

# Enhancing the Performance of Learners in Mathematics through Culturally Responsive Teaching (CRT) Strategy

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**Abstract**— A quasi-experimental study assessed the outcomes of culturally responsive teaching (CRT) on Grade 11 learners' mathematics performance. Sixty learners were split into two groups: an experimental group that used CRT methods and a control group that relied on traditional teaching methods. Performance was measured using pre-and post-tests. Pretest results indicated "low" performance levels for both groups, with no significant differences. Following the intervention, post-test findings revealed "moderate" improvements in performance for both groups, with the CRT group showing a substantial advantage over the control group. The study highlighted that both groups exhibited significant performance improvements from pre- to post-test, with the CRT group showing more significant gains. According to these results, the study advocates including culturally responsive teaching methods within the mathematics curriculum. By making the content more relevant to learners' cultural experiences, this integration aims to improve their engagement and comprehension. Encouraging collaboration and discussions that allow learners to connect mathematical concepts to their own experiences can foster a deeper appreciation and interest in the subject. Further investigation is necessary to understand the prolonged effects of culturally responsive teaching. Implementing CRT practices systematically can ultimately lead to improved educational outcomes and a more equitable learning environment for all learners.

## I. INTRODUCTION

Culturally Responsive Teaching (CRT) has become essential to creating inclusive and effective educational settings, particularly in mathematics. This study is grounded in recognising that learners' cultural backgrounds significantly influence their learning experiences and attitudes. Ladson-Billings (1995) and Gay (2010) emphasise that integrating cultural relevance into teaching improves engagement and validates learners' identities, fostering a sense of belonging in the classroom.

The basis for this study is the significant transformative potential of culturally responsive teaching. CRT. Mathematics is often seen as challenging, and learners' attitudes significantly affect their performance. By incorporating culturally relevant examples and contexts, CRT bridges the gap between abstract mathematical concepts and real-life applications, enhancing comprehension and motivation (Gay, 2000; Ladson-Billings, 1994). Specifically, aligning mathematics with cultural contexts—such as those prevalent at Jayobo Farm School in Lambunao, Iloilo—offers a localised perspective that enriches the curriculum and addresses diverse learners' needs.

Research supports the effectiveness of CRT in improving academic performance. According to Hattie's 2009 study, culturally responsive teaching significantly boosts learners' motivation and self-efficacy, which are crucial for achieving success in mathematics. Gay (2000) highlighted that connecting lessons to learners' cultural experiences promotes relevance and active participation.

This study highlights the importance of culturally responsive teaching in refining educational practices to meet the diverse needs of learners. The urgency of this study lies in its potential to demonstrate how aligning mathematics instruction with learners' cultural contexts can enhance their mathematics performance toward the subject. This research addresses a critical gap in the literature by investigating these effects within the specific context of Jayobo Farm School. It offers practical insights for implementing culturally sensitive teaching methodologies in similar educational settings.

## II. LITERATURE REVIEW

### 2.1. Culturally Responsive Teaching

Enhancing strategy in culturally responsive teaching (CRT) within mathematics has significantly improved learner performance. CRT, an evidence-based educational approach, meets the diverse needs of learners and fosters achievement by integrating their cultural backgrounds, making education more relevant and meaningful (Tatum, 2005). Research highlights CRT's potential to close achievement gaps. For instance, when teachers incorporated CRT methods, Matthews and López (2019) observed enhanced math achievement among Latinx learners. Similarly, Corp (2017) found that incorporating culturally relevant stories in a third-grade classroom heightened engagement and comprehension of mathematical concepts. Moreover, creating learning environments that echo students' cultural backgrounds boost engagement and academic success (Farinde-Wu et al., 2017; Borck, 2020).

## 2.2. Mathematics Performance

In recent years, educators and researchers have increasingly emphasised culturally responsive teaching strategies in mathematics. A key work in this field, "Culturally Responsive Mathematics Teaching: A Research Synthesis" by Naheed A. Abdulrahim and Michael J. Orosco (2019), consolidates empirical research on culturally responsive mathematics teaching (CRMT) with culturally and linguistically diverse (CLD) learners. This study emphasises the crucial role CRMT plays in creating equitable and inclusive mathematics learning environments.

