diverse students. The project will also allow teachers to collaborate and learn from their colleagues. K−5 teachers have voiced their need for PD to become more effective in using CRT math practices to enhance the math proficiency of culturally diverse students. This proposed comprehensive PD focuses on offering content and conceptual understanding of CRT, collaborative sessions for teachers to create math activities that they could implement, and opportunities to build teacher capacity for using CRT practices in the math classroom. The formative and summative project evaluation will include data that will determine if the 3-day PD workshop and ongoing PLC meeting for K−5 teachers were effective.

Project Implications

I designed the PD project experience to support K−5 teachers in improving the use of CRT practices in the math classroom when working with culturally diverse students. I intend to use this project to add value to the local setting and district level, as one goal of the school district is to improve the use of CRT at the K−5 level. The

participants of this study echoed the need for educational leaders to support PD that enhances their ability to improve the use of CRT practices in math when working with culturally diverse students. The PD learning experience I created could stimulate a positive social change if K−5 teachers feel empowered to use CRT practices in their daily math teaching. Upon completing the PD with K−5 teachers, I will write and share an article about the PD on the local district website. By sharing the article about the PD, administrators, educational leaders, and curriculum leaders in other school districts might be encouraged to use a similar PD approach to build teacher capacity in using CRT practices in the math classroom to enhance the success of culturally diverse students.

Summary

In section 3, I explain the overview, agenda, and evaluation tools for the execution of the project. Appendix B contains the breakdown of the 3-day PD. I also include a review of the literature that validates the importance of effective professional training to build teacher capacity to improve the use of CRT practices in math when working with culturally diverse students. In section 3, I discuss the summary of the potential challenges and potential solutions. This section also includes the rationale for the PD, suggestions for execution, and a plan to assess teacher learning and the project. In summary, I also provide the implication for social change for teachers and educational leaders. Section 4 includes the limitations and strengths of the project, including my reflections as the researcher.

Section 4: Reflections and Conclusions

For this study, K–5 teachers in the local district responded to questions about the challenges of using CRT practices in math with culturally diverse students. Teachers also shared their perceptions about what they believed would help them to improve CRT practices. During the data collection and analysis process, I learned about the teachers' successes, challenges, resource needs, and the type of PD needed to implement CRT practices successfully. Based on the PD needs expressed by teachers, I designed a 3-day PD to create an atmosphere of collaboration, skill building, and sharing of knowledge to enact teachers' CRT practices in math. Teachers who participate in the PD can expand their knowledge and work collaboratively with their colleagues to use the skills learned to reproduce culturally relevant math activities to support culturally diverse students in math. The PD project for this study can provide a blueprint for future teacher training. In this chapter, I evaluate the strengths and limitations of the PD project and share recommendations for this study. I also reflect on the study's importance and directions for future research.

Project Strengths and Limitations

One significant strength of this project is that the PD is geared toward improving the pedagogical understanding of CRT practices in the K−5 math classroom. Another strength of this project is that the participants will have an opportunity to learn from experts in the field, work with their colleagues, and leave the PD with prepared culturally responsive math activities that they can use in their classroom. Another strength of this project is that the ongoing PLC meetings and blog will allow teachers to reflect on

innovative CRT math practices, discuss challenges they face using CRT practices, and share ideas throughout the school year. During the PLC meeting, novice and veteran teachers will access current research and information about CRT practices that apply to the math classroom.

This project has a few limitations that could determine the success of PD. One of the project's limitations is the participants' obligation to attend a 3-day of PD. This PD will be in addition to other PD required by the district in preparation for the start of the new school year. While teachers expressed the need for PD to improve CRT practices when working with culturally diverse students, they might not be willing to take time out of their schedules to participate in a 3-day PD in addition to their everyday responsibilities. Additionally, teachers may not be willing to attend a PD that is not focused on meeting the needs of all their students.

Recommendations for Alternative Approaches

The participants in the study indicated that they needed more training, support from administrators, and culturally relevant resources to improve the use of CRT practices in the math classroom when working with culturally diverse students. Based on the findings of this study, educational leaders need to offer alternative approaches and opportunities for teachers to participate in PD to ensure that teachers improve their CRT. The district leadership team also needs to create different pathways for teachers to engage in PD that do not increase demand on their time or schedule. One option would be asynchronous PD for teachers to work at their own pace. Another alternative approach that the district leadership team could explore is to design CRT practice PD time during

teachers' instructional data team meetings, as that time slot is already a part of the teachers' work schedule. An additional option could be to have one day of scheduled PD per marking period to allow each grade level to meet and plan culturally relevant math activities. Students would not be present during this PD day, so teachers would have enough time to focus and collaboratively plan math lessons. Finally, the district leadership team could set up culturally responsive model classrooms for teachers to visit or watch virtually to gain first-hand experiences using CRT practices in the math classroom.

