

Strategies for Culturally Responsive Mathematics Teaching: Secondary School Teachers' Perspectives and Experiences

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Abstract

Culturally responsive teaching (CRT) is increasingly recognized as a pedagogical framework capable of addressing persistent inequities in mathematics education by aligning instruction with students' sociocultural contexts. This study explores the strategies, equity implications, and challenges of implementing CRT in mathematics education in public secondary schools in The Gambia. Grounded in Vygotsky's sociocultural theory, the study employed a qualitative approach, utilizing semi-structured interviews with eight mathematics teachers and eight student focus groups across three secondary schools. The data were transcribed, coded, and thematically analyzed. Findings revealed six dominant CRT strategies: integrating real-life community-based examples, using students' first languages for instruction, incorporating cultural games, adapting teaching materials, leveraging students' cultural funds of knowledge, and involving learners in collaborative, inclusive group tasks. Teachers highlighted that CRT fosters equity by contextualizing instruction, validating students' cultural identities, and bridging academic gaps across socio-economic backgrounds. However, several challenges were identified, including lack of culturally relevant instructional materials, curriculum rigidity, student resistance to non-traditional methods, overcrowded classrooms, limited knowledge of diverse cultures, and insufficient professional development. The study confirms that CRT holds substantial promise for fostering equitable and inclusive mathematics education. However, systemic reforms, particularly in curriculum design, teacher training, and assessment policies, are necessary to institutionalize culturally responsive practices in The Gambia's education system.

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Introduction

Culturally responsive teaching is an approach that integrates students' cultural backgrounds and experiences into the learning process to promote inclusivity, engagement, and improved academic achievement (Gay, 2010). This paper discusses culturally responsive mathematics teaching based on this definition above. Most scholars in the field of education suggest that culturally responsive teaching is applicable across all subjects (López, 2016). Culturally responsive Mathematics teaching is given special attention due to several reasons such as students' perceptions that most Mathematics concepts are abstract, vague and ambiguous as well as the limited students' motivation in the subject. According to Ladson-Billings (1994), culturally relevant pedagogy fosters academic achievement, affirms students' cultural identities and ensures equity among students from various cultural backgrounds. In mathematics education, this implies that using culturally relevant examples, teaching materials, and methods that reflects with students' backgrounds enhances equity and performance in Mathematics teaching and learning (Howard, 2010; Gorski, 2018). Culturally responsive teaching should create equity between various cultures such as the dominant and minor cultures in the classrooms as suggested by Gay (2018) that it is behavioral expressions of knowledge, beliefs, and values that acknowledge the significance diversity in race and culture.

According to Dee and Penner (2017), evidence-based approaches for eliminating learning inequity in Mathematics are already available in the form of culturally responsive teaching but unfortunately, they are not often implemented in classrooms. Rima et al. (2024) note that superficial integration of CRT in Mathematics education can reduce its effectiveness. Thomas (2024) highlights that systemic support is essential to align CRT with existing standards-based practices. Gay (2013) defines CRT as an educational framework that align students' in-school learning to their out-of-school experiences, promoting equity, cultural competence, and social consciousness. This approach overcomes traditional biases in curricula and teaching methods by placing emphasis on cultural integrity and intellectual competences of students from all backgrounds. Rima et al. (2024) in their study argue that CRT has transformative ability to create inclusive learning environments by integrating students' cultural backgrounds into teaching strategies and practices. Similarly, Mburu (2022) explain the significant role of CRT in enhancing positive attitudes of teachers toward students' abilities while maintaining high expectations for their success. According to Roessingh (2020) it is important to translate theoretical principles of culturally responsive pedagogy (CRP) into classroom practices that support learning, equity, and academic achievement. Meanwhile, Ober et al. (2023) encourages the use of culturally responsive personalized learning (CRPL), which entails students' social, cultural, and linguistic contexts into instruction to foster equitable learning opportunities for all learners in the classroom. The concept of CRT is further discussed by Turner et al. (2023), who argue that culturally responsive practices help to make mathematics instruction more relatable to students daily life by integrating real-world modeling tasks that mirrors students' lived experiences. This is in line with the assertion made by Gay's (2013) that CRT improves academic achievement by teaching "to and through" cultural diversity.

Strategies for Culturally Responsive Mathematics Teaching

Culturally responsive Mathematics teaching strategies involve aligning the teaching of mathematical concepts with students' cultural contexts to make such concepts relevant and ensure effective engagement among learners

from diverse backgrounds in the classroom. Muñiz (2019) discusses CRT competencies that can be integrated into mathematics lessons, such as linking the lesson's content and instructional practices to students' cultural backgrounds by using their cultural experiences to explain concepts. Comstock et al. (2022) explain that strategies such as designing lessons to show the mathematical contributions of different cultural groups and revising learning materials to represent various cultures enhances fair instruction. According to Larson et al. (2018) CRT strategies, such as linking the lessons to real-world contexts, integrating positive humor, and employing teaching techniques that enhances engagement such as rhythmic call-and-response positively enhance student behavior and learning engagement. Anyichie et al. (2023) expanded on these idea that culturally responsive teaching strategies include flexible classroom support and instructional methods tailored to students' cultural backgrounds.

