THE EFFECTIVENESS OF CULTURALLY RESPONSIVE TEACHING (CRT) AS A DIFFERENTIATED LEARNING APPROACH IN SECONDARY LEARNING

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ABSTRACT

This study aims to describe the effectiveness of Culturally Responsive Teaching (CRT) as a differentiated learning approach in mathematics. CRT is important to implement because it accommodates students' diverse cultural backgrounds, thus increasing learning participation and understanding. This study used a quantitative approach with a one-group pretest-posttest type pre-experiment design. The research subject was class VIII B of SMP Negeri 15 Surakarta, which was selected by simple random sampling from eight parallel classes. The treatment was conducted in three meetings. The research instruments included learning outcome tests, student activity observation sheets, and student response questionnaires. The results of descriptive analysis showed that the average score of learning outcomes increased from 57.73 to 85.30. The single-sample t-test showed this improvement was statistically significant at the 0.05 significance level. Student activities showed positive engagement of 88.66%, while negative engagement amounted to 6.70%. More than 70% of students responded positively to the CRT implementation. The results of this study show that the CRT approach is efficacious in improving learning outcomes, student engagement, and response, and is relevant to be applied in culturally diverse classrooms.
Keywords: Culturally Responsive Teaching (CRT), Differentiated Learning, Secondary School

PRELIMINARY

Education is one of the efforts to develop human resources and improve their qualifications. Humans need education in life to develop their potential through learning and other socially recognised and accepted methods (Triyani et al.,2024). People carry out education to find their identity, change their attitudes and personal potential, and survive in society (Afsari et al., 2021). Education involves a learning process consisting of various elements to achieve specific goals (Hasmawati et al., 2022). Teachers play a crucial role in facilitating this process effectively, and they must possess the skills to appropriately engage with students during learning. Mathematics, in particular, is a fundamental subject that needs to be mastered from early childhood to higher education (Hafriani, 2021).

Mathematical knowledge includes problem-solving skills, thinking skills, algorithms, relationships between concepts, and the ability to communicate ideas and concepts (Fahma & Purwaningrum, 2021). Many students feel that math is an unpleasant subject, that there are complex tasks and problems, that it is difficult to understand, and that not everyone can do it (Dzulfikar, 2016). Mathematics often causes learning anxiety in students. This anxiety is characterised by fear, worry, and discomfort when facing situations or problems related to mathematics, thus negatively affecting student learning outcomes (Meece et al., 1990; Sherman & Wither, 2003). To overcome this problem, a learning approach that can accommodate students' different needs and characteristics is needed. One approach that can be used is differentiated learning.

Every child has distinct interests, talents, and cognitive abilities, so teachers need to recognise that each child has unique dreams, intelligence, and skills. (Faiz et al., 2022). One of the key ingredients in the independent curriculum is differentiated learning (Afya et al., 2024). Differentiated learning is an effective solution for addressing the diverse needs of students. It involves teachers adapting their instruction to cater to various aspects of student learning, such as readiness, interests, and individual profiles based on abilities and preferences (Aprima & Sari, 2022; C. Tomlinson, 2001).

Differentiated learning adjusts to learning preferences, student interests, and readiness to achieve learning outcomes that meet student needs (Herwina, 2021). Differentiated learning is not differentiating or individualizing students, but learning that meets the needs of all students so that students can learn in the way they prefer. There are three approaches to differentiated learning: content, process, and product (Tomlinson et al., 2003). Differentiated learning is student-centred, incorporates whole-class, group, and individual learning, and is dynamic and organic (Tomlinson, 2017).

Student needs are categorized based on several aspects, such as learning motivation, interests, and student learning profiles (Tomlinson, 2001). Humans have unique potentials and talents, depending on where and how they gain experience and maturity of thought (Faiz et al., 2022). A related approach to differentiated learning that responds explicitly to cultural diversity in the classroom is Culturally Responsive Teaching (CRT). While differentiated learning adapts teaching to students' needs, CRT emphasizes incorporating students' cultural backgrounds into the learning process. By connecting learning materials to the cultural contexts that students are familiar with, CRT enhances the relevance and accessibility of content, fostering greater engagement and understanding.

This research focuses on content-differentiated learning through CRT, where the materials provided in the Learner Worksheet are adapted to reflect the local culture. This adaptation helps students better relate to and understand the material, addressing their individual learning needs and cultural backgrounds. The learning process must pay attention to and consider students' knowledge and cultural background, which aims to encourage students to develop understanding and knowledge in a social context (Rafii et al., 2022).

