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Local Culture as Pedagogical Leverage: Examining Culturally Responsive Teaching Strategies in Secondary Mathematics Classrooms

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ABSTRACT

This study aims to explore teacher strategies in implementing Culturally Responsive Teaching (CRT) within mathematics instruction at Muhammadiyah Mlati Senior High School. A qualitative approach employing a case study design was used to examine the processes, meanings, and instructional practices in their natural context. The research participants consisted of one mathematics teacher and five students selected through purposive sampling. Data were collected through classroom observations, semi-structured interviews, and documentation. The data were analyzed using the interactive analysis model developed by Miles & Huberman, which includes data reduction, data display, and conclusion drawing. The trustworthiness of the data was ensured through methodological triangulation, source triangulation, and member checking. The findings reveal that CRT implementation was carried out through four key strategies: (1) contextualizing mathematical problems using local cultural references, (2) differentiating instruction based on students' learning readiness and abilities, (3) applying collaborative learning supported by multimodal representations, and (4) reinforcing values and learning identity through humanistic pedagogical interactions. This study concludes that the application of CRT fosters a more inclusive and meaningful mathematics learning environment while enhancing students' motivation and participation.

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ABSTRAK

Penelitian ini bertujuan menggali strategi guru dalam menerapkan *Culturally Responsive Teaching* (CRT) pada pembelajaran matematika di Muhammadiyah Mlati Senior High School. Penelitian menggunakan pendekatan kualitatif dengan desain studi kasus yang berfokus pada pemahaman proses, makna, serta praktik pembelajaran dalam konteks alami. Subjek penelitian terdiri dari satu guru matematika dan lima siswa yang dipilih melalui teknik purposive sampling. Data dikumpulkan melalui observasi, wawancara semi-terstruktur, dan dokumentasi. Analisis data dilakukan menggunakan model analisis interaktif Miles & Huberman melalui tahap reduksi data, penyajian data, serta penarikan kesimpulan. Keabsahan data diperkuat dengan triangulasi metode, triangulasi sumber, dan member checking. Hasil penelitian menunjukkan bahwa implementasi CRT dilakukan melalui empat strategi utama, yaitu adaptasi konteks soal berbasis budaya lokal, diferensiasi pengajaran sesuai kemampuan siswa, penggunaan metode pembelajaran kolaboratif dengan representasi multimodal, serta penguatan nilai dan identitas belajar melalui interaksi pedagogis yang humanis. Penelitian ini menyimpulkan bahwa penerapan CRT mampu menciptakan pembelajaran matematika yang lebih inklusif, bermakna, dan meningkatkan motivasi serta partisipasi siswa.

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Introduction

Student diversity in today's educational context is inevitable and has become a reality that teachers must address within the classroom environment (Astutik et al., 2025). Learners enter the classroom with varied cultural backgrounds, languages, academic abilities, family values, religions, and prior learning experiences. According to (Venkatesan & Prabakar (2024) and Sadiyah et al. (2025), cultural diversity is an educational asset that, when properly managed, can enhance instructional quality and expand students' ways of thinking. However, in practice, many teachers still apply standardized and uniform instructional approaches without considering students' diverse learning styles. This condition leads to learning experiences that are less meaningful and unable to accommodate students' individual needs.

In subjects that are abstract in nature, such as mathematics, these challenges become even more complex. Many students experience anxiety and learning barriers because the material feels distant from their lived cultural realities (Siswanto, Kintoko, Susetyawati, et al., 2025). When mathematics is positioned as universal knowledge without integrating sociocultural context, some students struggle to connect with the learning process. Resi et al. (2025) and Vale & Barbosa (2023) argues that culturally grounded mathematics instruction helps students understand abstract concepts by presenting them through authentic representations relevant to their daily lives. Therefore, an instructional approach capable of bridging mathematical theory with students' sociocultural realities is needed to make learning more accessible.

One relevant pedagogical framework in this context is Culturally Responsive Teaching (CRT). This approach, introduced by Ewulley et al. (2023) and Opesemowo (2025), emphasizes that students' cultural diversity should serve as a foundation in instructional design. CRT positions teachers not only as content experts, but also as professionals who understand students' identities, cultural experiences, and the social dynamics shaping how they learn (Hendriana et al., 2025; Saputra et al., 2025). This approach places students at the center of the learning process and encourages teachers to design culturally relevant, collaborative, and humanistic instructional strategies.