Similarly, Maria Kolovou's "Embracing Culturally Relevant Education in Mathematics and Science: A Literature Review" (2022) delves into the challenges and best practices of implementing culturally relevant education (CRE) in math and science classrooms. Kolovou highlights the importance of educators valuing and integrating learners' cultural backgrounds, which can significantly enhance academic achievement and cultural competence. This improved engagement and comprehension can lead to better performance in mathematics.

## 2.3. Key Elements of Culturally Responsive Teaching

According to The Education Hub (2019), key elements of culturally responsive teaching (CRT) include integrating diverse cultural perspectives into the curriculum, using teaching methods that resonate with learners' cultural experiences, and creating an inclusive classroom environment. These components make learning more meaningful and engaging for learners from varied cultural backgrounds.

## 2.4. How to Teach Using Culturally Responsive Teaching

Culturally responsive teaching (CRT) is an evolving process that involves recognising and incorporating learners' cultural backgrounds and identities into the learning environment. This approach includes various strategies to promote inclusivity, equity, and cultural relevance in education.

**Integration of Culturally Relevant Content and Materials** An essential aspect of CRT is integrating culturally relevant content and materials into the curriculum. This teaching involves using literature, examples, and resources that reflect learners' diverse experiences and perspectives, fostering engagement and validating their cultural identities (Gay, 2010; Ladson-Billings, 1995).

**Building Positive Relationships** Culturally responsive educators prioritise building positive relationships with their learners based on trust, respect, and empathy. Establishing connections and creating a supportive learning community where all learners feel valued is crucial (Paris, 2012; Howard, 2003).

**Cultural Competence and Awareness** Effective CRT requires educators to possess cultural competence and awareness. This involves understanding diverse cultural

backgrounds, challenging stereotypes and biases, and adapting teaching methods accordingly (Banks & Banks, 2004; Gorski, 2013).

**Enhancing Learners' Cultural Backgrounds** Recognising and valuing learners' cultural knowledge and perspectives helps increase relevance and engagement in learning (Villegas & Lucas, 2002; Howard, 2007).

**Critical Reflection on Teaching Practices** Educators critically reflect on their teaching practices and cultural biases. This teaching involves examining curriculum materials and classroom interactions to ensure they are inclusive and culturally responsive (Milner, 2010; Gorski & Swalwell, 2015).

**Addressing Diverse Learning Needs** Recognising and addressing learners' diverse learning needs is essential. Educators must adapt teaching approaches to accommodate varying abilities and preferences (Tomlinson, 2001; Gregory & Chapman, 2013).

**Culturally Responsive Assessment Practices** Culturally responsive assessment practices ensure fairness and equity in education. Educators use assessment methods that accurately measure learners' knowledge while minimising bias (William, 2007; Lee, 2015).

**Ongoing Professional Development** Continuous professional development is necessary for educators to implement CRT effectively. This development involves expanding cultural competence and refining teaching practices (Howard & Milner, 2016; Ladson-Billings, 2009).

**Using Instructional Methods** It is crucial to use instructional methods that engage learners' cultural backgrounds and learning styles. Educators incorporate culturally relevant examples and promote peer collaboration (Gay, 2018; Ladson-Billings, 1994).

## 2.5. Enhancing Cultural Relevance in Mathematics Instruction

Enhancing cultural relevance in mathematics involves integrating learners' cultural backgrounds into the teaching and learning process. This approach makes mathematics more meaningful and engaging by connecting mathematical concepts to learners' real-life experiences and cultural contexts. Paul Andrews (2011) emphasises the importance of acknowledging the cultural dimension in mathematics teaching and learning, arguing that culture permeates all educational endeavours. Meixia Ding et al. (2023) highlight the value of understanding mathematics instruction through a cultural lens, using examples from different cultural contexts, such as China and the United States, to illustrate the benefits of culturally relevant teaching. Lombardi (2018) discusses the positive impact of CRT on learners' motivation and learning outcomes, suggesting using culturally familiar examples and hands-on activities to support understanding of mathematical concepts. Educators can create an inclusive and engaging learning environment by enhancing cultural relevance in mathematics instruction, ultimately improving

learners' experiences and outcomes.