To develop individual abilities, build character, and create a dynamic learning environment, a learning process that suits students' different backgrounds and conditions needs to be relevant to the needs of the 21st century (Antika et al., 2023). Several educational initiatives in Indonesia have begun adopting the values of the Culturally Responsive Teaching (CRT) approach as part of efforts to improve the quality of education (Khalisah et al., 2023).

CRT is a learning approach where the teacher acts as a facilitator who meets the learning needs of students with different backgrounds, traditions, and ethnicities (Salma & Yuli, 2023). Culturally Responsive Teaching is an approach that focuses on cultural diversity and the integration of students' local culture into learning materials (Noviarini et al., 2024). This approach aims to improve motivation, learning outcomes, and increase students' understanding of cultural diversity (Sari et al., 2023). By applying CRT, students can deepen their understanding of culture and factors that influence cultural diversity in Indonesia.

Teaching with a CRT approach can increase understanding and knowledge of Indonesian culture, especially the local culture of each student's region. Connecting culture with learning media will positively impact it because it can create a sense of love for the country or the spirit of nationalism (Darihastining et al., 2020). Culture-based learning enhances students' understanding of mathematics. This approach is grounded in constructivist theory, emphasizing that learning is built upon the learner's experiences and cultural context. (Perkins, Piaget, and Vygotsky) explaining that individuals can build knowledge through their environment (Hadijah et al., 2019). This approach can be used to respect the cultural differences of diverse learners.

This study explores the effectiveness of *Culturally Responsive Teaching* (CRT) as a differentiated learning approach in multicultural schools, specifically in mathematics instruction at SMP Negeri 15 Surakarta, focusing on the Pythagorean theorem. Initial observations and interviews with mathematics teachers revealed that students had not experienced content-differentiated learning, as they were primarily taught through traditional lecture methods and note-taking.

Given the increasing cultural diversity in classrooms, it is crucial to implement teaching strategies that are not only effective but also culturally relevant. Students from diverse backgrounds may struggle to connect with the material without such strategies, hindering their learning and engagement. By applying CRT as a differentiated learning approach, which is known to enhance students' understanding and motivation, this study aims to offer insights into designing more responsive, inclusive, and effective learning experiences. The findings of this study could contribute to the development of teaching strategies that better address the diverse needs of students, ultimately improving learning outcomes and fostering a more inclusive educational environment.

METHODS

This research approach is a pre-experimental design with a one-group pre-test post-test design, part of quantitative research. The following is the research design:

Table 1. One Group Pre-test Post-test Design

Pre-test	Treatment	Post-test
O_1	X	O_2

Description:

O_1 = Pre-test Score O_2 = Post-test Score X = Model Treatment

This research was conducted in class VIII of SMP Negeri 15 Surakarta. The population in this study was eighth-grade students, and the sample was taken by simple randomization from eight available classes. The selected class was Class VIII B with a total of 30 students. Data collection methods include three main instruments, namely tests, observation sheets, and questionnaires. The test was used to measure students' learning outcomes on Pythagoras material. The form of the question consists of five description questions designed to determine students' concept understanding. In addition, the observation sheet was filled in by the researcher to record student activities during the learning process. The indicators observed include student activity, response to learning, courage in asking questions, and Interest in the learning strategy used.

Students' responses to learning with the Culturally Responsive Teaching (CRT) approach were measured using a questionnaire. The questionnaire consists of seven statements with a 4-point Likert scale (Strongly Agree, Agree, Disagree, Strongly Disagree). This instrument has been tested for construct validity to ensure its accuracy and consistency. The data collected was analyzed descriptively and inferentially. Descriptive analysis was

used to provide an overview of student performance and engagement during learning. Inferential analysis was used to assess the effectiveness of the CRT approach. The paired sample t-test was used to compare the pre-test and post-test results. Before the t-test was conducted, a normality test was first conducted to ensure data distribution. Hypothesis testing was conducted using SPSS software version 25.0. The significance criteria used were p-value <0.05.

RESULT AND DISCUSSION

The research was conducted in five meetings: one pretest meeting, three learning meetings, and one post-test meeting. The following is an explanation of the results obtained from implementing the research.