Furthermore, Schirmer & Lockman (2022) identify specific strategies that enhance CRT in mathematics, such as including examples from different cultures and making positive cross-cultural comparisons. Similar to this, Nolan & Xenofontos (2023) argue that teachers can integrate CRT by drawing on students' funds of knowledge while highlighting the cultural significance embedded in mathematical concepts to foster engagement. Evans et al. (2022) explain that CRT requires a flexible and pluralistic framework that is beyond superficial approaches to diversity. Donoghue et al. (2023) and Yuliantari & Huda (2023) center their discussion on the importance of embedding culturally relevant content in learning materials and encouraging critical reflection during mathematics lessons.

Furthermore, Karatas (2020) puts forward that culturally responsive teaching strategies include respecting students' diverse cultural backgrounds, including positive cultural values into lesson planning and delivery, and engaging students with culturally relevant activities like drama, role play, and discussions about relevant historical events. Teachers' strategies such as using cultural awareness, integrating cultural content, and adapting instructional methods are all significant in creating inclusive learning environments across all subjects (Rima et al., 2024).

Equity in Learning Through Culturally Responsive Teaching

The concept of equity in learning has gained attention across the global education landscape because of the call for inclusion in schools. According to Levinson et al. (2022), equity in education means giving equal learning opportunities, and resources to all learners regardless of the culture, gender or family background or economic status. According to Lustig & Koester (2017), CRT is gaining more prominence because of its role in creating equity among learners and between teacher and students.

In mathematics education, Comstock et al. (2022) explains that teachers who integrate CRT with strategies centering on conceptual rigor create useful engagement for all learners, regardless of their cultural or economic background. Karatas (2020) highlights that respecting and acknowledging cultural diversity among learners can help promote a fair and equitable learning experience. Research by Mpisi & Alexander (2022) indicates that integrating students' cultural experiences to contextualize abstract Mathematics concepts enables all learners to feel respected and involved. Similar research by Larson et al. (2018) show that CRT enhances a learning

environment where students from various cultural backgrounds feel fairly involved and motivated to perform. According to Naz et al. (2024), culturally responsive teaching practices are found to be able to promote equity and fairness in education by creating a sense of ownership, mutual respect, and inclusivity.

Challenges in Culturally Responsive Teaching

The integration of culturally responsive teaching (CRT) in most subjects comes with varied challenges such as resource constraints, standardized testing pressures, and inadequate professional development opportunities (Rima et al., 2024). According to Mburu (2022), teachers often struggle to move beyond superficial applications of CRT practices due to inadequate training and robust professional development. Roessingh (2020) critiques the over-reliance on prepackaged or digital materials in integrating culturally responsive teaching practices, arguing that authentic, real-time interactions between students and teachers are significant in supporting academic development of students. The study by Skelley et al. (2022) indicates obstacles such as teachers' initial lack of confidence and proficiency in implementing CRT strategies and the difficulty of overcoming sensitive cultural topics in classrooms.

Furthermore, Muñiz (2019) states that structural and systemic barriers also impede CRT's integration into education. For instance, the author notes that teachers face additional challenges in reconciling CRT with standards-based teaching practices (Thomas, 2024). Similarly, Nolan & Xenofontos (2023) critique the tokenistic inclusion of cultural content in textbooks, which reflects deep biases and systemic barriers in integrating CRT practices into the teaching. Moreover, Evans et al. (2022) argue that misappropriation of CRT is a significant challenge faced by teachers. The authors highlight instances where culture is used merely as a bait to engage students or as a tool for assimilation rather than a means of authentically embedding students' lived experiences into the lesson. Charoensilp (2024) affirms that teachers also face barriers that are related to aligning instructional practices with various cultural norms while maintaining inclusive classroom setting. Finn (2023) highlights additional obstacles, including inadequate time, the difficulty of deeply involving individual student identities, and rigid pre-designed curricula. Donoghue (2023) adds that these challenges prevent teachers from aligning daily instructional practices with students' diverse cultural backgrounds. Larson et al. (2018) further note that low self-efficacy among teachers together with challenges in behavior management, further hindered teachers' ability to integrate CRT in their lessons.

