# "All Children Matter": A Preservice Teacher's Understanding and Practice of Culturally Responsive Teaching in a Third-Grade Mathematics Classroom

**Jane Mwihaki Mburu, Ph. D**

**Independent Scholar**

**U. S. A.**

**ABSTRACT: Many researchers have called for teacher educators to provide experiences that can prepare preservice teachers to become effective in adopting and implementing culturally responsive practices in mathematics classrooms. This study examined how one prospective teacher understood the concept of culturally responsive teaching and how she later implemented this understanding in a third-grade mathematics classroom during her student teaching. Analysis of the data demonstrates that the teacher-participant did not have a good understanding of culturally responsive teaching and did not implement it other than superficially.**

**KEYWORDS: Preservice teachers, student teaching, diversity, culturally responsive mathematics, culturally responsive classroom practice**



Public schools are becoming increasingly diverse exponentially (Snyder et al., 2019; Woodward, 2018). However, the teaching workforce is predominantly white. About 80 percent of the teaching workforce identify as white, monolingual, and female from middle-class backgrounds (Berchini, 2015; Haddix, 2016; Skepple, 2015; Strauss, 2015). A teaching workforce that is less diverse than its students can lead to underrepresentation and cultural conflict between the teachers and their students (Wells, 2020). Furthermore, cultural mismatch can impact the perceptions teachers have toward their students and the ability to form authentic relationships with them (Boser, 2014; Bowman et al., 2018; Goldring et al., 2013; Grinage, 2011; Howard, 2003; Milner, 2006; Siwatu et al., 2016).

Much attention has been focused on ways to prepare mathematics teachers to become culturally responsive (Boaler & Staples, 2008; Bowman et al., 2018; Civil & Khan, 2001; Gutierrez, 2000; Tate, 1995; Villegas & Lucas, 2002). The

urgency of this preparation comes from observing the disturbingly low rates of mathematics achievement by students of color (African Americans, Latinx, and Native Americans) and low-income students (Bowman et al., 2018). According to some scholars, the low performance in mathematics among racially diverse students is not because of inability or potential (Gutiérrez, 2000); it is because the school environments, schooling practices, curricula, and classroom culture do not mirror their home and community cultures (Villegas & Lucas, 2007). Teaching and learning that is separate from students' cultural and lived experiences contribute to a disengaged and disinterested learner (Aguirre et al., 2017; Bonner, 2014; Corp, 2017; Harding-DeKam, 2014).

In its "equity principle," the National Council of Teachers of Mathematics (NCTM, 2000) calls for mathematics teachers to hold high academic expectations – practices that align with culturally responsive teaching. However, mathematics as a subject continues to be understood as culture and context-free and divorced from the everyday experiences of students (Aguirre et al., 2017; Civil & Khan, 2001; Tate, 1995) thereby leading to ignorance of the contributions other groups of people have made (Wiest, 2001). Furthermore, the teaching of mathematics that is divorced from students' realities contributes to systemic oppression and invisibility of the already marginalized groups of students (Boaler & Staples, 2008). Teachers cannot realize the potential of diverse students if their teaching practices continue to devalue and ignore these students' funds of knowledge (Wells, 2020).

To be mathematically proficient is extremely important to students of color. Most students depend on the school for social advancement and reaching future goals (Ladson-Billings, 2007). However, not all students can access quality and rigorous mathematics and instructional practices that adequately prepare them for success (Tate, 2005). Most teachers, even the well-intentioned, continue to exclude diverse students in the learning process. This exclusion is because of language and cultural barriers, often reifying myths of who is and is not encouraged to participate, learn, and become successful (Aguirre et al., 2017; Wells, 2020). Unfortunately, society tends to view those good at mathematics as intellectually superior (often white males or Asians). This understanding can prohibit students of color from becoming successful later in life (Waddell, 2014).

Dominant instructional mathematics practices have often included "giving information, asking questions, giving directions, marking assignments, monitoring seatwork, reviewing assignments, assigning homework, settling disputes, punishing non-compliance, marking papers and giving grades" (Haberman, 1991, p. 290). Unfortunately, these teaching approaches continue to dominate in most US mathematics classrooms (Aronson & Laughter, 2016; Ellis & Berry, 2005; Kana 'iaupuni et al., 2017; Leonard, 2018). These one-size-fits-all practices, although seemingly objective, are void of students' cultural strengths and experiences (Leonard et al., 2009; Parker et al., 2017). This culture-free instruction can lead to low motivation, lack of interest, low confidence, and overall poor performance (Aguirre et al., 2017; Harding-DeKam, 2014; Matthews & Lopez, 2019).

Culturally responsive mathematics is vital because it allows students to make personal connections, important for developing a meaningful and robust

understanding of mathematics content (Bonner, 2014; Corp, 2017). Compared to other school subjects, mathematics teachers seem to have difficulty finding examples of appropriate culturally responsive practices (Debnam et al., 2015; Mette et al. 2016; Namatovu, 2015; Parker et al., 2017; Siwatu et al., 2016). Debnam et al. (2015) reported that teachers have difficulty adapting the curricula to make them more culturally responsive and exciting. This study concluded that mathematics teachers had problems creating culturally responsive classrooms because they lacked an understanding of culturally responsive teaching.