Learning Activities

The implementation of learning occurs over three sessions, during which the teacher observes the administration of differentiated questions using a Culturally Responsive Teaching (CRT) approach. The collected data undergoes univariate analysis and is presented descriptively through frequency distribution. The results of this frequency distribution are shown in Table 2 below:

Table 2. Descriptive Statistics Results of Learning Implementation Activities

Meeting	Average Score	Category
1	63.533	Good
2	77.633	Very Good
3	84	Very Good
Average	**75.053**	**Very Good**

Table 2 shows that the implementation of learning activities has improved in each meeting. In the first meeting, the average score of 63.53 was included in the Good category. This score reflects the initial stage of students' adaptation to the Culturally Responsive Teaching (CRT) approach, which is still new to them. In the second meeting, there was a significant increase to 77.63 (Excellent category), which indicated that students were getting used to the culture-based learning method and showed more active engagement. This improvement was also supported by the adjustment of teaching strategies more aligned with the students' cultural context. In the third meeting, the score increased again to 84 (Very Good category), indicating that students' understanding of the material and their comfort in following CRT-based learning were getting stronger. Overall, the average score of the three meetings reached 75.05, which falls into the Excellent category. This improvement reflects

the effectiveness of the CRT approach in increasing students' participation and understanding over time.

Description of Learning Outcomes

Learning outcomes come from the pre-test and post-test scores that have been carried out. The results obtained are listed in Table 3:

Table 3. Descriptive Statistics of Learning Outcomes

Statistics	Pre-test	Post-test
N	30	30
Mean	50.7333	85.3000
Median	52.0000	87.0000
Mode	52.00	88.00
Std. Deviation	10.25850	4.83629
Variance	105.237	23.390
Range	38.00	19.00
Minimum	30.00	75.00
Maximum	68.00	94.00

Based on Table 3, it is obtained that each assessment is carried out on 30 respondents. In the pre-test, the mean value is 50.733, while in the post-test, it has increased to 85.8300. Furthermore, the values are grouped into five categories presented in Table 4 below:

Table 4. Results of Pre-Test and Post-Test Student Learning Categories

No	Category	Before		After	
		F	%	F	%
1	Very Low	0	0	0	0
2	Low	7	23.3	0	0
3	Medium	18	60	0	0
4	High	5	16.7	6	20
5	Very High	0	0	24	80

Based on the table 4, the pre-test results show that there were 0 individuals in the very low category (0%), 7 individuals in the low category (23.3%), 18 individuals in the moderate category (60%), 5 individuals in the high category (16.7%), and 0 individuals in the very high category (0%). In the post-test, there were also 0 individuals in the very low (0%), low (0%), and moderate (0%) categories, while 6 individuals were in the high category (20%) and 24 individuals in the very high category (80%). This change shows that CRT was not only able to improve average learning outcomes, but also helped to lift all students to higher levels of achievement, including those who had previously had low achievement. This indicates that the CRT approach effectively addresses the challenges of students' cultural diversity, as the materials linked to local culture are proven to increase the relevance of

learning and encourage student engagement. These results support the research objective to evaluate the effectiveness of CRT as a differentiated learning strategy in multicultural classrooms. Additionally, the learning outcome data is categorised according to the completeness criteria outlined in Table 5 below:

Table 5. Categories of Completion Criteria

Category	before		After	
	F	**%**	**F**	**%**
Not Completed	30	100	1	3.3
Completed	0	0	29	96.7
Total	30	100	30	100

The increase in average score from 50.73 in the pre-test to 85.30 in the post-test shows that students gained a better understanding of the Pythagorean material and that the CRT approach delivered relevant and meaningful learning. This can be seen from the distribution of scores that moved significantly from the "medium" and "low" categories to the 'high' and "very high" categories, as well as from the achievement of learning completeness that increased from 0% to 96.7%. In addition, the narrowing of the score range and the decrease in standard deviation indicate that CRT contributes to equalizing learning outcomes, an important indicator in differentiated learning. This means that this strategy is effective for high-ability students and helps students who were previously behind catch up. Thus, all the data presented support the conclusion that CRT effectively improves learning outcomes, strengthens student engagement, and accommodates students' diverse cultural backgrounds. This is by the indicators of effectiveness in the research, namely score improvement, equity of achievement, active involvement in the learning process, and positive response to the strategies used. Additionally, the pretest and post-test data were analyzed using normalized gain, as detailed in Table 6 below:

Table 6. Normalized Gain Test Results

Gain Value	Category	F	%
$g < 0.30$	Low	0	0
$0.30 \leq g < 0.70$	Medium	10	33.3
$g \geq 0.70$	High	20	66.7
	Total	30	100
	Average		0.6956

Based on the results of Table 6, most students (66.7%) experienced a high increase in learning outcomes after implementing the Culturally Responsive Teaching (CRT) approach. Meanwhile, the rest (33.3%) experienced moderate improvement, and no students were in the low improvement category. The average n-gain value of 0.70, which is at the upper limit

of the moderate category, indicates that the CRT approach can substantially improve students' understanding of mathematics material. This result aligns with the research objective, which is to evaluate the effectiveness of CRT as a differentiated learning approach. In addition to showing an increase in scores, the dominant n-gain distribution in the medium to high category also strengthens the evidence that culture-based learning can reach all students equally, including those who previously had low achievements. Thus, it can be decided that the increase in results is included in the medium criteria.