Theoretical Framework

This research is guided by Vygotsky's socio-cultural theory, which is an educational theory that places emphasis on the role of social interaction and cultural context in cognitive development. According to Vygotsky (1978), learning is a social process that occurs through interactions with others in a cultural context. Individuals are seen as historical and cultural entities enmeshed in a complicated web of social interactions and processes, and it is these changing relationships and collaborative attempts that mold and reinterpret learning and development (Lim & Renshaw, 2001).

According to socio cultural theory, learning is no longer viewed as a process in which people acquire knowledge but rather as one in which they actively engage with diverse communities of practice. Even though initial participation may be partial, the SCT perspective emphasizes the value of connection within those communities, going beyond the individual as the exclusive object of investigation. Numerous cultural tools, both tangible and semiotic, support engagement in these societies, allow students to absorb information, act, and think back on their experiences. Learners adapt socio cultural knowledge and practices such as language, behavioral norms, representation standards, communication protocols, and knowledge verification techniques by engaging in these activities.

The theory emphasizes key concepts which include language, a crucial tool in the learning process, social connections, and learning which takes place within the Zone of Proximal Development (ZPD). The ZPD clarifies the distinction between what students can accomplish on their own and what they can accomplish with assistance from a more knowledgeable person (Lim & Renshaw, 2001). This could also be referred to as scaffolding, where more knowledgeable individuals provide support to learners to help them achieve tasks they cannot yet perform on their own (Editorial process, 2024). The support can be removed gradually as the learner becomes more competent. The More Knowledgeable Other (MKO) is anyone who has a better understanding or a higher ability level than the learner, with respect to a particular concept or task. Through the process of internalization, social interactions are transformed into internal cognitive operations. According to Vygotsky (1978), social interactions help children assimilate the tools and symbols of their society. In order to govern and regulate social interactions and cognitive processes, cultural tools can include language, signs, and symbols that are exclusive to a culture. It suggests that learning is an open-ended process where new ways of thinking, feeling, and acting can emerge through complex interactions and group efforts. This dynamic process of interaction and engagement with cultural tools and social practices offers significant opportunities to celebrate diversity. When children are allowed to incorporate their individual cultural experiences into the classroom, it encourages them to develop various viewpoints.

Research Questions

1. What are the strategies for culturally responsive Mathematics teaching used by the teachers?
2. How do these strategies create equity in learning among students in Mathematics classroom?
3. What challenges do teachers face in culturally responsive Mathematics teaching?

Methodology

This research employed a qualitative approach to study the strategies for culturally responsive mathematics teaching in public secondary schools in The Gambia. This approach was deemed suitable to gain in-depth understanding of teachers' perspectives, practices, and experiences in integrating CRT. The population of the study comprised of Mathematics teachers and students recruited from three public secondary schools located in the West Coast Region. These schools are referred to as School A, School B, and School C. The choice to include multiple schools was necessary because no single school had a sufficient number of eligible and willing

participants. Teachers from these schools were included in the study because they have experience in using culturally responsive teaching in their Mathematics lessons.

A purposive sampling technique was employed to select participants for the study. The inclusion criteria were clearly defined to ensure that participants had relevant experience in culturally responsive teaching practices. Specifically, participants were required to: (1) have a minimum of three years of teaching experience using culturally responsive teaching (CRT) strategies in the Mathematics classroom; (2) be currently teaching examination classes—specifically Grade 9 or Grade 12—who are responsible for preparing students for high-stakes national or regional Mathematics examinations such as the West African Senior Secondary Certificate Examination or Gambia Basic Certificate Examination (3) demonstrate a willingness to participate in an in-depth interview with the researcher; and (4) be accessible for follow-up communication if necessary. For the students' population, the criteria included: (1) voluntary willingness to take part in a focused group discussion, (2) Willingness to contribute in the discussion and be recorded for the purpose of the study only (3) Must be permitted to take part in the study by both the school and parent. These criteria ensured that the selected teachers and students could provide rich, informed perspectives on the integration of CRT in Mathematics instruction.

The sample size of the study comprised of eight (8) teachers and 32 students who were divided into 8 student focus groups chosen from the selected secondary schools in the study area. Three teachers were selected from School A, two from School B, and three from School C. For the student, each group represents one ethnic group and comprised of 4 students. Each focus group has a mixture of boys and girls, even though the number of boys and girls were not even. The ages of the students range from 13 to 16 years old. To ensure confidentiality and protect the identity of the participants and the students' ethnic groups, all teachers and the focus groups were assigned pseudonyms in the form of codes—T1 through T8 as well as FG1 through FG8 respectively. These diverse characteristics of the participant provided a fair representation of diverse perspectives on the integration of CRT in Mathematics lessons.

