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The Application of Culturally Responsive Teaching to Improve the Mathematics Learning Outcomes of Class XI.3 Students at SMA Negeri 5 Mataram

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Abstract: This research aims to improve students' mathematics learning outcomes through the application of the Culturally Responsive Teaching (CRT) approach. The subjects of this study are the students of class XI.3 at SMAN 5 Mataram for the 2024/2025 academic year, totaling 39 individuals. This study uses the Classroom Action Research (CAR) approach conducted in two cycles, with each cycle consisting of four stages: planning, implementation, observation, and reflection. Data were collected through learning outcome tests at each stage: pre-cycle, cycle 1, and cycle 2. The research results indicate an increase in the average student learning outcomes from 45.85 in the pre-cycle, rising to 72.36, and reaching 85.26 in cycle 2. This improvement indicates that the application of the CRT approach is effective in enhancing students' learning outcomes.

Keywords: Culturally Responsive Teaching, Classroom Action Research, Learning Outcomes, Mathematics

Introduction

Education is a process aimed at developing individual potential, both in terms of knowledge, skills, and attitudes. Thus, it produces independent individuals who are capable of facing the challenges of the times (Erika, 2025). Law No. 20 of 2003 on the National Education System defines education as a conscious and planned effort to create a learning atmosphere and learning process in which students actively develop their potential, including spiritual aspects, self-control, personality, intelligence, noble morals, and skills that are beneficial for themselves, society, the nation, and the state (Depdiknas, 2003).

The main goal of education can be achieved through the learning process. Learning is an interaction between teachers and students in an environment designed to provide beneficial learning experiences for students. The process includes cognitive aspects (knowledge), affective aspects (attitudes), and psychomotor aspects (skills) (Pramaishella et al., 2024). The success of learning is greatly influenced by teaching strategies, learning media, and a conducive and inclusive classroom atmosphere (Samsudin, 2020). Effective learning is defined as learning that connects the material with students' daily lives, according to (Efendi & Ningsih, 2022).

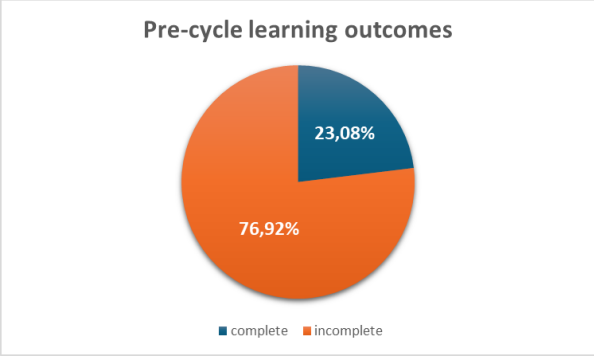
One of the benchmarks for the success of learning is learning outcomes. Learning outcomes are the changes that occur during the student's learning process. Mathematics learning outcomes include conceptual understanding, logical thinking skills, conceptual understanding, and attitudes toward the subject (Yandi et al., 2023). However, mathematics is often considered boring and abstract, especially when the material is not related to local culture or the students' daily lives (Nurrahmawati et al., 2020). Therefore, culturally and contextually relevant learning is necessary to improve mathematics learning outcomes.

The low mathematics learning outcomes of students also occur at SMA Negeri 5 Mataram, particularly in class XI.3. The initial evaluation results (pre-cycle) showed that only 23.08% of students achieved learning completeness. Out of the 39 students evaluated, only 9 students scored above 75, indicating that the majority of students have not yet met the Minimum Completeness Criteria. Additionally, observations conducted in the classroom indicate that students tend to be less actively engaged in the learning process. Many students find mathematics lessons difficult and irrelevant to their daily lives. Table 1 and Figure 1 present the pre-cycle student learning outcomes in class XI.3.