Student Activity Observation Results

Student observations were obtained based on the results of observations during 3 learning meetings. The results obtained are presented in table 7:

Table 7. Student Activity Observation Results

No	Components Observed	Average	%
Positive Activity			
1	Students are enthusiastic in following learning process	28	93.3%
2	Students respond and play an active role in the material taught.	26	86.7%
3	Students dare to ask and answer	25	83.3%
4	Students can choose their preferred visual, auditory or kinesthetic learning media	28	93.3%
5	The material presented is easy understood and delivered well	26	86.7%
Total			443.3
Average			88.66%
Negative Activity			
6	Students are not interested in the strategy strategy applied	2	6.7
7	Students do other activities such as talking and busy with their colleagues	2	6.7
Total			13.4
Average			6.7%

Table 7 shows the results of observations of student activities during learning with the Culturally Responsive Teaching (CRT) approach. The observation results show a very positive student involvement in the learning process. Students' positive activities reached 88.66%, which shows that most students were actively and enthusiastically involved during learning. Some aspects of positive activities observed include: students' enthusiasm in participating in learning (93.3%), response and active role in the material taught (86.7%), and students' courage to ask and answer questions (83.3%). This shows that students not

only passively listen, but also engage in discussions and actively ask questions during the learning process.

In addition, students can choose learning media according to their learning style, whether visual, auditory, or kinesthetic, which shows that the CRT approach can adapt to students' individual needs. This is also evident from the 93.3% of students who chose the media according to their preferences. This ability greatly supports their understanding of the material, especially in math materials requiring deep conceptual understanding. However, a small amount of harmful activity was recorded, at 6.7%, which included disinterest in the strategies applied and students engaging in conversations or other activities outside of learning. Nonetheless, these negative activities were very low, indicating that most students remained focused on the material presented and successfully implemented the CRT strategy in the classroom.

Student Response Result

Student responses obtained from the questionnaire results were collected and analyzed; the results are presented in Table 8:

Table 8. Student Response Results

No	Components Observed	No		Yes	
		f	%	f	%
1	Is learning with various material presentations, visual, auditory, and kinesthetic, more enjoyable?	0	0	30	100
2	Is learning with various material presentations linked to central Javanese culture easier to understand?	0	0	30	100
3	Is Culturally Responsive Teaching (CRT) learning as an approach to differentiated learning attractive?	0	0	30	100
4	Do you find understanding the material with Culturally Responsive Teaching (CRT) as an approach to differentiated learning is easier and faster?	1	3.3	29	96.7
5	Do you feel your learning needs are met by being able to choose the presentation of material with the appropriate learning style?	1	3.3	29	96.7
6	Do you feel uncomfortable during the learning process	0	0	30	100
7	Are there any obstacles that you experience during the learning process	0	0	30	100
Average		0.942		99.057	

Based on the table above, it is obtained that overall, the respondents who answered no were 0.942%, while the respondents who answered yes were 99.057%. So, it can be decided that it is effective because it has met the criteria for student response, which is $\geq 70\%$. The real implementation of this approach can be seen in learning the Pythagorean Theorem material. For example, for visual learning styles, students are given an animated video explaining the relationship between the sides of a right triangle and using the Pythagorean theorem in everyday life, such as measuring the length of a ladder leaning against a wall. For auditory learning styles, students listen to narrative explanations while discussing in small groups. As for kinesthetic learning styles, students do project activities to build triangle models from bamboo or ice cream sticks, then measure the length of the sides and verify the Pythagorean formula directly. In the context of local culture, students are also invited to analyse the triangular shape of the roof of the Joglo traditional house and apply the Pythagorean concept to calculate the roof's height or the slope's length.

Inferential Analysis Results

Inferential analysis for hypothesis testing through the normality test and the Wilcoxon test.

Normality Test

The results of the normality test using statistical analysis are presented in Table 9 below.