Table 1. Demographic Information of Teachers

Teacher	Gender	Experience	Background
T ₁	Male	11 years	Bachelors in Mathematics
T ₂	Male	11 years	Bachelors in Mathematics
T ₃	Male	17 years	Masters degree in Mathematics
T ₄	Male	11 years	Bachelors in Mathematics
T ₅	Female	9 years	Bachelors in Mathematics
T ₆	Female	9 years	Bachelors in Mathematics
T ₇	Female	9 years	Bachelors in Mathematics
T ₈	Female	7 years	Bachelors in Mathematics

Data was collected through face-to-face semi-structured interviews with the participants. This method allowed both the researchers and the interviewee to maintain flexibility during the process and allowed the researcher as well as the interviewees to clarify any doubt. Each of the interviews and the focus group discussions lasted

approximately 40 minutes and was conducted by the researchers personally. All the interviews were taped recorded, with the participants' consent, to ensure accuracy in reporting the findings. The recorded interviews were strictly secured and used for the purpose of this study only. Interview guide was developed, reviewed and vetted by educational experts and professors with expertise in culturally responsive teaching so as to ensure the credibility and reliability of the data collection process. In addition, participants were well-informed about the purpose of the study and were assured of their confidentiality. Focus group discussion were held 8 times, once for each group. In each meeting, only the four students who formed the group were involved. For the interviews with the teachers, each teacher was interviewed only once.

The study employed thematic data analysis approach which involved a process of transcription of interview records, coding, and theme development. The interview records were transcribed verbatim so as to accurately capture the participants' responses. The transcribed interviews were then refined and subjected to open coding which involved breaking down the data into smaller, meaningful units. The initial codes were further organized into larger themes through axial coding. This process enabled the researcher to identify recurring concepts that addressed the research questions. The themes were organized into a comprehensive report that made up the basis of the study's findings.

The study's credibility and trustworthiness were ensured through various measures. The analysis involved multiple researchers so as to reduce biases and ensure consistency in coding and theme development. Participants were also given the chance to review their interview transcripts to ensure accuracy and authenticity of the recorded data. The findings were presented with detail direct quotes from interviewees to ensure transparency.

Ethical considerations were carefully observed throughout the entire study. Participants of the study were informed of the purpose of the research, the voluntary nature of their participation, and their right to withdraw from the study at any given time. Confidentiality and anonymity of participants were ensured with pseudonyms used to protect their identities.

In Gambian secondary schools, the language of instruction for Mathematics teaching is English, and it is guided by a nationally standardized curriculum developed by Curriculum, Research and Development Directorate under the Ministry of Basic and Secondary Education (MoBSE). Commonly used textbooks include *New General Mathematics for West Africa* and *The Gambia Mathematics Book* series, AKIOLA Series. However, due to limited resources, not all schools can provide complete sets of textbooks and materials. Consequently, teachers often supplement these with improvised teaching aids and locally available resources to support student learning.

For example, when teaching topics such as measurement, geometry, and ratio, teachers may use items like woven baskets, calabashes, locally made mats, and farming tools to demonstrate concepts like area, volume, and symmetry. In teaching statistics and data handling, teachers might use data related to local market prices, rainfall patterns, or school attendance records, making the learning more meaningful and grounded in familiar contexts. Pebbles, sticks, bottle caps, and even local currency (dalasi) are used to teach foundational concepts like counting, sets, and operations. Instruments like maps, globe, and shapes are also used by teachers.

Findings

RQ 1. Strategies for Culturally Responsive Mathematics Teaching

The study's findings show that mathematics teachers do integrate different culturally responsive teaching (CRT) strategies in their lessons to make abstract and ambiguous concepts of Mathematics more meaningful and relatable to students. The integration of these practices was triggered by teachers' recognition that students learn better when instruction is related to their daily life experiences. Students' motivation, confidence, and cognitive development were highly influenced by culturally responsive teaching practices. The key strategies that were used to integrate culturally responsive teaching are grouped into themes presented below.

Adopting Real-Life Examples

A widely used strategy among the mathematics teachers was the integration of real-life examples that depict day-to-day life experiences of students. Teachers reported that the culturally responsive practices close the gap between classroom instructions and students' social realities, which scaffolds them to grasp the idea and better involved in the lesson. For instance, T1 used scenarios that related to the community where learners live when he was teaching percentages to his students. He explained that:

"I do ask students such as Joan scored 21 out of 25 in a mathematics test, and a score of 31 out of 40 in a physics test. Did she do better in mathematics or in physics? Justify your answer. This makes mathematics concepts more relatable and enjoyable for students because they are actually doing this as they always compare themselves with their friends when they get test results."