Table 1. Student Learning Outcomes

Number	Aspect	Description
1	Number of students who took the test	39
2	Number of students who passed	9
3	Number of students who did not pass	30
4	Average	45.85
5	Percentage of passing	23.08%

Source: Data processed with Excel



Source: Data processed with Excel

Figure 1. Percentage of student learning mastery

The results of the data analysis in Table 1 and figure 1 show that the majority of students have not yet reached the very high Minimum Completeness Criteria, which is 76.92% or 30 out of 39 students. The average student score is also low, at 45.85. These findings indicate a serious problem in the understanding of mathematical concepts among the students of class XI.3 at SMA Negeri 5 Mataram. This issue demands the need for a more creative, relevant, and contextual learning approach to address the gap in students' understanding of abstract and conceptual material.

One of the approaches that can be used to address this issue is Culturally Responsive Teaching (CRT). The CRT approach is a learning approach that demands equal rights for every student to receive education without discrimination based on the students' cultural backgrounds (Gay, 2000). This approach allows students to actively engage in learning (Fitria & Saenab, 2023). Integrating culture into learning will make the learning experience more meaningful for students (Fadillah & Listiawan, 2024), making it easier for students to understand the material because it is linked to contextual events. This is in line with the opinion of (Khasanah, 2023), who stated that the CRT approach can improve student learning outcomes in cognitive, affective, and psychomotor aspects.

The application of CRT in mathematics learning has empirically proven to enhance student motivation, conceptual understanding, active participation, and learning outcomes. Research by Masfiastutik et al. (2024) noted an increase in student engagement and understanding of fractions after the material was connected to everyday contexts. Girsang et al. (2024) emphasize that culturally based teaching makes the teaching and learning process meaningful and can enrich students' learning experiences. Enjelina et al., (2024) found that the use of CRT not only improves mathematics learning outcomes but also creates an inclusive and responsive classroom atmosphere for student diversity. Hernita et al., (2024) noted an increase in conceptual understanding and active participation, while Lusida et al., (2024) reported improved learning outcomes and positive attitudes in science subjects after the implementation of CRT. Sari et al., (2023) also showed that the integration of culture into learning could enhance learning outcomes compared to conventional approaches.

Although the implementation of Culturally Responsive Teaching (CRT) has been proven to enhance students' conceptual understanding and active participation in several studies, there are still few studies examining the application of CRT in mathematics education, particularly at the high school level. Additionally, research related to the implementation of CRT in local contexts such as the City of Mataram, which faces unique challenges of cultural diversity and social backgrounds, is also very limited. Therefore, it is important to explore how the implementation of CRT can address the issues faced by students in class XI.3 at SMA Negeri 5 Mataram, particularly in terms of low student learning outcomes, through a more contextual approach that is relevant to their needs.

Method

The type of research used is Classroom Action Research (CAR). CAR is a research approach aimed at continuously improving and enhancing the learning process. The CAR design used refers to the cycle model by Kurt Lewin (Mualimin & Cahyadi, 2014), which consists of four main stages: planning, acting, observing, and reflecting. This research is designed in two cycles, and each cycle consists of two meetings. The issues identified in Cycle I will be analyzed and used as the basis for improvements in Cycle II. The flow of activities in the CAR cycle is presented in Figure 2.

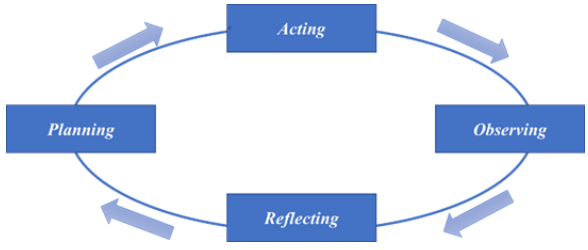


Figure 2. The CAR Cycle according to Kurt Lewin

1. Planning

At this stage, the researcher, together with the subject teacher, prepares an action plan to be carried out, namely, developing teaching modules and student worksheet based on the CRT approach, preparing observation sheets for teachers and students, designing learning outcome test instruments, and adjusting mathematics learning materials to the cultural background of the students.

2. Acting

This stage is the implementation of the plan that has been prepared. Learning activities are conducted according to the designed CRT approach. Each cycle consists of two meetings, each lasting 2 × 45 minutes.