The implementation of CRT involves adapting instructional materials and contexts, differentiating teaching methods, using multimodal representations of knowledge, and fostering empathetic teacher–student interactions that honor cultural identity (Efendi et al., 2025; Pisriwati, 2025) This framework requires teachers to think critically and reflectively about their instructional practices. According to Sukmanasa et al. (2024), culturally responsive teachers do not merely modify instructional techniques they transform their perspectives by recognizing learners as unique cultural individuals. Therefore, teacher awareness of diversity becomes a key determinant in successful CRT implementation.

Although CRT has been widely studied in Western educational contexts, research examining its application in Indonesian schools particularly faith-based institutions remains limited. As a multicultural nation, Indonesia has strong potential for CRT implementation; however, instructional practices in schools remain predominantly uniform and standardized (Amalia et al., 2024; Lefrida, 2025). The context of Muhammadiyah schools, which integrate Islamic values

into daily instruction, presents a compelling opportunity to explore how local cultural values, religion, and academic content intersect within culturally responsive pedagogical practices.

The gap between the need for culturally responsive instruction and the realities of classroom practices indicates the urgency for deeper investigation into teacher strategies for implementing CRT. Teachers, as key instructional agents, must understand concrete steps for translating this approach into authentic classroom practice. Naufal et al. (2025) and Saleh et al. (2025) asserts that qualitative research is suitable for exploring practices, strategies, and teacher experiences in natural learning settings. Accordingly, this study is essential for examining how teachers design, implement, and evaluate culturally responsive mathematics instruction in a systematic manner.

Method

This study employed a qualitative research approach with a case study design to explore teacher strategies in implementing Culturally Responsive Teaching (CRT) in mathematics instruction at Muhammadiyah Mlati Senior High School. The qualitative approach was selected because the study prioritizes understanding processes, meanings, and interactional dynamics within a natural setting (Anggreni et al., 2025). A case study design was used to investigate the phenomenon in depth within a specific site that aligns with the objectives of the research. The research participants consisted of one mathematics teacher as the primary informant and five students as supporting informants, selected through purposive sampling based on their involvement in the CRT-based learning process. Data were collected through classroom observations, semi-structured interviews, and documentation of instructional materials. The primary research instrument was the researcher, supported by an observation checklist and interview guidelines as secondary instruments (Creswell, 2014).

The collected data were analyzed using the interactive model of Miles & Huberman (1994), which includes data reduction, data display, and conclusion drawing and verification. To ensure the credibility of the findings, data validation was conducted through methodological triangulation, source triangulation, and member checking to ensure that the findings accurately reflect field realities. The research procedures were carried out sequentially, including pre-observation, data collection, simultaneous analysis, and interpretation of findings based on contextual evidence. All research activities adhered to ethical research standards, including confidentiality of participant identities, informed consent, and maintaining researcher objectivity during data collection and interpretation (Mertens, 2015). With this design and analytical procedure, the study is expected to produce a comprehensive understanding of strategies used to implement Culturally Responsive Teaching in mathematics instruction.

Results

1. Adaptation of Mathematical Contexts to Students' Cultural Backgrounds

The mathematics teacher at Muhammadiyah Mlati Senior High School consistently applied contextual adaptation strategies as part of the Culturally Responsive Teaching (CRT) approach. Based on the interview findings, the teacher explained that the use of problem examples closely related to students' cultural backgrounds and daily experiences supports their understanding of abstract mathematical concepts. The teacher stated that students grasp concepts more quickly when the content is connected to familiar activities such as market transactions, religious activities, or local traditions. This approach not only increases learning interest but also fosters a perception that

mathematics has practical relevance in everyday life.

Classroom observations confirmed the implementation of this strategy in real learning activities. The teacher presented contextual problems such as calculating profit percentages of local market traders, determining zakat maal distribution, and converting measurement units for agricultural land management, which reflects the lived experiences of many students. At other times, the teacher also used modern examples involving digital transactions, such as online shopping discounts and installment payments (Parilah et al., 2025; Wibowo et al., 2024). The variation of contexts appeared to increase students' enthusiasm and engagement, as they perceived the problems as personally meaningful and relatable.

These findings reinforce that contextual adaptation in mathematics learning contributes to a more meaningful and inclusive learning experience. Students demonstrated greater confidence when expressing answers and problem-solving strategies because the task contexts felt familiar rather than abstract or intimidating. Moreover, the teacher succeeded in reducing the psychological distance often perceived between learners and mathematics. Thus, this strategy not only enhances students' conceptual understanding but also supports the CRT goal of validating learners' cultural identities and lived experiences.