T5 shared that she initially used dice and playing cards which are foreign materials to teach Probability but found these foreign concepts less relatable to the students' cultural background. She then turned to using rainfall and traditional Gambian sweets. She explained:

"In teaching Probability, I simply ask students to estimate the chances of rainfall during the rainy season. For example, I may ask students that if it's July and it has rained for the past three days, what's the chance it will rain tomorrow? I may also present sweets of different colors like 3 red, 2 green, and 1 yellow sweet and then ask them that if you close your eyes and pick one sweet at random, what's the chance that it will be red?"

Teaching materials like the *New General Mathematics for West Africa* usually introduce topics like Probability with such examples as tossing coins or rolling dice. Even though these examples are useful, the teachers found more culturally relevant events or materials to their students. For example, T2 explains that connecting mathematics to students' daily realities like sharing fruits during break time helps to simplify concepts like ratios:

"When teaching ratios, I could have 2 mangoes and 3 oranges and ask students to determine the ratio of mangoes to oranges."

T3 added that he uses scenarios involving traders in traditional markets where traders estimate prices because some students are from families of trading background.

“I can use this example in my lessons on proportions; 8 cakes need 400 grams of flour. How much grams of flour will be needed for 20 cakes? Students relate this example to the cakes that they buy from the school canteen, and others are made at home by their parents. This helps students to relate the value of approximation in real life to the Mathematics lesson.”

Teachers also reported that they do use school and home setting to teach spatial concepts like angles and bearings. T5 highlighted that:

“I first exemplify angles and bearings using the classroom layout, then ask students to measure spaces at home like their parents’ rooms. This helps them apply these concepts in real situations.”

Students in their focus groups explained that when they are exposed to the real-life applications through culturally meaningful examples, they see Math as something concrete and understandable. They began to see mathematics as a practical tool embedded in their daily activities rather than a disconnected academic task.

FG2: *A student explained: “I used to think math was just in books, but now I see it in our markets and farming too.”*

FG7: *“When we talk about things from our community in class, I see that math is useful in daily life, not just for exams.”*

Using Students’ First Languages

Another major theme that emerged from the findings is the use of students’ first languages to enhance understanding of certain Mathematical concepts and instructions. In The Gambia, English is the official language of instruction beginning from kindergarten to tertiary level. However, most students at this stage, secondary school, are still in the process of acquiring and polishing their English language proficiency while simultaneously learning subjects such as Mathematics in English. To support students’ comprehension, many teachers in this study reported using students’ first languages, such as Mandinka, Wolof, or Fula, to clarify key mathematical concepts and overcome difficulties due to low English proficiency.

Teachers reported that code-switching—alternating between English and students’ home languages—not only facilitated understanding but also helped bridge the gap between two linguistic and cultural frameworks, allowing students to navigate both worlds with greater ease. They emphasized that code-switching is especially effective in explaining complex word problems and abstract mathematical ideas, relating concepts to students’ daily lives in familiar linguistic terms.

T4, shared how he used Mandinka and Wolof to clarify the textbook concept of sets and probability:

"When I teach sets, I present problems like: 'In a family of X children, 3 eat both rice and bread, 4 eat only bread, and 2 eat only rice. How many children are there in total?' I explain terms like 'both,' 'only,' and 'total' in Mandinka and Wolof before translating them into English."

T5 used Fula and Wolof to introduce three-dimensional geometry (3D):

"I explain dimensions—length, width, and height—in Wolof first, using examples like: 'The bed goes wall to wall (length), side to side (width), and up to the roof (height).' Then I transition into English and connect it to Mathematical concepts in English like 'volume' and 'surface area'."

The goal of integrating students' first languages was to make mathematical language and ideas more accessible. Teachers noted that once students gained confidence through initial explanations in their native languages, they participated more actively in problem-solving and class discussions.

Playing Cultural Games

Another significant theme that emerged from the study's findings is the incorporation of cultural games involving mathematical reasoning to make learning more interactive, culturally meaningful, and cognitively engaging. These games originated from students' communities and served as a bridge between home knowledge and classroom instruction. Teachers integrate a traditional African board game, wari, into their lessons. It is a board game that involves distributing and counting seeds in pits for concepts such as, probability, addition, subtraction, and multiplication. Wari is structured around two rows of six pits, where players take turns collecting and redistributing seeds based on specific rules. This requires players to mentally calculate potential outcomes, anticipate opponents' moves, and apply arithmetic skills. T7 said:

"In the classroom, wari supports problem-solving and strategic thinking, especially when teaching number operations and logical reasoning tasks found in junior secondary Mathematics textbooks".

T7 shared how she adapted another community-based game to teach spatial concepts:

"I use the blindfold game to help students practice accuracy in reasoning and interpreting instructions. One student is blindfolded, and another reads a direction-based word problem while the blindfolded student performs the described movements. If they make a mistake, another student takes over."