3. Observing

Observation is conducted during the learning process to record the activities of teachers and students and to identify the effectiveness of actions. Observation is conducted by the supervising teacher and students using the prepared observation sheets.

4. Reflecting

The reflection stage is conducted after all activities in one cycle are completed. The researcher and the teacher discuss the results of the observations and tests to evaluate the effectiveness of the actions and formulate improvements for the next cycle.

The instruments used in this study are observation sheets for the implementation of learning and learning outcome tests. The data analysis method in this study uses a descriptive method by comparing students' learning outcomes before the action with students' learning outcomes after the action. Data obtained from the observation of the learning process and students' learning outcomes are subsequently analyzed. This data analysis is used to prove whether students' learning outcomes meet the established indicators.

The steps for data analysis are as follows:

1. Learning Process

a. Scoring is adjusted according to the scoring guidelines that have been previously established. If each observed aspect corresponds to reality, it receives a score of 1, whereas if the observed aspect does not correspond to reality, it receives a score of 0.

b. Conduct a percentage analysis of the observation scores of the learning process with CRT found on the observation sheet using the following formula:

$$X\% = \frac{\sum Observation\ score}{Total\ Skor} \times 100\% \quad (1)$$

c. The assessment criteria for the learning process are as follows:

Table 2: The assessment criteria for the learning process

Percentage (%)	Category
75.00 - 100	Good
50.00 – 74.99	Fair
25.00 – 49.99	Poor
< 25.00	Very Poor

Source: Arikunto, 2016

d. Drawing conclusions based on the analysis of the learning process in CRT learning on the topic of circles.

2. Learning Outcomes

a. Scoring the test, the score given based on the scoring guidelines created by the researcher;

b. Converting the score into a grade using the formula referring to the formula proposed by Arifin (2016), as follows:

$$Score = \frac{\sum Total\ Score}{\sum Maximum\ Score} \times 100 \quad (2)$$

Criteria:

- Score ≥ 75 = Complete
- Score < 75 = Incomplete

c. Calculating the average score using the formula:

$$\bar{x} = \frac{\sum x}{N} \quad (3)$$

Explanation:

$\bar{x}$ = Mean

$\sum x$ = Total Score

N = Number of Students

d. Calculating the percentage of completeness using the formula:

$$\%Completeness = \frac{\sum \text{umber of students who completed}}{\sum \text{total number of students}} \times 100\% \quad (4)$$

e. Drawing conclusions based on student learning outcomes using the CRT approach.

As a benchmark for the success of this classroom action research, it can be seen from the learning process if it has reached a good category with at least 75% of the learning process being implemented according to the stages on the observation sheet (Arikunto, 2016). Additionally, it can be seen in the learning completeness results of the students who participated in the learning, with at least 75% of the students being complete (Panjaitan et al., 2020).

Result and Discussion

1. Research results

a. Pre-cycle

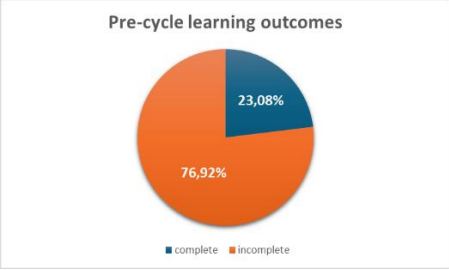
Before the action was taken, the researcher conducted initial observations to identify the initial conditions of the students in class XI.3 SMA Negeri 5 Mataram in mathematics learning, particularly

regarding circles. This observation was conducted through an initial assessment to measure the students' mastery level of basic mathematical concepts as a preliminary reference. The assessment results show that out of 39 students, only 9 students (23.08%) scored ≥ 75. The average class score in the pre-cycle stage was 45.85, with the highest score being 96 and the lowest score being 10. The learning outcomes of the XI.3 class students in the pre-cycle stage are presented in Table 3 and Figure 3.