## Relevant Literature

Teachers can successfully integrate culturally responsive practices by utilizing students' cultural knowledge, frames of reference, and prior experiences to make learning relevant and engaging (Au & Jordan, 1981; Gay, 2000, 2010; Ladson-Billings, 1995; Paris, 2012). Much evidence shows that teachers have been successful in implementing culturally responsive practices in mathematics classrooms (Boaler & Staples, 2008; Bonner, 2014; Civil & Khan, 2001; Corp, 2017; Ensign, 2003; Fulton, 2009; Gutierrez, 2000; Gutstein, 2006; Harding-DeKam, 2014; Hubert, 2014; Leonard et al., 2009; Mathews & Lopez, 2019; Tate, 1995). For example, Harding-DeKam (2014) investigated how eight elementary mathematics teachers of diverse students in public and private school classrooms in Colorado incorporated students' diverse knowledge and practices into the learning and teaching of mathematics. This research revealed that the teachers successfully incorporated cultural knowledge into their teaching due to their understanding of the individual students' home and community life, culturally responsive mathematics, culturally appropriate mathematics examples, and their knowledge of diversity.

Similarly, Bonner (2014) conducted a study to gain insights into the culturally responsive practices of successful teachers of traditionally underserved students. The participants in this study were three female mathematics teachers, one African American, one white, and one Mexican-Arab. Bonner (2014) concluded that the teachers successfully implemented culturally responsive practices because they would allow students to use their home languages during instruction. They would also include instructional techniques such as music, movement, clapping, rhythm, dance, oral story-telling, and choral responses in their teaching. These practices align with culturally responsive teaching and contributed to increased interest and enjoyment in mathematics learning.

In another study, Corp (2017) investigated the effects of culturally responsive stories in a third-grade mathematics classroom. The participant was a white female teacher who taught in a predominantly Black classroom. Results revealed that, by incorporating stories that featured Black characters, learners could make a cultural connection, thus allowing them to better think, explore, and understand mathematical concepts and ideas. As a result, there was a notably increased level of engagement, interest, and enjoyment in learning mathematics.

Finally, Matthews and López (2019) conducted a mixed-methods study to explore the link between teachers' beliefs and teacher-reported culturally responsive behaviors to predict Latinx students' mathematics achievement. The participants were five teachers from grades three to five from six elementary schools. Results revealed that when teachers allowed students to use their home language for instruction, set high academic and behavioral expectations, and validated students' socio-cultural backgrounds, the student's academic achievement began to improve.

Considering the unequal academic performance in many US public schools, culturally responsive teaching may assist in closing the persistent achievement gap. For example, Farinde-Wu et al.'s (2017) study showed that when teachers create classroom environments that support learning and social development, the opportunity for engagement and learning is maximized, leading to academic success. Similarly, Borck's (2020) study concluded that, when the curricular content is tailored to reflect students' histories and cultural backgrounds, students not only become inspired and engaged in the learning process, but their academic achievement is also realized. In summary, students benefit immensely from instruction taught from a culturally responsive lens. By tailoring the instruction to include learners' cultural backgrounds, these teachers hope to meet students' academic, social, and cultural needs. This paper will use the terms culturally relevant (Ladson-Billings,1995), and responsive teaching (Gay, 2000) interchangeably as the concepts are similar.

## Method

The purpose of this study was to examine how one preservice teacher understood the concept of culturally responsive teaching and how she later implemented this understanding in her third-grade mathematics classroom during her student teaching assignments. Two research questions guided the study:

1. How did Ms. Dana understand culturally responsive teaching of mathematics in a third-grade classroom?
2. During her student teaching assignment, how and in what ways did Ms. Dana implement or not implement her understanding of culturally responsive teaching?

### Participant

The participant in this study, Ms. Dana (pseudonym), was a white female preservice teacher enrolled in a teacher preparation program in a significant research one university in the Midwestern United States. She grew up in New Mexico, an area she described as culturally and linguistically diverse. At the time of this study, Ms. Dana was in the final year of her bachelors' program of study.

She was placed in a local suburban elementary school in a third-grade classroom to gain teaching experience and earn a license to teach K-5 grade levels.

Lakewood Elementary School (pseudonym) is located in a small suburb with a total population of 47,826 according to community statistics. About 92% of the total population identified as white and 8% as non-white. Lakewood Elementary School had a total population of 554 students (according to the school website), with about 86.3% of the students identified as white, 2.9% as African American, and 7.6% as other races. Similarly, about 43% of the student population identified as low-income students based on their eligibility for free or reduced lunch. All teachers at Lakewood Elementary School were white. Ms. Dana's third-grade student teaching classroom had about 20 students, of whom she identified as 16 white, one Asian American, and three African American.

Before her field placement, Ms. Dana had taken courses, including those focused on equity and diversity in education and inclusion, as part of her program's major requirements. In addition, she had taken mathematics methods courses entirely grounded in the fundamentals of social justice (based on the course syllabi and Ms. Dana's testimonials). These courses are meant to prepare predominantly white preservice teachers to be more accommodating of and willing to embrace students from diverse backgrounds.

## Data

Sources of data were interviews with the participant (Stake, 1995); teaching observations (Spradley, 2016); reflective field notes (Marshall & Rossman, 2016); and document collection (mathematics lesson plans and participants' written essays on equity pedagogy for a mathematics methods course). I conducted four interviews with the participant using a semi-structured interview protocol. The initial interview took place before the first teaching observation and two follow-up interviews took place right after the first two teaching observations. The duration between the first interview and the follow up interviews was four weeks. I conducted the final interview two weeks after the teaching observations. All four Interviews took between 25 and 60 minutes, were audiotaped and transcribed verbatim, and were performed at a location proposed by the participant and based on her availability. I completed the final interview for member checking and clarification purposes. Similarly, I conducted five classroom observations on five different days totaling 300 minutes. The teaching observations were also audio-recorded and transcribed verbatim. The participant's essay was an assignment from a math methods course gauging the preservice teachers' understanding of equity-based and culturally responsive pedagogy and how to apply this knowledge inside the classroom before the student teaching assignment. Data collection took place from October to November 2017.