This game was particularly effective for teaching word problems involving direction, bearing, and location—topics typically found under geometry and measurement units in textbooks. It encouraged students to actively engage with spatial language and apply it in a dynamic context. Several students reported that lessons incorporating culturally familiar examples reduced their anxiety and improved their self-belief in learning mathematics. The students revealed that abstract concepts are grounded in known experiences; it helped students to be more capable and willing to participate in class.

FG3: *“When the teacher used examples from our local games, it made the math easier to understand. I wasn’t scared to try anymore.”*

FG6: *“Before, I thought I couldn’t do math, but now I feel more confident because the teacher relates it to games I already knew and practice daily.”*

RQ 2: Creating Equity Through Culturally Responsive Teaching

The findings of the study suggested that teachers perceive culturally responsive teaching (CRT) as an influential tool for harnessing equity in mathematics lessons. They reported that learning inequalities can be overcome when they carefully implement CRT by making sure that all learners have their cultures represented in one way or the other. Four major themes that highlight how CRT promotes equitable learning experiences were revealed. They are active Participation, fair Learning Opportunities for Students, and inclusive Learning.

Bridging the Gaps among Learners

An essential component of effective mathematics teaching is ensuring that all students, regardless of ethnicity, socioeconomic status, or ability, actively engage with the lesson. The participants explained that integrating CRT strategies helps to level the playing field by grounding mathematical concepts in students’ cultural backgrounds and lived experiences. This approach fosters inclusion, boosts student morale, and encourages participation. For example, in classrooms with students from five different ethnic groups, teachers reported encouraging learners to contribute examples from their own cultures to solve math problems. T1 emphasized:

“I use real-life examples from daily life, like measuring ingredients for cooking or calculating profits from selling mangoes to reduce fear in students. This helps students—especially those who struggle—see that they already use math in their lives. It builds their confidence and helps them catch up.”

T7 highlighted how culturally relevant examples help close gaps in learners’ mathematical abilities:

“I use real-world problem puzzles based on students’ backgrounds. These puzzles allow every student to participate because they are culturally familiar yet mathematically challenging.”

T4 also noted that math becomes more accessible when connected to occupations usual in students' communities:

“I relate math to things they see—like farming, fishing, or tailoring. Because all of them are seeing these activities, they have equal chance to learn.”

Creating Fair Learning Opportunities for Students

Teachers reported that CRT supports equity by reducing dependence on rigid textbook-based learning and promoting experiential, culturally grounded teaching. It enables learners to relate new knowledge to their

own backgrounds, which improves access and motivation. T2 explained:

"When teaching profit and loss, instead of using textbook examples about stock markets or foreign goods, I ask students to calculate profits from selling items like bananas or peanuts at the local market. These examples are part of their daily lives."

This clarification highlights how textbook examples often involve unfamiliar contexts—like supermarkets, credit cards, or brand-name goods—that many students cannot relate to. By contrast, CRT makes lessons accessible through locally relevant scenarios. T6 stated:

"I use objects students already have at home—bottles, straws, sticks—to teach concepts like volume and measurement."

T5 also emphasized resource equity:

"I ask students to bring items like fruits, grains, or containers from home to teach shapes or measurement. Everyone can access these, so no one is left out due to lack of materials. It gives them ownership of their learning."

Students in the focus group discussions indicated that culturally relevant instruction enhanced their comprehension of mathematical concepts. When the content was connected to familiar contexts, students were better able to make sense of lessons and retain information.

FG1: *"The way our teacher linked math to how we measure things at home helped us get the topic faster."*

FG5: *"Using local stories to explain word problems made it easier for us to understand and solve them."*

Creating Inclusive Learning Atmosphere

Teachers reported that CRT promotes collaboration and inclusivity, ensuring that learners who struggle with mathematics get peer support. T6 shared:

"I create small groups and assign a leader, like a family head. I mix students with different abilities so those who understand can help others. It builds a sense of belonging and support."

T7 added:

"When students work in groups, they feel comfortable asking each other questions. It gives shy students

a chance to seek help from peers and promotes a classroom where everyone learns at their own pace."

The students also explained that integration of CRT contributed to a stronger sense of inclusion and belonging among students. Recognizing diverse cultural experiences in class discussions and examples encouraged respect and improved peer interactions.

F4: *"When the teacher uses examples from different cultures in our class, it helps us understand and respect each other more."*

F8: *"We started sharing more during group work because we felt our ways of doing things were valued."*

RQ 3: Challenges in Culturally Responsive Teaching

Culturally responsive teaching (CRT) is acknowledged as a powerful tool for improving math instruction and student engagement, however, teachers face numerous implementation challenges in real classroom settings. Key challenges include limited access to CRT materials, student resistance to non-traditional teaching methods, and constraints posed by a rigid curriculum and examination-oriented instruction. These challenges hinder the effective integration of CRT, despite teachers' willingness to adapt their instructional practices.