Scholarship, Project Development and Evaluation, and Leadership and Change

This basic qualitative research process took on an iterative design approach. I employed various steps to design a practical project study that would meet the needs of the teachers, resource personnel, and administrators. Once I collected the data and transcribed the interviews using the Otter.ai program™, tables were created in Microsoft Word™ and Excel Spreadsheets, which were useful tools to organize the data set for coding. As I read, coded, and categorized the participants' responses, I understood the challenges and resolutions teachers perceived would improve CRT practices in math. A methodologist specialist reviewed the initial conclusions from the data set and provided guidance on how to identify the emerging themes. Throughout the project study, I experienced writing challenges, but as I worked through the challenges, my character as a doctoral student and project designer improved. I also identified some of my strengths and weaknesses as a scholarly writer; however, I am convinced that my strengths and weaknesses were important to become a change agent. I researched extensively to find

appropriate resources and scholarly articles to support the rationale for designing PD and PLC. Prenger et al. (2021) asserted that PLCs could build teacher capacity and improve the teaching and learning process, which is a potential goal for this project study.

While my writing skills as a researcher have improved, the greatest reward is that I feel more confident promoting and facilitating opportunities to stimulate change among adult learners. I feel more assertive supporting teachers, administrators, and district leaders in making decisions concerning how to use CRT practices in the math classroom. As an Afro Jamaican and math teacher for over 20 years, I believe I can continue to follow my passion promoting equity for culturally diverse students in the math classroom. I have gained a wealth of knowledge about different CRT math practices and how to support teachers in using them to make math more engaging and rewarding for culturally diverse students. In the review of the literature for this project study, I highlighted the importance of creating PD with a specific subject focus, offering opportunities for teacher collaboration and reflection (see Holliday, 2021; Sancar et al., 2021; Popova, 2022). Darling-Hammond et al. (2017) also encouraged PD planners and facilitators to consider the characteristics of adult learners during and after PD. Therefore, I considered those recommendations as I designed the PD to meet the needs of the teachers to support them in improving CRT practices in the math classroom. Embarking on this project study has helped me to become an agent of change.

In my future pursuits, I want to become a culturally responsive change agent for my school district, where I develop and facilitate PD on CRT practices for all grade

levels in urban schools. Change agents in education seek new innovative strategies and opportunities to support and promote the success of all (Timm & Barth, 2021).

Today, there is a high demand for STEM educators to use CRT to support a diverse body of students (Olayemi & DeBoer, 2021). As such, I desire to conduct more research on CRT practices across different disciplines, such as science, to shed light on some of these challenges. Like math, integrating CRT practices in science could influence the student's academic achievements, attitudes, and identities (Yu, 2022). Using culturally responsive science teaching creates accessibility for culturally diverse students' science (Brown et al., 2021; Yu, 2022). Allowing culturally diverse students to explore science through a cultural lens can benefit their academic success. However, many science teachers are not prepared to teach science through a cultural lens because they have not examined their beliefs or increased their confidence in working with culturally diverse students (Brown et al., 2018). Therefore, there is a need for more research to determine what support teachers require to transfer CRT theory to practice in science (Abdulrahim & Orosco, 2020; Brown et al., 2021). Continued conversations between researchers, teachers, and other stakeholders could advance culturally responsive science teaching to enhance the academic success of culturally diverse students. Further exploration could add to the body of knowledge concerning CRT practices. District leaders and administrators could also use the research findings to make informed decisions about supporting science teachers in using CRT practices

Reflection on Importance of the Work

As I reflect on this project study that is taking me one step closer to closing this chapter of my educational career, I am amazed at how much I have grown as a lifelong learner. It is rewarding to know that my study could significantly contribute to PD for educators and improve the culturally responsive pedagogical practices among K−5 teachers and students in the local district. The focus of this study was that K−5 teachers would improve the use of CRT practices in the math classroom when working with culturally diverse students. Based on participants' responses to the interview questions, lack of training, time constraints, and limited resources influence CRT practices in the math classroom. Most teachers believe they need more knowledge and resources to improve CRT practices in math when working with culturally diverse students. This project study helped fill this gap in practice as the PD was designed to meet the needs of the K−5 teachers across the local district. To build teacher capacity, teachers must gain the knowledge and skills needed to improve the use of CRT practices in the math classroom.

Implications, Applications, and Directions for Future Research

The findings of this study give rise to practical and theoretical implications. Firstly, they provide empirical evidence that supports Bonner's (2021) ideas for integrating culturally responsive practices in math and Neri et al.’s (2019) perspective on reframing teacher resistance to CRT as the way forward to shift teachers' towards using CRT practices in the classroom. The emerging themes indicate that the challenges teachers face using CRT practices in math are influenced by Neri et al.’s elements of

teacher resistance to CRE practices: (a) limited understanding and belief in the efficacy of CRT and (b) a lack of expertise needed to execute it. Min et al. (2022) also validated teachers' perceptions of the challenge of using CRT practices in the classroom. Min et al. found that lack of knowledge of and skill with CRT, lack of cultural competence, and time influence CRT practices.