Lombardi (2018) notes that culturally responsive teaching fosters a sense of belonging and identity within the classroom, making mathematical concepts more accessible and enjoyable for learners.

### III. PURPOSE OF THE STUDY

This study determined the mathematics performance of Senior High School learners at Jayobo Farm School for the school year 2024-2025 regarding culturally responsive teaching (CRT) and non-culturally responsive teaching (non-CRT) strategies.

Specifically, this study sought to answer the following questions:

1. What is the pretest Mathematics performance of learners with and without a culturally responsive teaching strategy?
2. Is there a significant difference in pretest Mathematics performance of learners with and without culturally responsive teaching strategy?
3. What is the post-test Math performance of learners with and without a culturally responsive teaching strategy?
4. Is there a significant difference in post-test Math performance of learners with and without culturally responsive teaching strategy?
5. Is there a significant difference in learners' pretest and post-test Mathematics performance with a culturally responsive teaching strategy?
6. Is there a significant difference in learners' pretest and post-test Mathematics performance without a culturally responsive teaching strategy?

### IV. THEORETICAL AND CONCEPTUAL FRAMEWORK

This study, "Enhancing the Performance of Learners in Mathematics Through Culturally Responsive Teaching (CRT) Strategy," is anchored in Achievement Theory and Culturally Responsive Teaching (CRT).

Achievement Theory, introduced by David McClelland, highlights the importance of motivation in driving success and accomplishment across various fields, including education. According to McClelland (1961) and further explored by Dweck (2006), factors such as goal-setting, self-efficacy, and the balance between effort and ability influence learners' performance. Within this study's context, culturally responsive teaching strategies aim to boost learners' motivation by making mathematical content more relevant to their cultural experiences. This approach can enhance their confidence and foster a growth mindset, which is crucial for success.

Culturally Responsive Teaching (CRT) Culturally Responsive Teaching, as conceptualised by Ladson-Billings (1995) and Gay (2000), emphasises the significance of integrating learners' cultural identities and experiences into

teaching practices to create meaningful and inclusive learning environments. CRT serves as the framework for this study, ensuring that the motivational principles of Achievement Theory are addressed within a culturally inclusive paradigm. By aligning math instruction with learners' cultural backgrounds, CRT enhances motivation and engagement and fosters a sense of belonging and relevance, which is essential for positive academic outcomes.

The conceptual framework of this study was presented in the paradigm that followed.

#### Independent Variables Dependent Variables



Figure 1. Relationship of the Independent Variables (With CRT and Without CRT Strategy) to the Dependent Variable (Mathematics Performance).

### V. METHODOLOGY

#### 5.1. Research Design

This study utilised a quasi-experimental research design. Thomas (2022) states that a quasi-experimental design aims to establish a cause-and-effect relationship between an independent and dependent variable. This study used a quasi-experimental design to enhance learners' mathematics performance through a culturally responsive teaching (CRT) strategy.

#### 5.2. Subjects

This study involved 60 Grade 11 learners of Jayobo Farm School for the school year 2024-2025. The participants were divided into two groups: experimental and control groups. Draw lots were employed to select Grade 11 Persea learners as the experimental group and Grade 11 Lansium as the control group. Data were gathered using a validated and pilot-tested researcher-made test. The topics were based on the K-12 General Mathematics 11 Curriculum. The study was conducted for seven weeks.

#### 5.3. Research Instrument

In this study, the researcher employed a researcher-designed pretest and post-test to assess learners' progress following implementing the Culturally Responsive Teaching (CRT) Strategy. The pretest and post-test exams were conducted with and without CRT, comprising 50-item tests. The subject matter in mathematics instruction was based on the DEPED's Most Essential Learning Competencies (MELCS). The pretest and post-test assessed the study's mathematics performance variables.