Data analysis for this study started when the study began and continued after the conclusion of data collection. The steps in the qualitative research

process included: (1) preliminary exploration of the data by reading the transcriptions and personal reflective field notes (Charmaz, 2006); (2) development of the initial sets of codes, reading and re-reading, and development of the second sets of codes (Charmaz, 2006); (3) developing codes to themes (Braun & Clarke, 2006); and finally (4) constructing a narrative composed of descriptions and themes (Esterberg, 2002). The credibility of findings was achieved by: (1) triangulating the various sources of data collected (Charmaz, 2006); (2) member checking through asking the teacher to review and respond to the transcript (Creswell & Miller, 2000); (3) collecting thick description of data; (4) constant reflexivity during data analysis (Lincoln & Guba, 1985); and finally (5) peer debriefing.

## Author's Positionality

As a black woman who received her formal education and an undergraduate degree in Kenya, I approached this study from an outsider's perspective. I did not share commonalities with the participant concerning race, class, nationality, and cultural backgrounds. I did not have a relationship with her before this study. Therefore, by looking at the participants' teaching practices from an outsider lens, I sought to understand how she made sense of her teaching. Furthermore, during my graduate studies in the department of education, I had been a graduate teaching assistant for a couple of years, teaching multicultural education courses to preservice teachers. During that time, I realized that, although we strived to provide the preservice teachers with various reading materials on diversity, we did not always offer practical examples to help them further understand how to implement this knowledge inside the classroom. Although the preservice teachers were eager to discuss race and diversity in the recitation classrooms, most of them, especially those training to become mathematics teachers, were concerned about teaching mathematics from a culturally responsive lens. In addition, I was also a university supervisor. Whenever I would be in the field observing the preservice teachers during their internship, I came to realize that most of them did not implement or struggled to implement culturally responsive practices in their teaching. Thus, I became inspired to conduct a study that looked at how preservice teachers understand culturally responsive teaching and how they might implement it inside the classroom.

## Findings

In the following sections, I address each of the research questions separately. I will begin with the first research question and discuss three themes that focus on Ms. Dana's understanding of culturally responsive teaching. On the second research question, I will share themes on how Ms. Dana implemented her

knowledge of culturally responsive mathematics inside a third-grade mathematics classroom.

## First Research Question: How did Ms. Dana understand culturally responsive teaching of mathematics in a third-grade classroom?

This section will offer insights on how Ms. Dana understood the concept of culturally responsive teaching and the examples she stated to support this understanding.

### *Theme 1: Culturally responsive teachers have positive attitudes toward their students' abilities, knowledge, and experiences and hold high expectations for students' learning and achievement.*

Ms. Dana believed that culturally responsive teachers should have positive attitudes towards students' abilities and "hold high academic expectations for all students." Since teachers expect students to succeed in reasoning and doing math, teachers can express their expectations by creating instructional practices that "allow students to think for themselves." According to Ms. Dana, when students think for themselves in reasoning and solving math problems, it increases their "self-confidence" and strengthens their mathematical identity.

Teachers can also express their expectations by creating learning spaces where students can "demonstrate their knowledge in multiple ways." According to Ms. Dana, this is important because there is no single way of teaching mathematics that can accommodate all students' ways of learning. According to Ms. Dana, the teacher is aware of the knowledge that students possess and is aware that other students can benefit from shared knowledge in a culturally responsive classroom. Culturally responsive teachers strive to create learning opportunities where students can "freely exchange ideas" and "explain their strategies" by "working in groups and teaching each other."

### *Theme 2: Culturally responsive teachers know their students' backgrounds and interests and strive to develop a relationship with them.*

Ms. Dana believed that culturally responsive teachers must get to "know their students' backgrounds and interests and develop a relationship with them." She indicated that, when teachers strive to better comprehend students' lives outside of school, they can "take students' cultural, religious, ethnic, socioeconomic status and gender into account" when creating mathematics lessons. Ms. Dana indicated that it is crucial to connect with diverse students

personally because only then can a teacher–develop a sound knowledge base about her students' histories, values, beliefs, and overall lived experiences.

Similarly, when teachers take time to understand their students' lived experiences, they are better equipped to create "atmospheres of learning that are more relatable and authentic." Ms. Dana believed that teachers could show their students they care about them by making an effort to learn about their lives outside of school. This dynamic will then make students "less likely to misbehave because they feel valued." According to Ms. Dana, the "mutual respect" between the teacher and students should go far beyond the "simple interactions" inside the classroom. As a result, students are likely to "treat each other properly" and "feel safe and motivated" to learn.

### *Theme 3: Culturally responsive teachers integrate culturally diverse content in the curriculum and seek ways to make it responsive and engaging.*

According to Ms. Dana, culturally responsive teachers create lessons where "students can see themselves." They also provide "content with real-world applications" to make learning responsive and engaging. Ms. Dana believed that, by restructuring the mathematics curriculum to incorporate elements of multiculturalism, diverse students find learning engaging and meaningful. This provides diverse students the "opportunity to see the contributions of members of their gender, race, religion or socioeconomic status."