The findings implicate that a lack of knowledge and experience using CRT practices influenced their ability to meet the needs of their culturally diverse students. This is supported by another finding in which teachers reported that a lack of cultural awareness challenged their self-efficacy and confidence to sustain CRT practices in the math classroom (Thomas & Berry, 2019). Therefore, administrators should consider providing opportunities for teacher collaboration and for teachers to observe other teachers who use CRT practices to develop their competency with CRT practices.

The findings also implicate the importance of PD as highlighted by Chen & Yang (2017), Davis (2021), and Gay (2018). Based on this finding, I suggest that district leaders endorse a 3-day PD with an ongoing PLC to support teachers in developing the knowledge and skills needed to improve the use of CRT practices. PD opportunities empower teachers to enact more inclusive CRT practices. Further, because a limited understanding of culturally relevant practices and a lack of knowledge of how to use CRT practices influence student performance (Neri et al., 2019), school administrators should consider strategies to develop teacher capacity in CRT practices (Gay, 2018; Samuels, 2018).

With the school district promoting the use of CRT to work toward educational equity, some teachers in the district request that they have access to culturally relevant math activities and literature books to help them create culturally relevant learning spaces. By doing this, the district will create opportunities for teachers to use culturally relevant activities and other tenants of Gay's (2010) theoretical framework on CRT to promote student academic success.

These findings call for school administrators and district leaders to develop and provide supportive opportunities like the 3-day PD that promotes practices that empower teachers to meet the needs of culturally diverse students. Given that lack of time for planning culturally relevant math activities was indicated as a challenge for using CRT practices, school administrators and district leaders should help teachers obtain enough time to develop culturally relevant activities to serve students better. Teachers should also be provided with human capital, feedback, and physical/virtual space to effectively explore, evaluate, and reflect upon their practice, like what this project study offers. Teachers taking part in effective PD and PLCs increase their knowledge and skills to improve instructional practices and determine student academic growth (Brigandi et al., 2019; Sims & Fletcher-Wood, 2021).

A possible implication for positive social change could be the improvement of teachers' knowledge and skills when using CRT practices in the math classroom. Gunn et al. (2021) and Farinde-Wu et al. (2017) asserted that culturally responsive teachers must develop culturally relevant teaching practices. If district leaders review research to make decisions on how to identify the best approaches, strategies, and techniques to support

teachers in using CRT practices in math, there may be an improvement in the math proficiency of culturally diverse students. This could increase graduation rates and ultimately influence students to pursue careers in science, technology, engineering, and math.

Based on this study's findings, a recommendation for future research would be to continue exploring the needs of teachers in rural areas with most culturally diverse students at the middle and high school levels. By broadening the scope of this study, the local school district could gain insight into how to support teachers' CRT practices in math at the K−12 level. Another recommendation for practice for school leaders and teachers is to continuously review and analyze CRT practices to make informed PD and instruction decisions. This is an ongoing process because CRT practices continuously evolve as research studies are conducted to develop opportunities for teachers to enact more comprehensive and better CRT practices.

Conclusion

In this study, teachers' perceptions about the challenges of using CRT practices when working with culturally diverse students in math were explored to gain insight into their suggestions for needed resources and training. Teachers face challenges in using CRT practices in the math classroom due to time constraints, lack of cultural awareness, and limited knowledge of CRT practices. Teachers desired PD, teacher collaboration opportunities, and culturally relevant resources. The findings of the study have significant contributions to the educational field. Firstly, the evidence collected from the K−5 teachers contributes to scholarly literature in the field. Secondly, the findings reveal the

need for PD to support K−5 teachers' growth in developing cultural awareness and the skill sets needed to become culturally responsive change agents. Thirdly, the PD project supplies insight into how administrators and district leaders can better aid and promote K−5 teachers' CRT practices in math.

In summary, despite these notable findings, the project study has limitations that could potentially decide its success. Although the PD project aims to meet the needs of the K-5 teachers, district leaders may need to integrate PD during scheduled school time to accommodate more staff. Teachers' resources and training needs may also vary depending on the grade level; as such, it is suggested that future research explore teachers' CRT needs at the middle and high school levels.