Table 3. Student Learning Outcomes Pre-cycle

Description	Results
Highest score	96
Lowest score	10
Average score	45,85
Number of students who passed	9
Number of students who did not pass	39
Percentage of students who passed	23,08%

Source: Data processed with Excel



Source: Data processed with Excel

Figure 3. Percentage of student learning mastery

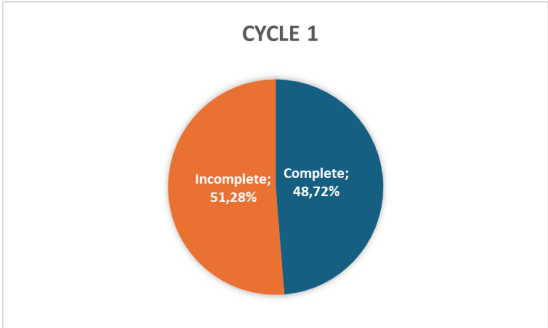
b. Cycle I

In the first cycle stage, the researcher designed and implemented learning using the CRT approach with the discovery learning model. Teaching materials such as modules, student worksheets, media, and assessment instruments were developed by adapting the circle material to the local cultural context, specifically the Sasak culture. Students were divided into heterogeneous groups to complete the student worksheets related to local cultural contextual problems and concluded with formative assessments to evaluate students' understanding. The results of cycle I are presented in Table 4 and Figure 4.

Table 4. Student Learning Outcomes Cycle I

Aspect	Description
Number of students who took the test	39
Number of students who passed	19
Number of students who did not pass	20
Highest score	100
Lowest score	35
Average	72.36
Percentage of students who passed	48.72%

Source: Data processed with Excel



Source: Data processed with Excel

Figure 4. Percentage of student learning mastery in cycle I

Data analysis in Table 4 and Figure 4 shows an improvement from the pre-cycle stage, both in terms of average scores and percentage of completeness. The percentage of students in class XI.3 who met the completion criteria by the end of cycle I reached 48.72%, or 19 students, with an average score of 72.36. However, based on observations, some students still show low participation in group discussions.

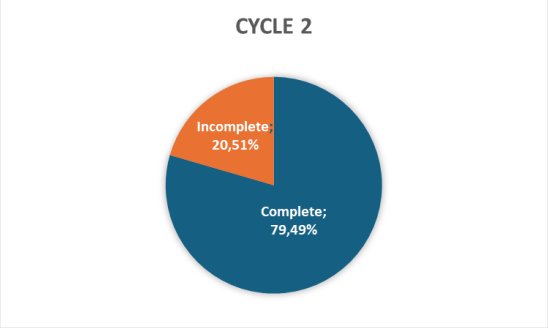
c. Cycle II

Based on the findings from Cycle I, the research continued to Cycle II by making adjustments to the learning plan. The lesson plan refers to the reflection results from the previous cycle, adopting the cooperative learning model and the CRT approach. Several improvements were implemented in the second cycle. First, the teaching materials were enriched with the integration of local cultural contexts to enhance the relevance of learning for students. Second, the digital platform Wordwall was used as an interactive learning medium. Third, special attention is given to students who did not complete the first cycle through more intensive mentoring during group discussion activities. To measure the effectiveness of the improvements made, formative assessments were given again at the end of cycle II. The results of these assessments are provided in Table 5 and Figure 5.

Table 5. Student Learning Outcomes Cycle II

Aspect	Description
Number of students who took the test	39
Number of students who passed	31
Number of students who did not pass	8
Highest score	100
Lowest score	50
Average	85.26
Percentage of students who passed	79.49%

Source: Data processed with Excel



Source: Data processed with Excel

Figure 5. Percentage of student learning mastery in cycle II

The results of the analysis in Table 5 and Figure 5 indicate that students' learning outcomes are generally good, with a completeness percentage of 79.49% and an average score of 85.26. These results show that the actions in the second cycle effectively improved students' learning outcomes, as evidenced by the increased average score and completeness percentage. The results of the observations also indicate an increase in student engagement in the learning process in cycle II.