According to Ms. Dana, culturally responsive teaching is beneficial to all students because it allows them to investigate mathematical ideas from various vantage points. It enables diverse students to "share their cultures and background experiences." She believed that, in such a classroom, English learners should be free to use their "native language" to exchange mathematical ideas and express their thinking as part of their culture. As such, Ms. Dana believed that, when the curriculum content is inclusive, "learning is not only possible, but also meaningful."

## Second Research Question: During her student teaching assignment, how and in what ways did Ms. Dana implement or not implement her understanding of culturally responsive teaching?

This section will offer insights into how Ms. Dana implemented her knowledge of culturally responsive mathematic inside her third-grade classroom. I organize this section in terms of the three themes already mentioned in the first research question.

### *Theme 1: Culturally responsive teachers hold positive attitudes toward their students' abilities, knowledge, and experiences and have high expectations for students' learning and achievement.*

Ms. Dana appeared to treat all her students like they mattered and could experience academic success. She demonstrated this by offering students the support they needed to become successful in learning mathematics. Ms. Dana believed that it was important for students to connect between concepts and have a deep understanding before moving forward. The belief that all students mattered was something that Ms. Dana claimed to have learned from her program professors.

Ms. Dana was cognizant of the importance of embracing all students and treating them not as blank slates. She acknowledged that it was her responsibility to ensure that students benefitted from learning practices that were informed by their lived experiences. Whenever Ms. Dana introduced the day's lesson, she articulated the directions step-by-step, often checking in with her students to ensure they followed her advice. If even a single student had a challenge following the process, she would restate the directions slowly or differently until the student was satisfied. Ms. Dana mentioned that giving guidance to young students was necessary so they could follow the lesson.

Ms. Dana understood that all her students had diverse learning needs. She would often give struggling students extra time to solve problems while keeping the rest busy. Ms. Dana tried to ensure that all students had an in-depth understanding of concepts before moving forward. If she noticed that students had a weakness in a particular area, she would create another lesson to reteach the concept until all students understood. For example, while grading students' work in one lesson, Ms. Dana observed that most students had missteps like "forgetting to write word sentences," "borrowing from the wrong places," and "regrouping mistakes." Instead of moving forward, she decided to reteach the concept.

In addition, Ms. Dana was observant of students' personalities. She was careful not to leave behind the "quiet, shy student." She believed that those are "the kids that are not going to tell you they don't understand." During an interview, she uttered that a teacher must have a "lot of formative ways of watching their body language" to make sure they are "getting it." Teachers have to try and figure out "how to get them out of the corner." For Ms. Dana, the mission of ensuring that her students understood concepts was personal because, growing up, she had the kind of teachers who

> would just leave you in the dust. If you did not understand something, then that was your fault, and they would keep moving. I didn't have a teacher who took time to explain things the way they made sense to me.

Being overlooked and ignored by her teachers made Ms. Dana vow to always put her students' first.

Ms. Dana had created a cultural practice in her classroom whereby probing and asking for justifications to an answer was the norm. Whenever a student would respond to a question, she would expect the student to know how they arrived at an answer by asking questions like, “How do you know?” “What else?” “Who else can add to what student X has just said?” This way, Ms. Dana made sure that students understood the reasoning and communicated their mathematical ideas. Upon hearing a student’s justifications and how they built on each other’s thinking, she would then use students’ constructions to facilitate classroom discussion about their ideas.

Despite these many good practices, there is little evidence that Ms. Dana relied on culturally responsive teaching; instead, it appears that she sought to ensure student understanding. When students showed misunderstanding, Ms. Dana used positive reinforcement to encourage students to keep their spirits up. For example, Ms. Dana would often walk around the room checking on students’ work. While doing so, she would use phrases of encouragement like “good job” or “awesome.” Whenever a student would attempt an answer and did not get it right, she would say something like, “I like how you are thinking,” “I like your strategy,” just to boost their spirits.

Ms. Dana believed that when students are allowed to work with each other, powerful learning can happen, as “9-year-old’s are great at teaching each other when they know how.” Accordingly, she created a classroom environment where learning was student-centered. Ms. Dana would occasionally write a math problem on the board, ask students to read it quietly, and then say to them, “I want you to talk to your partner about how you would solve this. Just talk to your partner about some of the strategies that you could use.”

Sometimes, if Ms. Dana had graded students’ work and noticed that a certain student was doing well in that area and another one was struggling, she would say to the former, “Why don’t you go see if you can help so and so.” At other times, Ms. Dana would organize students into small groups, especially when performing hands-on activities. While in these groups, students would take an active role in learning by participating in exchanging ideas and solving a problem. As students worked, Ms. Dana would move around the classroom, helping students who might be struggling. Ms. Dana would also allow her students to approach math problems using familiar strategies such as manipulatives or dialogue.

### *Theme 2: Culturally responsive teachers know their students’ backgrounds and interests and strive to develop a relationship with them.*

Ms. Dana believed that culturally responsive teachers should strive to make connections with their students. She seemed to practice this belief inside her classroom, such as when the students came in the morning, she would “stand in the hallway, greet them by their names and compliment them in some way.” She

remembered little details from their journal writing, such as playing soccer or “they just had a baby sister.” Ms. Dana felt that remembering such details made the kids “feel like they are connected with her in some way” and that it made a difference. This kind of nurturance continued even inside the classroom. If she noticed that a student was having a “bad day" or seemed sad or worried, she would ask the student if they wanted to talk about their feelings. She would then ask the student whether they want to “talk outside in the hallway or during recess, or if they wanted to write a letter.” By noticing what was bothering her students and availing several avenues for them to communicate their feelings, Ms. Dana expressed that she cared about them.