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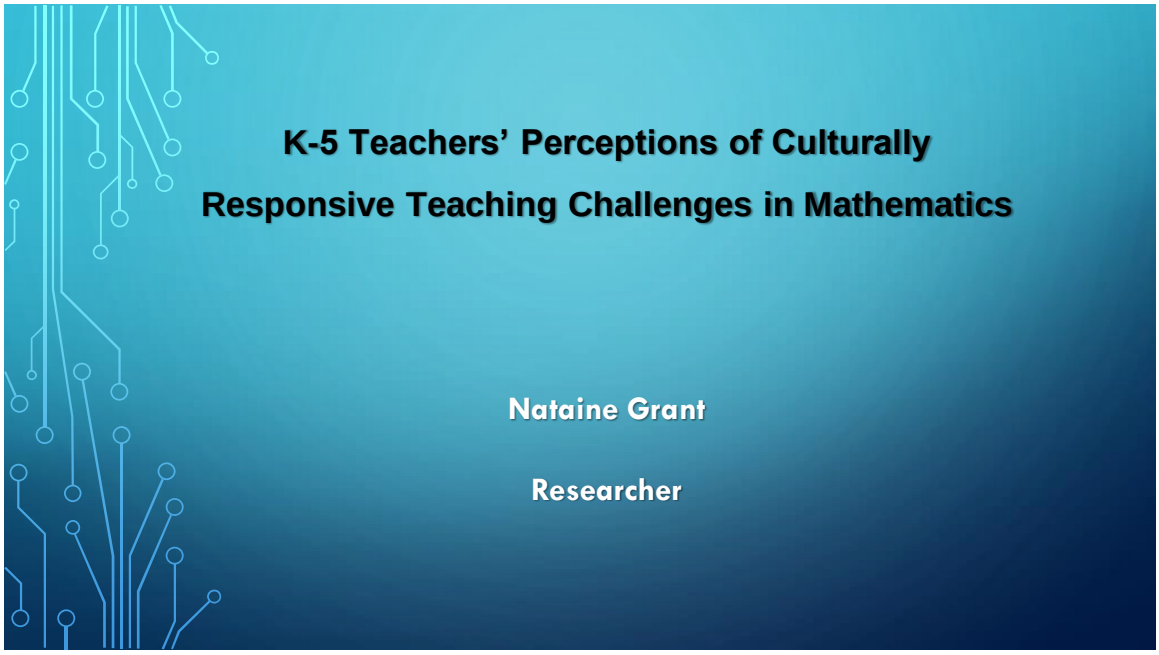
Appendix A: Project Study Content

Presentation of Findings for the School District

The PowerPoint presentation below shows the study findings and steps I will take to provide teachers with the training needed to improve culturally responsive teaching. I will share the PowerPoint presentation with the school district leadership team to gain their support in executing the 3-day professional development within the district.



K −5 Teacher Participant Invitation

Dear K −5 Teachers,

You are invited to participate in a 3-day professional development on CRT math practices as teachers have expressed a need for more training to improve the use of CRT practices in math. As a teacher of culturally diverse students, who work in a district with a CRT mandate, you are ideal for learning valuable content and experiences aligned to what CRT math practices are and how to incorporate these practices into your daily math lessons. Upon agreement, I will inform you of the local site for the in-person 3-day professional development. During the sessions, you will work with culturally responsive teaching experts to develop a deeper understanding of CRT math practices, how to best incorporate these practices in your math lessons and share with colleagues your experiences with CRT practices. You will collaboratively plan math activities aligned to CRT math practices. Lastly, you will be asked to become a part of a professional learning community (PLC). During the PLC meeting, you will meet once a semester via the Zoom platform to collaborate, share ideas, and discuss concerns about using culturally responsive teaching practices in your math classroom.

Your participation will be beneficial and could lead to a deeper understanding of how to successfully use culturally responsive teaching practices in math when working with culturally diverse students.

Sincerely, Nataine Grant

Walden University Doctoral Student

Project Study Goals and Objectives

Target Audience: K−5 Teachers

Goal: The goals of professional development are to allow teachers opportunities:

- To develop their knowledge of the different constructs of culturally responsive math teaching by reviewing articles, examining videos, and working with culturally responsive teaching experts.
- To increase cultural awareness by examining the eight competencies of culturally responsive teaching and reflecting on their experiences of using CRT in the classroom.
- To use constructs of twelve culturally responsive math practices and audio literature math books to create mathematics lessons that engage students (See Appendix A project study content).

Objectives:

1. After completing the 3-day professional development on CRT math practices, teachers will apply their knowledge and skills of at least 4 of the twelve CRT math practices to create a grade-level aligned math lesson.
2. At the conclusion of the 3-day professional development, teachers will establish a professional learning community where they will have a space to continue sharing ideas, creating culturally relevant mathematics activities, reflecting on the successes of CRT practices, and finding new innovative resources that promote how to implement CRT practices in mathematics.