Limited Availability of Culturally Relevant Materials

CRT requires the use of students' cultural background and experiences, including materials that reflect those experiences, to make lessons meaningful. However, most teachers highlighted the scarcity of teaching resources that are culturally relevant, making it difficult to integrate appropriate examples. For example, T3 noted:

"Textbooks alone cannot help students understand abstract concepts, especially when the content doesn't reflect their culture."

T8 echoed this challenge, stating:

"I often have to improvise examples using accessible materials from students, but that takes extra time and isn't always effective."

T2 emphasized:

"Integrating CRT becomes difficult when the right resources are lacking. This affects how well I can plan and deliver lessons."

Resistance from Students

Many students are accustomed to rote learning and view new approaches with skepticism, especially when asked

to relate math to local contexts. T6 illustrated this by saying:

"When I introduced a local example in a lesson, students immediately asked if it would be on the test. They're used to thinking math is only about formulas."

T3 shared a similar experience:

"Some students see CRT methods like using traditional trade practices to explain percentages as storytelling, not real math. They prefer direct number work and find real-life applications unfamiliar."

Rigid Curriculum and Standardized Testing Requirements

Teachers consistently cited the inflexibility of the national curriculum and the pressure of standardized testing as major barriers to CRT. T4 expressed this concern:

"The syllabus is packed, and exams are approaching. Spending extra time to include CRT examples puts me at risk of falling behind, which isn't an option."

T2 pointed out:

"Teachers are evaluated based on student exam scores. Since exams emphasize procedures over understanding, many avoid CRT despite its benefits."

T8 added:

"The curriculum is one-size-fits-all. It doesn't allow much room for adaptation, so we have to integrate CRT without institutional support."

Lack of Professional Development and Training

A significant number of the interviewed teachers acknowledged that they had received little or no formal training on integrating culturally responsive teaching strategies in their Mathematics classes. This lack of training makes it very difficult to implement CRT effectively, as many teachers rely on trial and error or self-learning. T7 noted:

"We were never trained on CRT during our teacher education programs. Most of us are learning by trial and error or from other sources on our own."

T1 added:

"Without training on how to apply students' cultural backgrounds in teaching, it is difficult to make CRT

effective in Mathematics."

Overcrowded Classrooms

Culturally responsive teaching requires a manageable class size in which teachers can meaningfully engage students and incorporate their experiences into the lesson. The findings show that most teachers reported large class sizes as a major barrier to effective implementation of CRT in Mathematics classrooms. They noted that large classes make it difficult to interact with students, monitor participation, and maintain discipline. T5 stated:

"In a class of over 50 students, giving everyone a voice during the lesson is hard. CRT needs interaction, but with so many students, it's difficult to engage everyone."

Limited Knowledge of Students' Diverse Cultural Backgrounds

Teachers also expressed challenges related to their limited understanding of the diverse cultural backgrounds present in their classrooms. Some teachers are not natives of the communities where their students come from, making it harder to relate lessons to all students' cultural contexts. T4 stated:

"Sometimes I realize I don't know enough about my students' backgrounds. I may use an example that makes sense to one group but is unfamiliar to others."

T7 echoed this:

"Even within the same ethnic group, students may have different traditions and ways of understanding things, which makes it hard to apply CRT uniformly."

Discussion

This study explored how culturally responsive teaching (CRT) is integrated into mathematics classrooms to foster equity among learners from diverse cultural, linguistic, and socioeconomic backgrounds. The findings demonstrated that teachers perceive CRT as a transformative tool to ensure inclusivity, promote engagement, and bridge achievement gaps in mathematics learning. These findings are grounded in both sociocultural learning theory and consistent with existing literature.

The finding revealed that teachers who incorporate students' cultural experiences into lessons achieve greater student engagement and participation. This aligns with the theory of sociocultural learning, which emphasizes the significance of social interaction and cultural context in learning (Vygotsky, 1978). When meaningful cultural contexts are embedded in learning, teachers help students make personal connections to content, thereby enhancing comprehension and motivation (Gay, 2010). As noted in the literature, Gay (2010) and Ladson-Billings (1995) argue that CRT fosters equitable access to learning by validating students' identities and making the

curriculum relevant. This was echoed in this study, where teachers used everyday cultural examples—such as farming, market sales, and traditional games—to illustrate mathematical concepts. These strategies promote inclusive pedagogy by affirming student experiences and dismantling the myth of cultural neutrality in mathematics (Gutstein, 2003).