2. Differentiated Instruction Based on Students' Diverse Learning Abilities

The mathematics teacher implemented differentiated instruction to accommodate the varied learning abilities of students. According to the teacher, the class consisted of students with significantly different levels of mathematical understanding ranging from those who understood concepts quickly, to those who required repetition, and those needing more intensive guidance. To address this variation, the teacher designed tiered problem sets basic, intermediate, and advanced to ensure that each student received an appropriate level of challenge aligned with their learning readiness.

Classroom observations showed that differentiation extended beyond task variation. The teacher provided additional scaffolding for students who struggled, such as step-by-step solution guidance and parallel example problems prior to independent practice. Peer tutoring was also implemented by assigning higher-performing students to support their peers during group work. These interactions appeared to boost students' self-confidence and fostered a more collaborative learning environment. The strategy also reduced students' dependence on the teacher by enabling peer-mediated learning opportunities.

The combined results of observations and interviews indicate that differentiated instruction contributed to a more inclusive and responsive mathematics learning environment. Students seemed more engaged because they were able to learn at their own pace and through their preferred learning approaches. Rather than being perceived as unequal treatment, differentiation created equitable learning opportunities suited to students' diverse needs (Hanama, & Apriwulan, 2025; Wahyuni et al., 2024). Accordingly, this strategy demonstrates that implementing CRT through differentiated instruction not only improves academic understanding but also strengthens student confidence, autonomy, and respect for diverse learning abilities.

3. Implementation of Collaborative Learning Methods and Multimodal Representation

The interview data revealed that the teacher intentionally selected instructional methods aligned with CRT principles, emphasizing collaboration and diversity in students' thinking processes. The teacher explained that mathematics learning should not focus solely on final answers,

but also on the reasoning processes that reflect students' individual cognitive approaches. Therefore, strategies such as small-group discussion, problem-based learning, and the use of visual media were purposefully included in the instructional plan. According to the teacher, these methods encourage active problem-solving and allow students to learn from peers with different reasoning patterns.

Classroom observations supported these claims through visible implementation of group-based problem-solving activities. Students used various representations to understand mathematical tasks, including board-drawn graphs, flow diagrams, digital calculators, and simple manipulatives such as folded paper for geometry concepts. The teacher also allowed students to present solutions in diverse formats formal mathematical notation, oral explanations, or visual diagrams. This flexibility enabled students with visual, auditory, and kinesthetic learning preferences to participate effectively.

The findings demonstrate that CRT-aligned instructional methods enrich the learning experience and foster an inclusive climate where diverse reasoning approaches are viewed as strengths rather than limitations. Students showed increased confidence when allowed to choose their preferred strategy for solving problems, leading to improved participation and engagement. Furthermore, collaborative learning and multimodal representation strengthened a learning culture grounded in respect for cognitive diversity and supported students' development of critical mathematical thinking. Thus, the implementation of CRT-based instructional methods significantly enhanced the quality of mathematics learning at Muhammadiyah Mlati Senior High School.

4. Reinforcing Values, Identity, and Positive Learning Culture Through Humanistic Pedagogical Interaction

The interview findings indicated that the teacher intentionally cultivated a learning environment that respects diversity through empathetic and supportive communication. The teacher emphasized that such an approach is essential to ensure students feel emotionally safe when participating in mathematics learning, particularly those who experience anxiety or lack self-confidence. The teacher reiterated that there are no "smart" or "weak" students only learners with different learning rhythms. For this reason, the teacher avoided labeling students and instead focused on acknowledging effort, reasoning processes, and learning progress.

Classroom observations confirmed these practices, as the teacher consistently offered affirmations such as "good job," "keep trying," and "your reasoning is interesting" to all students, even when responses were incomplete or incorrect. The teacher also enforced class norms grounded in discipline and responsibility, such as punctual assignment submission and revision requirements when learning outcomes were not met. These expectations were framed not as pressure but as a means to develop perseverance and a growth mindset in mathematics learning.

The findings further revealed that Islamic values such as ihsan (excellence), amanah (responsibility), and ukhuwah (brotherhood) were naturally integrated throughout classroom instruction and interaction. The teacher linked the importance of persistence in learning mathematics with the concept of ihsan and emphasized amanah when completing assessments honestly. Meanwhile, structured group collaboration fostered ukhuwah through peer support. This approach successfully created a learning environment that is inclusive, respectful, and supportive of both academic and spiritual identity formation.