Factsheet: Culturally Responsive Mathematics Teaching

Factsheet

Culturally Responsive Mathematics Teaching

Knowing and Valuing Every Learner

Culturally diverse students historically experience poorer educational outcomes than their White counterparts. To address this disparity, school districts have invested considerable resources to bridge student achievement gap. Against this backdrop, educators are encouraged to use culturally responsive teaching to improve students' outcomes. Using CRT practices during mathematics instructions requires that teachers connect CRT theory to practices. However, some teachers face challenges in implementing culturally responsive teaching practices in the mathematics classroom, which influences their ability to support culturally diverse students.

How is Culturally Responsive Teaching Defined?

Culturally responsive teaching uses students' cultural knowledge, prior experiences, frames of reference, and performance styles as resources to support learning. Teachers can help all students feel like they belong in math classes by creating connections between course material and students' lives.

For example:

- Teachers might spend time connecting a math unit to student experiences. For example, teachers may use food recipes related to students' culture to introduce measurements.

What Practices Are Considered Culturally Responsive?

Researchers and educators have identified a number of culturally responsive practices that, when applied as a component of a comprehensive strategy aimed at empowering and enhancing learning outcomes for culturally diverse students:

- Foster a welcoming environment by recognizing student contributions and solicit their feedback to improve relationships, classroom culture, and instructional practices. For example, at the end of instructional units, a teacher may debrief with students to find out

- Build relationships within schools and communities. For example, create interdisciplinary lessons with science teachers, or use data from the cafeteria to find the number of students who have hot or cold lunches.
- Students may invest time using the material they have learned to comprehend challenges affecting their neighborhood more thoroughly and offer solutions based on their personal experiences.
- Give students various ways to engage with the educational content by drawing on their prior knowledge and experiences. For example, students may create bar graphs or pictographs of their favorite food.
- Employ methods that connect the classroom to the real world, such as inquiry-based approaches and visual representations. Observe buildings in the community to identify shapes.
- Encourage student participation by promoting collaborative teaching and learning through student-to-student and student-to-teacher discussions. For instance, a teacher might arrange "turn and talks" during a math session to facilitate students' discussion of the material covered.

Culturally responsive educators understand how to create a learning environment that allows students to see the relevance of mathematics and how their culture and background relate to learned content.

what worked well and what needs improvement.

- Build relationships with students and collaborate with families to support student learning. To help foster the relationships, teachers may have a meet and greet social at the beginning of the year to learn more about the students and their families.

Implementing culturally responsive teaching in math requires adequate preparation, a willingness to alter classroom expectations and curriculum, and an ongoing commitment to fostering an environment conducive to productive, engaging learning. When culturally responsive teaching is implemented, all students can make a meaningful connection to mathematics and acquire skills to become lifelong learners.

Who is Culturally Responsive Teaching for?

Learners' varied identities and experiences are found, honored, and used in a culturally responsive classroom to bridge rigorous new learning. All pupils benefit from this kind of personalized education. Nevertheless, a disproportionate number of students from varied backgrounds face educators who declare, "I don't see color," and dismiss their cultural methods of knowing as obstacles to learning. Culturally responsive teaching would enable all students to respect one another's cultural heritage and current realities in a society that is becoming more and more diverse.

Why is culturally responsive teaching important in math?

TEDx Talk Video: Culturally Relevant Pedagogy in Mathematics: A Critical Need: https://youtu.be/EjLOuUhN6xY

Dr. Shelly M. Jones is Associate Professor at Central Connecticut State University. Her interests include culturally relevant mathematics, connecting mathematics and music, and students' mathematics beliefs. She contributed to The Brilliance of Black Children in Mathematics: Beyond the Numbers and Toward a New Discourse Tips:

- Math is cultural.
- Three criteria for academic success- (students have academic success, students have cultural competence, and students develop a critical consciousness).
- The learning environment must provide a social context for learning.
- Connect math to real-life stories.

Strategies to Over Challenges of Implementing Culturally Responsive Teaching Mathematics Practices

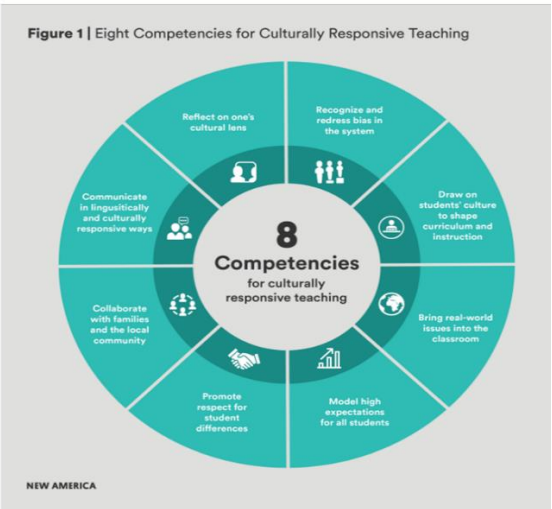
Twelve Ways to Make Math More Culturally Responsive: https://www.edweek.org/teaching-learning/opinion-twelve-ways-to-make-math-more-culturally-responsive/2020/12

1. Cultivate student collaboration
2. Building Community
10. Use oral-based instruction for math concepts
11. Go beyond having a growth mindset.
12. Connect content to real-world situations.