The study found that culturally responsive strategies such as using local languages, culturally familiar examples, and group collaboration encouraged active participation, especially among low-achieving and shy students. This supports Ladson-Billings' (1994) concept of "culturally relevant pedagogy," where cultural competence and critical consciousness are cultivated alongside academic success. Teachers' use of students' home languages in clarifying mathematical concepts supports research showing that multilingual learners perform better when their linguistic backgrounds are embraced (Cummins, 2000). This finding resonates with studies by Gay (2013) and Villegas and Lucas (2007), who found that culturally grounded instruction increases learner participation and confidence. However, while the literature often emphasizes theoretical benefits, this study extends those insights by offering concrete, grassroots examples from classrooms in resource-constrained contexts.

Teachers reported that CRT enables equitable learning by moving beyond textbook reliance to incorporate real-life, culturally grounded experiences. This is in line with Banks' (2015) multicultural education framework, which highlights the importance of integrating students' lived realities into the curriculum to foster equity. Teachers using familiar items—like bananas or water bottles—make mathematics instruction more accessible and democratic. This approach also aligns with the work of Nieto (2010), who emphasizes the need for equitable access to culturally responsive resources to bridge the gap between home and school cultures. However, the findings also add a critical dimension: while CRT strategies promote equity, they are largely improvised by individual teachers due to lack of systemic support, suggesting a disjunction between policy ideals and classroom realities. The collaborative learning promoted by CRT was found to support inclusivity and academic peer mentoring. Students of varying ability levels engaged more meaningfully when working in mixed-ability groups, mirroring Vygotsky's (1978) Zone of Proximal Development theory, which posits that learners benefit from more capable peers' support. This also supports Darling-Hammond et al.'s (2019) findings that inclusive, culturally attuned instruction fosters not only academic growth but also socio-emotional development. However, some studies—such as Delpit (1995)—have warned that collaborative methods may not be sufficient unless power dynamics and cultural mismatches are addressed. While not deeply problematized in the current study, this offers an avenue for future investigation.

Students in this study reported increased confidence, relevance, and a sense of belonging when CRT was used. These perceptions mirror Howard's (2003) claim that when students see their culture reflected in classroom practices, their engagement and achievement improve. CRT was found to reduce math anxiety and promote self-efficacy—an insight supported by research from Sleeter (2012), who emphasized that CRT contributes to both academic outcomes and student identity formation.

However, while the potential of CRT is affirmed, several barriers to its effective implementation were identified. Limited culturally relevant materials align with studies by Gay (2010) and Paris & Alim (2017) highlighting that

teachers often lack instructional resources aligned with students' cultures. Curriculum and assessment rigidity supports Cochran-Smith et al. (2015), who argue that high-stakes testing often conflicts with pedagogical innovations like CRT. Resistance from students unfamiliar with participatory or culturally rooted methods, echoing Delpit's (1995) caution that innovation must be scaffolded to avoid alienating learners. Lack of professional development has been reported in this study, a challenge earlier noted by Villegas & Lucas (2002), who argue that CRT must be institutionally supported through sustained teacher training, not left to individual initiative.

Conclusion

The findings of this study offer strong empirical support for culturally responsive teaching as a catalyst for educational equity in mathematics classrooms. CRT enables students from diverse cultural and linguistic backgrounds to engage meaningfully in mathematical learning by validating their lived experiences, enhancing comprehension, and fostering a sense of inclusion. The study aligns with sociocultural learning theory and corroborates existing literature, confirming that CRT strategies improve student engagement, comprehension, and participation. It also extends prior research by providing practical insights from under-resourced contexts, revealing how teachers use culturally familiar examples, local languages, and collaborative learning to promote equity.

However, despite the promise of CRT, its effective implementation is constrained by inadequate resources, rigid curriculum demands, standardized testing pressures, and limited teacher training. These systemic barriers underscore the need for policy reforms that institutionalize culturally responsive pedagogy through curriculum adaptation, teacher professional development, and the provision of appropriate learning materials. Ultimately, for CRT to fulfill its transformative potential, it must be supported at multiple levels—from classroom practice to national education policy. Integrating CRT should not be viewed as an optional pedagogical strategy, but as a fundamental right for learners from all backgrounds to access meaningful and equitable education.

Recommendations

Ministries of Education and teacher training institutions should embed culturally responsive pedagogy in pre-service and in-service teacher education. This will equip teachers with theoretical and practical knowledge to design lessons that reflect students' cultural and linguistic backgrounds. Curriculum developers and educational publishers should work with local educators to develop textbooks and teaching aids that reflect students' cultural and everyday experiences. Schools should encourage community participation by inviting local artisans, farmers, or traders to demonstrate how mathematics is used in their professions, thereby validating local knowledge and promoting relevance.

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