Ms. Dana preferred not to stand in front of the classroom while teaching. Instead, she always sat either on the carpet with her students or on a small chair. When Ms. Dana engaged students in discussions, either large or small groups, she would sit next to them and talk to them at their level. She believed that by putting herself to their level, she built connection and confidence, thus encouraging them to participate.

According to Ms. Dana, respect was a virtue that every student had to observe. She tried to encourage her students to be respectful of each other. Ms. Dana would ask her students to use their “table voice” to avoid distracting others whenever they worked in groups. In a follow-up interview, I asked Ms. Dana to elaborate on what “table voice” entailed. She said:

> So, the table voice is kind of the way you and I are talking right now. But what tends to happen is that they get excited, and one group gets loud. The other groups cannot hear. We are trying to reinforce that if we all just sit and talk at this level [table voice], we can listen to each other. We can still learn because whisper voices are not practical. You know, asking them to be practically quiet is not suitable, so table talk is a new thing that we started school-wide that all the teachers are using.

Ms. Dana understood that her students got overly excited about sharing their thoughts with members of their groups. Thus, by encouraging students to use table voices meaningful learning could still happen with little to no distraction. They will be learning from each other because they would be communicating their thought processes and at the same time respect each other.

Ms. Dana always tried to create a safe learning environment where students were encouraged to treat one another appropriately. For example, during one observation, Ms. Dana learned that some female students (race unknown) were involved in a conflict during recess. So, when students came back to the classroom after the break, Ms. Dana sat all students down and counseled them about treating each other with kindness. She told them that, even though they may not necessarily “like everybody and may not want to hang out with them,” they “must always be kind to everybody.” She said:

> We need to look at the positives. You must train your brain to look at the good stuff from people because it is easy to look at the bad stuff, making me feel horrible. I do not like that. Protect your heart from negative thoughts. It's not easy looking at the good things.

Ms. Dana did not punish the students who had been involved in the conflict or judge them for misbehaving. However, she took this incidence as a teachable moment to help the students understand the importance of treating each other appropriately. She chose to create a space for students to dialogue about their feelings and actions and their consequences on other people.

While Ms. Dana understood the importance of connecting with students inside the classroom, she was also keen not to reveal personal information to her students. She said that she was careful not "to bring up too many things from my own life that would make my students feel like they are somehow missing out." Instead, "I try to understand where they are coming from and help them celebrate the victories in their own life." Furthermore, while she was very keen on establishing relationships with her students inside the classroom, these relationships did not go beyond the classroom walls and into the students' families and communities. During an interview, she acknowledged the vitality of extending these relationships to the communities. However, she mentioned that she had not had time to go into the community. She said:

> You know I live about 45 minutes away from these communities. It makes it hard for me to get there in the evenings for their baseball games and music programs. But I know once I am done with student teaching, I plan to come back and visit.

However, the distance between her university and the school where she did her student teaching was just a three-minute drive. This means that the distance between her community and the community of those that she served was not that far. Instead of becoming involved in her students' communities, she chose to learn about these communities from her cooperating teacher and the student journals.

### *Theme 3: Culturally responsive teachers integrate culturally diverse content in the curriculum to make it responsive and engaging.*

In her essay, Ms. Dana indicated that teachers must connect the content to their students' lives, interests, and experiences outside of school. This thought was again echoed during an interview when Ms. Dana mentioned,

> Some of the things that you [as a teacher] bring to the table matter. So, for example, if we are doing story problems, and we are making that for a class in an urban population, we will not make all the content about farming and things they cannot relate to. So, I think it is important to understand your

> students and where they come from to make things relevant. This way, everyone will have a little bit of familiarity to grab on to, which makes it suitable.

Ms. Dana's acknowledged that most students come from a variety of backgrounds, and, for this reason, teachers need to acknowledge these differences in designing math lessons.

Ms. Dana always tried to connect mathematics to her students' lived experiences. In one lesson, after recapping the previous lesson, Ms. Dana instructed her students that they were going to learn about measurements of capacity, weight, and length. She told them that they would be using real-world tools and that she thought they would have fun. Ms. Dana then arranged her students into groups of threes and fours and instructed them to come to her table and collect rice, beans, and popcorn, which were already premeasured to determine weight; water to determine capacity; and three pieces of yarn to determine length. Ms. Dana then told her students to take turns measuring the contents.

The students seemed to enjoy performing this activity and were engaged throughout the lesson. Ms. Dana even said that her students were able to "understand how mathematics can be applied in real-world stuff." While the materials used in this lesson were not necessarily reflective of any cultural group, the lesson was productive. Students stayed engaged throughout the lesson.

In another lesson, Ms. Dana noticed that most of the students were struggling with multi-word problems. She decided that she was going to inject some fun into their learning by gamifying the lesson. She said, "You will notice that, on each desk in the room, there is a little card that looks like this." She then raised a card with a multi-word problem and a cartoon of a Black female cheerleader. She had placed the cards on each desk when students were out on recess. Each card had either an addition or subtraction problem and a small cartoon picture next to the problem. She also placed a recording sheet next to the card for children to record their answers. She explained the activity, saying,

> So, you will start on that problem at your desk and record your answer on the recording sheet. Each problem has about two to three sentences. You will work on it as best as you can. Try to answer it in two minutes. When the timer goes off, I will say "scoot," and you will move to the next desk on your right. I will also give you all a clue sheet. When we do word problems, we are sort of being math detectives, right?