Researchers conclude that culturally responsive math practices in the classroom increase motivation and interest in mathematics to help improve conceptual meaning and understanding. Other benefits include helping students develop a positive attitude towards mathematics to build a consciousness of their future in mathematics.

What Are Teachers' Competencies That Promote Culturally Responsive Teaching?

Cultural competence is the ability to understand, be sensitive, and be appreciative of the history, values, experiences, and lifestyles of others



(Muniz, 2019)

3. Make it social—create math experiences that connect with others.
4. Incorporate culturally responsive literature.
5. Embed the local community into the math instruction.
6. Build bilingual communication into presentations of math instruction.
7. Include challenging and complex work
8. Use culturally relevant manipulatives
9. Select relevant role models

Gloria Ladson-Billings - *Successful Teachers of African American Children:* *https://youtu.be/hmAZjNRmalI*

- ❖ What is cultural competence?
- ❖ What is the so what factor?
- ❖ What is culturally relevant pedagogy?

Cultural awareness means understanding the dynamic values and beliefs of diverse cultures. It fosters culturally responsive teaching.

- ❖ Express interest in the ethnic background of your students.
- ❖ Redirect your role in the classroom from instructor to facilitator.
- ❖ Maintain high expectations for student performance.
- ❖ Maintain an "inclusive" curriculum that remains respectful of differences.

Sample: Math Activities That Incorporate Culturally Responsive Math Practices

Grade 5

Topic: Adding and Subtracting Fractions

Common Core Standard: Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

Success Criteria: I can add and subtract fractions with unlike denominators by finding equivalent fractions by using measuring cups.

ENGAGE (WARM-UP)

Two days before this lesson, the teacher may request that students take recipes for their favorite cake, dinner, or meal. The recipe could be a family recipe or one they found on the internet. One of the ingredients must have a fraction quantity.

One day before this lesson, students and teachers will decide on the recipe they want to focus on and prepare for the lesson.

On the day of the lesson, 3-4 students will share the story behind the recipe they brought.

EXPLORE

Students will work in groups to use tools that can be added or subtracted to get to the recipe amounts using 1) addition and 2) subtraction. Examples:

- The recipe calls for ½ cup of almond flour. Ask the students which cup they would use to get to ½ cup if they have 1 cup and¼ cup. Why?
- The recipe calls for $^{3}/_{12}$ cup of granulated sugar. Ask the students which cup they would use if they had ½ cup, ¼ cup, and ⅛ cup. Why?

EXPLAIN

The teacher may use addition and subtraction to models to explain the equations from the explore session. The teacher must explain the importance of having the same denominator to add or subtract fractions.

- Students may share how they would add and subtract fractions.

ELABORATE

The teacher will select other recipes with similar ingredients and have student practice adding and subtracting fractions.

EXIT TICKET

Discussion questions from this lesson:

- Why is it important to add or subtract two fractions with the same denominators?
- What other reason can we have for needing two fractions to have the same denominator?

Kindergarten

Topic: 3 Dimensional and flat Shapes

Have students go on a nature walk within the school or the community to identify examples of 3 dimensional or flat shapes observed.

Discuss the importance of shapes in our environment.

Sample: Culturally Relevant Math Audio Books

The samples below show links to audio math books that teachers may integrate into math lessons.

KINDERGARTEN				
Unit	Title	Author	Content - Standards	Link(s)
1	Five Little Ducks	Denise Fleming	Counting, Add/Sub to 5	https://www.youtube.com/watch?v=76wnvD8hmYg
1	How Do Dinosaurs Count to 10	Jane Yolen	Counting	https://youtu.be/n-wRps6QNnk
1	Roosters off to see the World	Eric Carle	counting	https://www.youtube.com/watch?v=d7MpLijjM_M
2	Ten Black Dots	Donald Crews	Count to 10	https://youtu.be/dviUddyN1D0
2	The Crayons Book of Numbers	Drew Daywalt	Counting	https://www.youtube.com/watch?v=eBhTVdXe3UY
2	The First Day of Winter	Denise Flemming	Count to 10, Problem Solving	https://www.youtube.com/watch?v=JDua9EyshKo

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Professional Development Agenda Day 1