Table 9. Results of The Normality

Variables	Statistic	df	Sig.
Pretest	0.116	30	0.200
Posttest	0.212	30	0.001

Source: SPSS Output

Based on the table above, it is obtained that the pre-test obtained a significant. Value of 0.200, while in the post-test, it obtained a sig. Value of 0.001. Because there are variables that have a significant value. <0.05, so it can be decided that the data is not normally distributed, and testing is continued using the Wilcoxon test.

Wilcoxon Test

The Wilcoxon test is a test performed twice on the same subject or the same sample; this test is used when the normality assumption is not met. This test can be used in an experimental study's "Pretest-Posttest" design. The following is a hypothesis and basis for decision making.

Based on results of the Wilcoxon test, information is obtained that on learning outcomes before being given the application of Culturally Responsive Teaching (CRT) as a

differentiated learning approach has a mean value of 50.733 while on learning outcomes after being given the application of Culturally Responsive Teaching (CRT) as a differentiated learning approach has a mean value of 85.300. Thus, it can be decided that there is an increase in learning outcomes after being given the application of Culturally Responsive Teaching (CRT) as a differentiated learning approach of 34.567. In addition, the Sig. Value of 0.000 <0.05 and Z count of 4.787> Z_{kritis} of 1.645 are obtained, which means that H0 is rejected and H1 is accepted. Based on this, it can be decided that applying Culturally Responsive Teaching (CRT) as a differentiated learning approach affects student learning outcomes.

The results of this study indicate that Culturally Responsive Teaching (CRT) as a differentiated learning approach is proven effective in improving student learning outcomes in class VIII B SMP Negeri 15 Surakarta on Pythagoras material. One of the key findings is increased student engagement, with those taught with this approach showing higher levels of participation. Integrating elements of students' culture into the curriculum makes the subject matter more relevant and engaging, so students feel more connected to the content being taught. This is in line with previous research.

Differentiated learning using the *Culturally Responsive Teaching* (CRT) approach can increase student interest in learning (Aminah et al., 2024; Fadillah et al., 2024; Irfan et al., 2024). The *Culturally Responsive Teaching* approach is able to increase active participation and introduce cultural diversity through interactive media (A. Baso et al., 2024; Istika et al., 2024). Furthermore, the study noted positive changes in teachers' perceptions of inclusive learning. Teachers who implemented the Culturally Responsive Teaching (CRT) approach reported an increased understanding of the importance of recognising and valuing cultural diversity in the classroom. The obvious implication of this change in perception is that teachers become more motivated to seek out and implement more diverse and culturally appropriate teaching strategies, thereby creating a more inclusive and supportive learning environment.

Therefore, it is recommended that training and mentoring for teachers related to the implementation of CRT continue to be strengthened to expand their understanding and skills in creating classrooms that are more responsive to students' cultural diversity. They became more motivated to seek teaching strategies that suit the needs of their students, which in turn created a more conducive classroom atmosphere for all students. Overall, the findings confirm that Culturally Responsive Teaching improves academic learning outcomes and strengthens students' social skills, creating an inclusive and positive learning environment.

Therefore, it is recommended that more schools and educators adopt this approach to improve the quality of education for all students.

CONCLUSION

Implementing Culturally Responsive Teaching (CRT) as a differentiated learning approach in secondary schools has been effectively applied in mathematics for grade VIII students at SMP Negeri 15 Surakarta. This is supported by the study results, which showed a significant increase in mathematics learning outcomes after applying CRT. The average score increased from 57.73 to 85.30, with a standard deviation of 4.836. During learning activities, the percentage of positive activities reached 88.66%, while negative activities were only 6.7%. In addition, students' responses to learning mathematics with the Culturally Responsive Teaching (CRT) approach in differentiated learning showed positive results, with ≥ 70% of students giving favourable feedback.

Based on these findings, it is recommended that the application of Culturally Responsive Teaching (CRT) continues to be extended to other subjects and implemented in other schools to explore its effectiveness further. Teachers should be provided with additional training and professional development to deepen their understanding of CRT strategies and ensure they can implement culturally relevant teaching methods that meet the needs of diverse students. For future research, it is recommended that a longitudinal study be conducted to assess the long-term impact of CRT implementation on students' academic achievement and socio-emotional development. In addition, further research could also explore the effectiveness of CRT in different regions or contexts, especially in schools with different cultural or socio-economic backgrounds, to determine the extent to which this approach can be universally applied in various educational settings.

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