Ms. Dana thought that the way to engage her students while solving the long math word problems was by making it fun. During an interview, she mentioned that she knew most of her students enjoyed playing games. Therefore, if she made the lesson more like a game, it would appeal to them. While the "scoot" game is not associated with cultural practices of any ethnic or racial group, it was productive. It led students to stay on task the entire time. The students seemed to enjoy

working on the scoot game activity, and there were no instances of unfocused activities. This made Ms. Dana happy and she expressed in an interview that "they did a fantastic job." She further added, I "think if we do enough of these activities, they might figure out how to do it."

Ms. Dana tried to ensure that all students were represented either in the problems she gave or the examples. She ensured that names and pictures (like in the scoot cards mentioned above) of ethnic groups were present. Ms. Dana felt that if math problems contained ethnic and racially diverse backgrounds, it would connect to her students because they could see themselves represented. However, using such examples did not appear to have relevance beyond representational importance. It also took away the idea that examining math problems through race, class, and culture lenses is essential.

Furthermore, including ethnic names, places, holidays, fun, and focus on food within word problems is a minimal step to connect with children's cultures and communities. Scholars have condemned this superficial way of representing diversity, called on teachers to move beyond this minimal representation so that students can better understand racism, oppression, and everyday struggles that people of color face (Banks, 2004).

Finally, I noticed that Ms. Dana taught her students from the same textbook, and whenever she tried to use other sources like online resources that she had solicited on her own, there was little to no representation of diverse groups of people. My concern was confirmed during an interview when Ms. Dana said that she had not been able to use any multicultural resources inside her math lessons. She stated:

> I have used them [diverse literature] a lot for social studies, science, and literacy. So, I love to use good multicultural literature. But I have not incorporated that with the math lessons just because it is structured, and we are kind of on a time crunch. So, I have not brought any of that.

As the literature has shown repeatedly, white teachers struggle with how to incorporate a multicultural lens in mathematics compared to other subjects such as social studies and language arts, partially because mathematics is often perceived as culture- and politics-free. Many teachers continue to view mathematics as an abstract subject that primarily deals with numbers that are all the same across time and space. Despite her understanding of and enthusiasm for culturally responsive teaching, Ms. Dana did little to promote or use it during the lessons I observed.

## Discussion and Conclusion

The purpose of this study was to investigate how one prospective teacher understood the concept of culturally responsive teaching and how she later

implemented this understanding in her third-grade mathematics classroom. An analysis of the data revealed that, although Ms. Dana considered herself to be a culturally responsive mathematics teacher, her knowledge of culturally responsive practices was very minimal. She would state that a culturally responsive teacher ought to be such and such. However, Ms. Dana would not give details or examples to illustrate her beliefs. This superficial understanding was also apparent in how she conducted her teaching. Inside the classroom, Ms. Dana would not use diverse curricula, only relying on mathematics textbooks in her teaching.

The lack of diversity in everyday lessons is evidence that Ms. Dana was not aware of the role race played in students' learning and development. Similarly, while trying to incorporate diversity in her teaching, she would use examples with a minimal representation of students of color. Thus, by treating all her students equally, she ignored the experiences of Black and poor students. As such, Ms. Dana's understanding and implementation of culturally responsive teaching practices were superficial.

According to Hernandez et al. (2013), culturally responsive teachers must incorporate tenets of teaching that facilitate knowledge construction, prejudice reduction, academic excellence, and social justice in their mathematics classrooms. However, apart from the emphasis on academic excellence, all these other tenets seemed to be missing in Ms. Dana's student teaching. Ladson-Billings (2009) emphasizes that culturally responsive teachers should foster a learning environment where academic excellence, cultural competence and social growth can be achieved simultaneously (Ladson-Billings, 2009). This study concludes that Ms. Dana had difficulty implementing culturally responsive mathematics because she did not understand what it entails.

As this study only focused on one preservice teacher, the results cannot be generalized to a broader population. Nonetheless, the study provides recommendations to teacher educators. First, teacher educators must continue providing pre-service teachers with diverse resources and reading materials, illustrations, and practical examples that showcase how experienced teachers implement culturally responsive practices inside the classroom. Next, teacher educators must help preservice teachers reflect on who they are in terms of race, class, and other forms of identity with their students. Finally, teacher educators must also help preservice teachers differentiate between good and culturally responsive teaching. Many of Ms. Dana's practices were good, but not culturally responsive. Thus, good practices can still be effective although void of students' lived and cultural experiences.

To gain profound teaching experience from both the teacher educators' program and field practicum, this study suggests that seasoned teachers should also participate in professional development programs on culturally responsive teaching to support the preservice teachers. Overall, more evidence-based research on how teachers are engaging in culturally responsive mathematics teaching is needed.

## References


Aguirre, J., Herbel-Eisenmann, B., Celedón-Pattichis, S., Civil, M., Wilkerson, T., Stephan, M., & Clements, D. H. (2017). Equity within mathematics education research as a political act: Moving from choice to intentional collective professional responsibility. *Journal for Research in Mathematics Education*, *48*(2), 124-147. https://doi.org/10.5951/jresematheduc. 48.2.0124

Aronson, B., & Laughter, J. (2016). The theory and practice of culturally relevant education: A synthesis of research across content areas. *Review of Educational Research*, *86*(1), 163-206. https://doi.org/10.3102/0034654315582066

Au, K., & Jordan, C. (1981). Teaching reading to Hawaiian children: Analysis of a culturally appropriate instructional event. *Anthropology and Education Quarterly*, *11*, 91-115.