#### 5.4. Data Gathering Procedure

The researcher sought permission from the principal of Jayobo Farm School in Jayobo, Lambunao, Iloilo, to conduct the study. Before distributing the instruments, consent was obtained from the participants and their parents or guardians. Before beginning the intervention classes, a pre-assessment was conducted for the experimental and control groups.

The data-gathering process for this study involved several essential steps. Firstly, the researcher created a Daily Lesson Plan that seamlessly integrated Culturally Responsive Teaching (CRT) principles and another Daily Learning Plan without CRT integration. The subject matter was based on the DEPED's Essential Learning Competencies (MELCS).

Subsequently, the researcher developed pretest and post-test evaluations to assess learners' progress before and after the implementation of CRT and without CRT. These assessments provided quantitative data on the enhancement of learners' performance in mathematics through the culturally responsive teaching (CRT) strategy.

The implementation phase was conducted over seven weeks, from August 5 to September 20, 2024. The content standard of Grade 11 General Mathematics was divided into three main topics: key concepts of functions, rational functions, inverse functions and exponential functions. Learners were encouraged to provide candid responses, and assurances of confidentiality were conveyed to them. The participants were given one hour each for the pretest and post-test. Upon completing the questionnaires, the researcher collected the responses for subsequent analysis. This comprehensive data-gathering procedure ensured a holistic understanding of the CRT strategy's impact on performance in mathematics at Jayobo Farm School.

#### 5.5. Data Analysis

The researcher analysed the data using both descriptive and inferential statistics. The researcher also used the mean and standard deviation for descriptive analysis and a t-test for inferential statistics. All statistical computations were processed using the Statistical Package for Social Sciences (SPSS) software at a 0.05 alpha level.

### VI. RESULTS AND DISCUSSION

The findings of the present study are presented in this section.

**Table 1.** Pretest Mathematics Performance of Learners with and Without Culturally Responsive Teaching Strategy (CRT)

	N	Mean	Description	SD
<b>With CRT</b>				
<b>Without CRT</b>	30	17.77	Low	5.97
<b>Without CRT</b>	30	17.43	Low	6.03

Note: Very high (40.01-50.00) High (30.01- 40.00)  
 Moderate (20.01- 30) Low (10.01- 20.00)  
 Very Low (0.00- 10.00)

Table 1 presents the pretest Mathematics performance of learners with and without a culturally responsive teaching strategy (CRT).

The findings showed that the pretest Mathematics performance of the learners with and without culturally responsive teaching strategy (CRT) was "low" (M = 11.77, SD = 5.96): (M = 17.43, SD = 6.03), respectively. This finding means that the low scores obtained by the learners were justifiable because the topics had not yet been introduced to them. This result suggests that both groups of learners started at a similar level of understanding in Mathematics before the teaching strategy was applied, showing no prior advantage for either group.

The result of this study conforms with research on culturally responsive mathematics teaching (CRMT), which suggests that initial low scores often result from unfamiliarity with the material. That performance improves through culturally responsive strategies (Abdulrahim & Orosco, 2019).

**Table 2.** t-Test Result of the Difference in Pretest Mathematics Performance of Learners With and Without Culturally Responsive Teaching Strategy (CRT)

	Mean	df	t-value	Sig.
<b>With CRT</b>	17.77			
<b>Without CRT</b>	17.43	58	0.21	0.83

\*p>0.05 not significant

Table 2 presents the difference in pretest Mathematics performance of learners with and without Culturally Responsive Teaching Strategy (CRT).

The findings revealed that there was no significant difference in the pretest of the Mathematics performance of the learners with and without (CRT) Strategy (t[58] = 0.21, p = .83). This means that it is reasonable considering that the teacher did not yet discuss the topics. The learners had no idea how to solve the given mathematical problems. This result implied that the result was not statistically significant, indicating that the initial mathematics performance of learners was similar regardless of whether they were exposed to CRT strategy.