2. Discussion

Learning outcomes are an important indicator of the success of education, reflected through changes in students' knowledge, skills, and attitudes (Rohman, 2021). Comprehensive measurement of learning outcomes is necessary to determine the level of achievement of learning objectives, provide feedback, and design improvements in the learning process. In this study, the application of culturally responsive teaching showed a significant impact on improving mathematics learning outcomes on the topic of circles in class XI.3 SMA Negeri 5 Mataram.

At the pre-cycle stage, the average student score was only 45.85 with a learning completeness of 23.08%. This low achievement indicates that most students have not yet understood the basic concepts of circles, such as tangents, radii, and their interrelations. One of the causes is the previous learning approach, which tended to be conventional, less contextual, and had not taken into account the cultural diversity and learning experiences of the students.

The implementation of Culturally Responsive Teaching began in Cycle I by integrating the discovery learning model. The learning strategy is designed contextually through a worksheet containing illustrations of local Sasak culture, such as traditional weaving, cidomo wheels, and typical Lombok ornaments. Heterogeneous learning groups were formed based on students' academic abilities and social backgrounds to facilitate cooperation and mutual learning. As a result, the average score increased to 72.36, and the completion rate reached 53.85%. Although student participation improved, some students still showed a tendency to be passive, so the learning strategy needs reinforcement to ensure more even engagement. These findings are in line with (Yogica et al., 2020), who assert that contextual and student-centered learning strategies can build a deeper conceptual understanding.

Improvements were made in the second cycle by maximizing student engagement through interactive digital media such as Wordwall, assigning clear roles to each group member, and providing individual guidance for students who had not yet mastered the material. This change in strategy had a significant impact: the average score increased to 85.26, and the learning completeness reached 76.92%. The classroom atmosphere became more dynamic, as evidenced by the increasing number of students actively engaging in discussions, asking questions, and answering queries. This study supports the opinion of (Puspitasari & Airlanda, 2021) that the integration of local cultural contexts in mathematics learning can enhance students' motivation, participation, and understanding.

Overall, the improvement in learning outcomes from the pre-cycle to cycle II indicates that culturally responsive teaching is capable of bridging the gap between the subject matter and the students' cultural experiences. When students see the direct connection between mathematical concepts and their lives, they become more motivated and actively engaged in the learning process. This view is in line with Gay (2018), who stated that culturally responsive teaching can create an inclusive, relevant, and empowering learning environment. Therefore, the application of culturally responsive teaching in mathematics learning in classes with high heterogeneity, such as SMA Negeri 5 Mataram, is very relevant to improving learning outcomes while also building students' critical and collaborative thinking skills.

Conclusion

Based on the results of data analysis, the implementation of the Culturally Responsive Teaching (CRT) approach has proven effective in improving the mathematics learning outcomes of students in class XI.3 at SMA Negeri 5 Mataram. The percentage of learning completeness significantly increased from 23.08% in the pre-cycle to 53.85% in the first cycle and reached 76.92% in the second cycle. The average student score also rose from 45.85 in the pre-cycle to 73.36 in the first cycle and 85.26 in the second cycle. In addition to academic achievement improvements, classroom observations showed that the implementation of CRT was able to

enhance student activity in asking questions and discussing, strengthen group cooperation, and improve positive attitudes toward learning mathematics. This improvement shows that CRT not only impacts learning outcomes but also creates an inclusive learning atmosphere that is relevant to the cultural backgrounds of the students. Therefore, this approach is recommended for teachers as an effective, sustainable, and responsive learning strategy for student diversity.

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Author Contributions
Conceptualization, P.I.; methodology, P.I.; validation, S.P. and I.G.S.; formal analysis, P.I.; investigation, P.I.; resources, I.G.S.; data curation, P.I.; writing—original draft preparation, P.I.; writing—review and editing, S.P. and I.G.S.; visualization, P.I.; supervision, S.P.; project administration, P.I. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
The authors declare no conflict of interest.

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