Time	Activity
8:00 - 8:15	Login with a QR code to ensure that the participants receive their certificate of completion
8:15 – 8:50	Professional Development Introduction Overview of the study • Purpose • Research Questions • Results
8:50- 9:15	Review of the District's Culturally Responsive Teaching/ Equity Policy **Purpose:** The purpose of this policy is to establish a framework for educational equity for all students to ensure the elimination of bias, particularly institutionalized racism - and cultural bias, as factors affecting student achievement and learning experiences and to promote teaching and learning, and work environments that welcome, respect, and value strength in diversity **Goal - School and Culture**: Ensure an inclusive school and classroom culture conducive to student wellness and academic growth. **How:** • Ensure a culturally responsive curriculum K-12. • Promote culturally responsible pedagogy in instructional framework and practice. • Provide professional learning support to teachers for strengthening relationships and enhancing socio-emotional support in classrooms.
9:15- 11:00	CREC Presentation • What is culturally responsive teaching? • Who is culturally responsive teaching for? • What are teachers' competencies that promote culturally responsive teaching? • What does the research say about culturally responsive teaching?
11:00- 11:30	Break - light snack in the cafe

11:30- 12:30	Teachers will watch a 14-minute TEDx Talk video on *Culturally relevant pedagogy in mathematics: A critical need* https://youtu.be/EjLOuUhN6xY Discussion: • Takeaway from the video • **Reflection**: Why is culturally responsive teaching in math relevant?
12:30- 1: 30	Lunch on your own
1:30 – 2:30	Teachers will be asked to share their experiences of using CRT practices in the classroom and Complete the Formative Evaluation.
Day 2 Professional Development	
8:30- 9:00	Housekeeping and Ice Breaker Ice Breaker: Marooned If you were marooned on a deserted island, which three people would you want with you? They can be dead, alive, or imaginary. What tools would you use to survive? (Break into groups of 5)
9:00- 10:00	Review of Day 1: What are some culturally responsive teachings math practices discussed on Day 1? **Teacher reflection**: Sharing Teachers will share some of the activities they have used to incorporate culturally responsive math practices in the classroom.
10:00- 10:40	The teacher will watch a 6- minute video where Dr. Gloria Ladson-Billings present information on - *Successful Teachers of African American Children* https://youtu.be/hmAZjNRmalI Discussion: • What does being culturally aware mean to you?
10:40- 11:00	Break- Light snacks in the café.
11:00- 1:00	Break out in small group sessions to read and discuss the article: *Twelve Ways to Make Math More Culturally Responsive.* (Teachers and administrators will be given a printed vision)

	https://www.edweek.org/teaching-learning/opinion-twelve-ways-to-make-math-more-culturally-responsive/2020/12 Based on the article, teachers and administrators will respond to these questions. • What are some culturally responsive math practices? • Which practices identified in the article do you believe might be challenging to implement in your math classroom? • How will you overcome the challenges identified?
1:00- 2:00	Lunch in the cafe.
2: 00- 2:45	Teachers will come together and share takeaways from the articles and discuss the guided questions used during the small group discussion.
2:45- 3:00	Teacher Reflection and Takeaways **Supply for Day 3: Unit one of the Math Curriculum**

Day 3 Professional Development	
Time	**Activity**
8:30- 9:00	Housekeeping and Ice Breaker Teachers will be encouraged to participate in this activity 
9:00- 9:300	Review of Day 2: What are some culturally responsive teaching math practices discussed on Day 2? **Teacher reflection**: Sharing Teachers will share some of the activities they have used to incorporate culturally responsive math practices in the classroom.
10:00- 11:00	Teachers will watch a video of a coach modeling culturally responsive teaching in a math classroom.

	Coach/Training: Culturally Relevant Math Lesson https://youtu.be/iXuIZ9AGEog (21 minutes) Discussion questions stimulated by video: • Why is culturally responsive teaching important in math? • What was some evidence of cultural responsiveness modeled in the lesson? • What was some evidence of student discourse? • What was some evidence of student engagement?
11:00- 11:30	Question & Answer What are some misconceptions that you still have about using culturally responsive teaching in the math classroom?
11:30- 12:30	Lunch (on your own).
12:30- 2:30	**Collaborative Planning Session** Teachers will review a digital list of culturally relevant audio math books for K-5. Then discuss how they could integrate the audiobooks into math lessons. Teachers will be asked to group according to grade level. Each grade level will work collaboratively to plan five activities from Unit one of the math curricula. During the planning sessions, math coaches will give groups feedback on the activities being created. The following four CRT math practices will guide the activities. • Make it social—create math experiences that connect with others. • Incorporate culturally responsive literature. • Embed the local community into the math instruction. • Build bilingual communication into presentations of math instruction. **Debrief:** Share out one culturally responsive math activity for each grade level.
2:30- 3:00	Teachers will complete the Google form of the **summative assessment.** Discuss establishing a professional learning community that will provide ongoing support and a space to share ideas, concerns, or testimonials about culturally responsive teaching in math.