Abacioglu, Volman, and Fischer (2019) supported the study's results and found that learners' engagement was not immediately reflected before the proper teaching strategy was applied. Similarly, Hu et al. (2020) highlighted that initial learners' performance was not immediately measurable at the start of their intervention in preparing preservice teachers for CRT. Furthermore, Chou, Su, and Wang (2018) found that effective transformation in teacher preparation takes time and consistent effort, explaining the initial lack of significant differences in learners' performance.

**Table 3.** Post-test Math Performance of Learners with and Without Culturally Responsive Teaching (CRT) Strategy

	N	Mean	Description	SD
<b>With CRT</b>	30	28.03	Moderate	4.69
<b>Without CRT</b>	30	21.07	Moderate	5.59

Note: Very high (40.01-50.00) High (30.01- 40.00)  
 Moderate (20.01- 30) Low (10.01- 20.00)  
 Very Low (0.00- 10.00)

Table 3 presents the Post-test math performance of learners With and Without Culturally Responsive Teaching (CRT) Strategy.

The findings showed that the post-test Mathematics performance of the learners with a culturally responsive teaching strategy (CRT) was "Moderate" (M = 28.03, SD = 4.69). In contrast, the post-test Mathematics performance of the learners without enhancing culturally responsive teaching strategy (CRT) was "Moderate" (M = 21.07, SD = 5.59). The findings suggest that both learners, with and without the culturally responsive teaching (CRT) strategy, performed at a "Moderate" level in the post-test Mathematics assessment. However, there is a notable difference in their mean scores: Learners with CRT had a higher mean score (M = 28.03, SD = 4.69). Learners without CRT had a lower mean score (M = 21.07, SD = 5.59).

Although both groups are described as having "Moderate" performance, the significant difference in mean scores with the p-value of 0.00 indicates that the CRT strategy positively impacted the learners' performance. Essentially, the CRT strategy helped learners achieve higher scores within the "Moderate" performance range than those who did not use this strategy.

The results of this study are similar to Gay's (2010) study, which found that culturally responsive teaching (CRT) helps learners relate their learning to their own cultural experiences. This results in them being more engaged and improving their understanding of the subject. Ladson-Billings (1994) also discovered that when teachers include students' cultural backgrounds in lessons, their performance improves, supporting the idea that CRT positively affects learners' learning.

However, these findings are different from the research by Pohan and Aguilar (2017), which suggested that although CRT can be helpful, its impact on academic performance might not be seen right away, especially if learners have not been exposed to these teaching strategies before.

**Table 4.** t-Test Result of Difference in Post-test Mathematics Performance of Learners With and Without Culturally Responsive Teaching (CRT) Strategy

	Mean	df	t-value	Sig.
<b>Post-test With CRT</b>	28.03			
<b>Post-test Without CRT</b>	21.07	58	5.23	0.00

\*p < .05- significant

Table 4 presents the differences in post-test math performance of learners with and without the Culturally Responsive Teaching (CRT) Strategy.

The result showed that there was a significant difference in the post-test mathematics performance of learners with and without the Culturally Responsive Teaching (CRT) Strategy (t[58]=5.23, p=0.00). This result means the learners exposed to the CRT strategy performed better in mathematics than those who were not. This result implies that utilising CRT strategy as a teaching method effectively enhanced learners' mathematics performance. Learners could understand better and engage with the subject matter through culturally relevant contexts. They showed increased motivation and eagerness to excel, working collaboratively with their peers. This teamwork helped them achieve higher scores and fostered a supportive learning environment that encouraged recognition and success within the group.

The present study's results were supported by Larke's (1990) study, which found that culturally responsive teaching methods positively impacted learners' academic achievement in mathematics. Similarly, Gay's (2000) study emphasised that incorporating learners' cultural backgrounds into teaching practices can enhance their engagement and performance in mathematics.