Banks, J. A. (2004). Multicultural education. Historical development, dimensions, and practice. In J. A. Banks & C. A. McGee Banks (Eds.), *Handbook of research on multicultural education* (pp. 329). John Wiley & Sons.

Berchini, C. (2015, April 28). Why are all the teachers white? *Education Week*. Retrieved from https://www.edweek.org/tm/articles/2015/04/28/why-are-all-the-teachers-white.html.

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

Bonner, E. P. (2014). Investigating practices of highly successful mathematics teachers of traditionally underserved students. *Educational Studies in Mathematics*, *86*(3), 377-399. https://doi.org/10.1007/s1064 9-014-9533-7

Borck, C.R. (2020) "I Belong Here.": Culturally sustaining pedagogical praxes from an alternative high school in Brooklyn. *Urban Review* 52, 376–391. https://doi.org/10.1007/s11256-019-00536-z

Boser, U. (2014). Teacher diversity report: A New state-by-state analysis. https://cdn.americanprogress.org/wp-content/uploads/2014/05/ TeacherDiversity.pdf

Bowman, B. T., Comer, J. P., & Johns, D. J. (2018). Addressing the African American achievement gap: Three leading educators Issue a Call to Action. *YC Young Children*, *73*(2), 14-23. https://www.jstor.org/stable/26558913

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2),77-101. https://doi.org/10.1191/ 1478088706qp063oa.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. SAGE.

Civil, M., & Khan, L. H. (2001). Mathematics instruction developed from a garden theme. *Teaching Children Mathematics*, *7*(7), 400-405. https://doi.org/10.5951/TCM.7.7.0400.

Corp, A. (2017). Using culturally responsive stories in mathematics: Responses from the target audience. *School Science and Mathematics, 117(7-8),* 295–306. https://doi.org/10.1111/ssm.12247

Creswell, J. W. & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice, 39*(3), 124-131.

Debnam, K. J., Pas, E. T., Bottiani, J., Cash, A. H., & Bradshaw, C. P. (2015). An examination of the association between observed and self-reported culturally proficient teaching practices. *Psychology in the Schools*, *52*(6), 533-548. https://doi.org/10.1002/pits.21845

Ellis, M., & Berry, R. Q. (2005). The paradigm shift in mathematics education: Explanations and implications of reforming conceptions of teaching and learning. *The Mathematics Educator, 15*(1), 7−17.

Ensign, J. (2003). Including culturally relevant math in an urban school. *Educational Studies*, 34, 414-423.

Esterberg, K. G. (2002). Qualitative methods in social research. McGraw-Hill.

Farinde-Wu, A., Glover, C. P., & Williams, N. N. (2017). It's not hard work; it's heart work: Strategies of effective, award-Winning culturally responsive teachers. *The Urban Review*, *49*(2), 279-299. https://doi.org/10.1007/s11256-017-0401-5

Fulton, R. (2009). *A case study of culturally responsive teaching in middle school mathematics* (Publication no. 3372472) [Doctoral dissertation, University of Denver]. ProQuest Dissertations and Theses Database.

Gay, G. (2000). *Culturally responsive teaching: Theory, research, and practice.* Teachers College Press.

Gay, G. (2010). *Culturally responsive teaching: Theory, research, and practice (*2nd ed.*)*. Teachers College Press.

Goldring, R., Gray, L., & Bitterman, A. (2013). Characteristics of public and private elementary and secondary school teachers in the United States: Results from the 2011–12 schools and staffing survey (NCES 2013-314). Washington DC: National Center for Education Statistics.

Grinage, J. (2011). Color blindness, unconscious bias, and student achievement in suburban schools. In J. Landsman, & C. W. Lewis (Eds.), *White teachers, diverse classrooms: Creating inclusive schools, building on students' diversity, and providing true educational equity* (pp.123-135). Stylus Publishing, LLC.

Gutierrez, R. (2000). Advancing African American, urban youth in mathematics: Unpacking the success of one math department. *American Journal of Education*, *109*(1), 63-111. https://doi.org/10.1086/444259

Gutstein, E. (2006). *Reading and writing the world with mathematics: Toward a pedagogy for social justice*. Routledge.

Haberman, M. (1991). The pedagogy of poverty vs. good teaching. *Phi Delta Kappan,73*(4), 290-294.

Haddix, M. (2016). *Cultivating racial and linguistic diversity in literacy teacher education: Teachers like me*. Routledge.

Harding-DeKam, J. L. (2014). Defining culturally responsive teaching: The case of mathematics. *Cogent Education*, *1*(1), 972676. https://doi.org/10.1080/2331186X.2014.972676

Hernandez, C. M., Morales, A. R., & Shroyer, M. G. (2013). The development of a model of culturally responsive science and mathematics teaching. *Cultural Studies of Science Education*, *8*(4), 803-820. https://doi.org/10.1007/s11422-013-9544-1

Howard, T. C. (2003). Culturally relevant pedagogy: Ingredients for critical teacher reflection. *Theory into Practice*, *42*(3), 195-202. https://doi.org/10.1207/s15430421tip4203_5

Hubert, T. L. (2014). Learners of mathematics: High school students' perspectives of culturally relevant mathematics pedagogy. *Journal of African American Studies*, *18*, 324–336. https://doi:10.1007/s12111-013-9273-2

Kana 'iaupuni, S. M., Ledward, B., & Malone, N. (2017). Mohala I ka wai: Cultural advantage as a framework for Indigenous culture-based education and student outcomes. *American Educational Research Journal*, *54*(1), 311-339. https://doi.org/10.3102/0002831216664779

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, *32*(3), 465-491. https://doi.org/10.3102/00028312032003465

Ladson-Billings, G. (2007). Pushing past the achievement gap: An essay on the language of deficit. *The Journal of Negro Education*, 76, 316-323.