Formative Evaluation

Gallery Walk questions:

1. What is your understanding of CRT math practices?
2. What are some misconceptions and/or reservations that you still have about CRT math practices?
3. What are some helpful strategies that you will replicate in your math classroom when working with culturally diverse students?
4. What is your "aha" moment from today's training?

The Summative Evaluation

1. On a scale of 1to 5, how effective was the culturally responsive professional development? (1 being the lowest and five being the highest).

   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

2. Which session was most impactful to you and why? Please explain your selected choice.

   ☐ Working with culturally responsive teaching experts.

   ☐ Learning about the 12 CRT math practices.

   ☐ Watching the video on how a teacher uses CRT practices in the math classroom

   ☐ Working collaboratively with your grade level to plan culturally relevant math activities.

3. How likely will you now use CRT math practices in the math classroom? Please explain your selected choice in the space below.

   ☐ Very likely ☐ Somewhat ☐ likely Not likely ☐

4. How likely are you to participate in the once-per-term PLC Zoom meeting?

   ☐ Very likely ☐ ☐ Somewhat likely ☐ Not likely

5. Of the CRT math practices explored, which ones are you likely to incorporate in your math lessons? Select all that apply.

   - Building Community.
   - Providing Real-World Connections.
   - Create opportunities for Student Collaboration.
   - Make It Social—Create Math Experiences That Connect with Others.
   - Embed the Local Community into Your Math Instruction.
   - Provide Oral-Based Instruction for Math Concepts.
   - Select relevant role models- to build student frame of reference.
   - Use culturally responsive manipulatives.
   - Incorporate culturally responsive literature.
   - Including challenging and complex work.
   - All of the above
   - Other

6. What could we do to improve the training in CRT math practices?

Appendix B: Interview Protocol

Project: K-5 Teachers' Perceptions of Culturally Responsive Teaching Practices Challenges in mathematics

This interview will take place on a local site (ABC) convenient for potential participants. It will take approximately 60-minute, starting with a list of semi-structured questions. I will electronically capture the interview using a digital recorder. An iPad capture of the recording will serve as a backup. I will send the audio files to Otter ai™ transcription service for transcriptions, after which I will develop a summary of the interview. As a participant in the study, you will be asked to participate in a member checking where you will get a chance to review the study's initial findings.

Please be aware that: (1) all information will be held confidential, (2) your participation is voluntary, and you may stop at any time if you feel uncomfortable, and (3) I do not intend to inflict any harm.

Framework: Gay's culturally responsive teaching theory will be the conceptual framework for this study. Gay postulated that educators who take a culturally responsive approach instruct students based on their prior knowledge, cultural frame of reference, and cultural needs (Gay, 2010).

Time of Interview:

Interview Location:

Date:

Interviewer: Nataine Grant

Interviewee Pseudonym:

Position of Interviewee: The participant will sit across from the interviewer; if it is a virtual interview, you will be asked to keep your camera open.

The purpose of this study is to explore K–5 teachers' perceptions about the challenges of using CRT practices in math with culturally diverse students and identify teacher suggestions for needed resources and training.

RQ 1: What challenges do K−5 teachers face when using culturally responsive teaching practices in math with culturally diverse students?

CRT construct 1: developing a knowledge base about cultural diversity.

CRT construct 2: including ethnic and cultural diversity content in the curriculum.

Interview Items:

1. Describe your experiences using culturally relevant teaching (CRT) practices in the mathematics classroom?
2. Identify CRT practices with which you are familiar. Which one(s) do you use in your mathematics classroom? How do you know these practices are effective in meeting the needs of culturally diverse students?
3. What types of mathematics activities do you use during math instruction to allow culturally diverse students to make relevant connections to their experiences and math? Have you encountered any challenges in making math engaging and relevant for culturally diverse students?

RQ2: What are the perceptions of K−5 teachers on improving CRT practices in math when working with culturally diverse students?

CRT construct 3: responding to ethnic diversity in the delivery of instruction for teacher preparation**.**

Interview Items:

4. Have you received training on using culturally responsive teaching practices in teaching math with culturally diverse students? If so, please describe approximately when you received the training, the types of training you received, and how effective you found the training.
5. Do you feel you get support from the district to assist with implementing CRT practices in math when working with culturally diverse students? If yes, please explain? If not, what resources do you need from the district?
6. What resources would support you in using culturally responsive teaching practices in your math classrooms?
7. Is there anything else that you would like to share about culturally responsive teaching in math when teaching culturally diverse students?

Thank you for agreeing to take part in this interview. Your cooperation is deeply appreciated. Please be assured that your responses, comments, and answers will be confidential. All video/ audio recordings, transcripts, and notes will be kept locked away in a file locked cabinet in my home for 5 years, after which they will be discarded.

To consent, please reply to the email with 'I consent.'

Thank you!