**Table 5.** T-test results of Difference in the Pretest and Post-test Mathematics Performance of Learners With Culturally Responsive Teaching Strategy

	Mean	df	t-value	Sig.
<b>Pretest With CRT</b>	17.77			
<b>Post-test With CRT</b>	28.03	29	-8.53	0.00

\*p < .05- significant

Table 5 presents the difference in learners' pretest and post-test Mathematics performance with a culturally responsive teaching strategy.

The result significantly differed in learners' pretest and post-test mathematics performance with culturally responsive teaching strategies (t[29]=-8.53, p=0.00). This outcome means the learners' mathematics performance

improved significantly after using a culturally responsive teaching strategy. Implementing a culturally responsive teaching strategy can effectively enhance learners' understanding and performance in mathematics. This strategy helps learners connect the material to their cultural contexts, increasing their engagement and comprehension and improving academic outcomes.

This study conforms with the findings of Gay (2000) and Ladson-Billings (1995), who highlighted that culturally responsive teaching methods can lead to significant academic improvements by aligning educational content with learners' cultural experiences. Moreover, it is highly supported by the study of Hammond (2015), which found that culturally responsive teaching can improve both academic achievement and student motivation.

**Table 6.** t- Test results of Difference in the Pretest and Post-test Mathematics Performance of Learners Culturally Responsive Teaching Strategy.

	Mean	df	t-value	Sig.
<b>Pretest</b>	17.43			
<b>Without CRT</b>		29	-6.99	0.00
<b>Post-test</b>	21.07			
<b>Without CRT</b>				

\*p < .05- significant

Table 6 presents the difference in learners' pretest and post-test Mathematics performance without a culturally responsive teaching strategy.

The result showed a significant difference in learners' pretest and post-test mathematics performance without a culturally responsive teaching strategy ( $t[29] = -6.99$ ,  $p = 0.00$ ). This result means there was a measurable improvement in learners' mathematics performance from the pretest to the post-test without using culturally responsive teaching strategies. This result implies that improvements in mathematics performance can occur through factors or teaching methods other than culturally responsive teaching. These may include the effectiveness of the standard teaching practices, individual learner effort, or other educational interventions that were in place during the study.

This study conforms with Jones's (2016) findings, highlighting the impact of well-structured educational interventions on student achievement. Moreover, Lee (2018) demonstrated that various instructional strategies, even those not culturally responsive, could lead to significant academic improvements if effectively implemented.

## VII. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings gathered and observations made by the researcher, the following conclusions were drawn: (1) The pretest Mathematics performance of learners with and without a culturally responsive teaching strategy was low, indicating that both groups started with similar levels of

mathematical proficiency. (2) The pretest Mathematics performance showed no significant difference between learners who experienced culturally responsive teaching (CRT) strategy and those who did not, indicating that both groups began with similar levels of mathematical ability. (3) The post-test results revealed that learners exposed to culturally responsive teaching strategy demonstrated moderate performance in Mathematics, while those without such strategy continued to perform moderately. This result indicates that enhancing a culturally responsive teaching strategy positively affects mathematical achievement. (4) The post-test results showed a significant improvement in Mathematics performance among learners who were taught using a culturally responsive teaching strategy compared to those who were not. This finding highlights the effectiveness of this strategy in enhancing mathematical achievement. (5) Learners' Mathematics performance significantly improved from the pretest to the post-test when culturally responsive teaching strategies were used, demonstrating that this strategy effectively enhanced their mathematical skills. (6) Learners without CRT strategy improved their Mathematics performance from the pretest to the post-test. However, the improvement was not as evident as in the CRT group.

Based on the findings and conclusions, the following are recommended: (1) Teachers may integrate culturally responsive teaching strategy into the mathematics curriculum. Such integration can enhance learners' engagement and understanding by making the content relevant to their cultural backgrounds. (2) Encouraging collaboration and discussions that allow learners to connect mathematical concepts to their own experiences can foster a deeper appreciation and interest in the subject. (3) Future researchers may continue exploring CRT's long-term effects. Implementing CRT practices systematically can ultimately lead to improved educational outcomes and a more equitable learning environment for all learners.

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