Ladson-Billings, G. (2009). *The dreamkeepers: Successful teachers of African American children*. John Wiley & Sons.

Leonard, J., Napp, C., & Adeleke, S. (2009). The complexities of culturally relevant pedagogy: A case study of two secondary mathematics teachers and their ESOL students. *The High School Journal*, *93*(1), 3-22.

Leonard, J. (2018). Culturally specific pedagogy in the mathematics classroom: Strategies for teachers and students. Routledge.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 75). SAGE.

Marshall, C., & Rossman, G. (2016). Designing qualitative research. SAGE.

Matthews, J. S., & López, F. (2019). Speaking their language: The role of cultural content integration and heritage language for academic achievement

among Latino children. *Contemporary Educational Psychology*, 57, 72-86. https://doi.org/10.1016/j.cedpsych.2018.01.005

Mette, I. M., Nieuwenhuizen, L., & Hvidston, D. J. (2016). Teachers' perceptions of culturally responsive pedagogy and the impact on leadership preparation: lessons for future reform efforts. *International Journal of Educational Leadership Preparation*, *11*(1), 1- 20.

Milner, H. R. (2006). But good intentions are not enough: Theoretical and philosophical relevance in teaching students of color. In J. Landsman. & C.W. Lewis (Eds.). *White teachers/diverse classrooms: A guide to building inclusive schools, promoting high expectations, and eliminating racism* (1st ed, pp. 79-92). Stylus Publishing, LLC.

Namatovu, W. (2015). *Middle school mathematics teachers' understanding of culturally relevant and responsive teaching practices: A qualitative study* (Document No. 1449507692) [Doctoral Dissertation, University of Toledo]. Ohio LINK Electronic Theses and Dissertations Center.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. National Council of Teachers of Mathematics.

Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology, and practice. *Educational Researcher, 41*(3), 93-97. https://doi.org/10.3102/0013189X12441244

Parker, F., Bartell, T. G., & Novak, J. D. (2017). Developing culturally responsive mathematics teachers: Secondary teachers' evolving conceptions of knowing students. *Journal of Mathematics Teacher Education*, *20*(4), 385-407. https://doi.org/10.1007/s10857-015-9328-5

Siwatu, K. O., Chesnut, S. R., Alejandro, A. Y., & Young, H. A. (2016). Examining preservice teachers' culturally responsive teaching self-efficacy doubts. *The Teacher Educator*, *51*(4), 277-296. https://doi.org/10.1080/08878730.2016.1192709.

Skepple, R. G. (2015). Preparing culturally responsive pre-service teachers for culturally diverse classrooms. *Kentucky Journal of Excellence in College Teaching and Learning*, 12, 6.

Snyder, T. D., de Brey, C., & Dillow, S.A. (2019). Digest of education statistics 2017 (NCES 2018-070). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. https://nces.ed.govpubs2018/2018070.pdf

Spradley, J. P. (2016). *Participant observation.* Waveland Press.

Stake, R. E. (1995). *The art of case study research*. SAGE.

Strauss, V. (2015, May 21). Why we should diversify the overwhelmingly White US teaching force—And how. *The Washington Post*. From https://www.washingtonpost.com/news/answersheet/wp/2015/05/21/whywe-should-diversify-theoverwhelming-white-u-s-teaching-force-and-how/

Tate, W. F. (1995). Returning to the root: A culturally relevant approach to mathematics pedagogy. *Theory into Practice*, *34*(3), 166-173. https://doi.org/10.1080/00405849509543676

Tate, W. F. (2005). Race, retrenchment, and the reform of school mathematics. In E. Gustein & B. Peterson (Eds.), *Rethinking mathematics: Teaching for social justice by the numbers* (pp. 31-40). Rethinking Schools Publication.

Villegas, A. M., & Lucas, T. (2002). Preparing culturally responsive teachers: Rethinking the curriculum. *Journal of Teacher Education*, *53*(1), 20-32. https://doi.org/10.1177/0022487102053001003

Villegas, A. M., & Lucas, T. (2007). The culturally responsive teacher. *Educational Leadership, 64*(6), 28.

Waddell, L. R. (2014). Using culturally ambitious teaching practices to support urban mathematics teaching and learning. *Journal of Praxis in Multicultural Education*, *8*(2), 2.

Wells, A. (2020). *Achieving equity in gifted programming: Dismantling barriers and tapping potential*. Sourcebooks, Inc.

Wiest, L. R. (2001). Teaching mathematics from a multicultural perspective. *Equity and Excellence in Education*, *34*(1), 16-25.

Woodward, J. M. (2018). *Racial disproportionality as experienced by educators of color: Perceptions of the impact of their racial/ethnic identity on their work with students* (Document No. 10789946) [Doctoral dissertation, Boston College]. ProQuest Dissertations Publishing.

## Author Contact

Jane Mwihaki Mburu, mwihakij14@gmail.com
Independent Scholar, USA