Discussion

The implementation of Culturally Responsive Teaching (CRT) in mathematics learning at Muhammadiyah Mlati Senior High School demonstrates that adapting problem contexts is a crucial strategy in bridging students' understanding of abstract mathematical concepts. The findings align with Efendi et al. (2025), Fitriana et al. (2025), and Tarso et al. (2025), who emphasizes that learning connected to students' cultural backgrounds and lived experiences enhances meaning-making and facilitates conceptual thinking. Field observations revealed that when teachers incorporated examples relevant to students' daily activities such as traditional market transactions or the distribution of zakat maal students became more engaged and were able to relate mathematical ideas to real-life situations (Tang, 2024). This indicates that contextual adaptation not only increases motivation but also strengthens conceptual understanding through meaningful and relevant learning experiences (Janah et al., 2025; Fitriana et al., 2025).

Furthermore, the differentiated instruction strategies implemented by the teacher received positive responses in addressing students' diverse learning abilities. This practice is consistent with Astiwi et al. (2024), Pratiwi (2024), and Sukmanasa et al. (2024), who argues that learner diversity should not be viewed as a barrier, but rather as an indicator for adjusting instructional approaches. The findings show that the teacher provided scaffolding and tiered exercises to ensure each student had an appropriate learning pathway aligned with their cognitive development. This strategy aligns with Kliziene et al. (2022), Supriadi et al. (2024) and Tian & Zhang (2025), who found that differentiated instruction in mathematics enhances student engagement and reduces mathematics anxiety. Thus, differentiation plays a crucial role in promoting equity, increasing participation, and fostering student independence in learning.

In addition to differentiation, collaborative learning and multimodal representation further strengthened CRT-based instruction. These findings resonate with Howell (2021), Knaus (2023), and Tarso et al. (2025), who states that collaborative learning provides opportunities for knowledge construction through social interaction, while multimodal representations support comprehension across varied cognitive styles. Classroom observations indicated that the use of visual graphs, hands-on manipulatives, and digital tools improved students' learning engagement and enabled them to express problem-solving strategies comfortably (Rochmat et al., 2025; Kasanah, et al., 2025). With the flexibility to respond verbally, visually, or symbolically, learning became more inclusive, honored diverse thinking patterns, and enhanced students' critical thinking skills.

Another significant dimension found in this study is the reinforcement of values, identity, and a positive learning culture through humanistic pedagogical interaction. The teacher intentionally created an emotionally safe learning environment by avoiding academic labeling and emphasizing effort-based recognition rather than outcome-based evaluation. This finding aligns with Maulana et al. (2013) and Safitri et al. (2023) growth mindset theory, which posits that the belief in the potential to improve through effort increases students' academic motivation. It also corresponds with Chaiarwut et al. (2025), Schotte et al. (2022) and Siswanto et al. (2024), who asserts that culturally responsive teaching extends beyond instructional content to include pedagogical relationships that honor students' identities as unique individuals.

The integration of Islamic values such as ihsan, amanah, and ukhuwah added a distinct dimension to the CRT

implementation one that is rarely found in Western CRT literature. This approach reflects Anggraini (2022) and Birhan et al. (2021) character-based moral education framework, which argues that meaningful learning should foster not only academic competence but also moral and spiritual development. This integration represents a unique feature of CRT practices in religious-based schools such as Muhammadiyah Mlati Senior High School, contributing to broader CRT discourse within Indonesia's religious and cultural educational context.

Overall, the four instructional strategies implemented by the teacher demonstrate that CRT is not merely theoretical but can be realized through structured, reflective, and intentional pedagogical practice. These findings reinforce Maba et al. (2025) and Schreiter et al. (2024) argument that successful CRT implementation depends on teachers' ability to understand students' backgrounds, adapt instruction, and build positive classroom relationships. In this study, the mathematics teacher demonstrated pedagogical practices that not only responded to student diversity but also enhanced relevance, motivation, and students' sense of ownership in learning mathematics.

Conclusion

The implementation of Culturally Responsive Teaching in mathematics instruction at Muhammadiyah Mlati Senior High School has positively contributed to improving conceptual understanding, learning motivation, and student engagement. Strategies such as culturally grounded contextual adaptation of mathematical problems, differentiated instruction, multimodal collaborative learning, and value-driven humanistic pedagogy have successfully created an inclusive, meaningful, and empowering learning environment. To strengthen these practices, it is recommended that teachers continue developing contextually relevant problem examples aligned with social and technological developments, expand the use of digital learning media, and engage in ongoing pedagogical reflection to ensure instructional strategies remain adaptive to students' needs. Furthermore, sustained institutional support in the form of continuous professional development, sharing platforms for best practices, and provision of instructional resources will be essential for ensuring long-term CRT integration in mathematics education.

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