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Effect of Culturally Responsive Teaching through The Garut Dodol Context on Mathematical Problem-Solving Ability

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ABSTRACT

The low level of students' mathematical Problem-Solving ability remains a significant challenge in mathematics education, particularly when instructional processes are abstract and fail to connect mathematical concepts with cultural contexts relevant to students' daily lives. In this regard, the traditional food *Dodol Garut* is utilized as an ethnomathematical context, as its production process involves sequential and interrelated stages that represent the concept of composite functions and align with students' real-life experiences. This study aims to examine: (1) the effect of the Culturally Responsive Teaching (CRT) approach through the context of *Dodol Garut* on students' mathematical Problem-Solving ability, and (2) the percentage distribution of students' mathematical Problem-Solving ability across high, medium, and low categories after the implementation of the CRT approach. This research employed a quasi-experimental method with a Posttest-Only Control Group Design. The population consisted of eleventh-grade students at SMAN 18 Garut. Using cluster random sampling, two classes were selected: class XI-4 as the experimental group and class XI-5 as the control group. The research instrument was a mathematical problem-solving test based on the indicators proposed by Krulik and Rudnick, which had been validated in terms of content validity and reliability. Data were analyzed using the Shapiro–Wilk normality test, the Mann–Whitney U test, and effect size calculation. The results indicated a Z value of 2.149 with an effect size (η^2) of 0.0624, which falls into the medium category. Descriptively, 67.57% of students were categorized as high, 29.73% as medium, and 2.70% as low in their mathematical problem-solving ability. The novelty of this study lies in the integration of traditional food context within CRT-based mathematics learning.

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Introduction

Mathematical problem-solving ability is one of the key competencies in 21st-century mathematics education. This ability is essential as it enables students to apply mathematical concepts in various real-life situations and supports the development of 4C skills (communication, collaboration, critical thinking and Problem-Solving, and creativity and innovation) (Septikasari & Frasandy, 2018). However, it remains a major challenge in educational practice in Indonesia. The results of the Programme for International Student Assessment (PISA) 2022 indicate that Indonesian students' mathematics performance remains low, with an average score of 366, which is significantly below the OECD average of 472 (OECD, 2023). This condition suggests that students still experience difficulties in solving non-routine mathematical problems that require deep conceptual understanding and higher-order thinking skills. This issue is further supported by the findings of Rachmawati et al. (2025), which reveal that mathematics instruction is still predominantly procedural and lacks connections to real-life contexts.

Preliminary findings at SMAN 18 Garut indicate similar problems, where students tend to rely on mechanistic procedures and face difficulties in solving non-routine problems. Mathematics instruction that is abstract and disconnected from everyday life contexts results in low student engagement and motivation. These conditions highlight the need for instructional approaches that can connect mathematical concepts with students' social and cultural experiences to make learning more meaningful.

One relevant approach to addressing this issue is Culturally Responsive Teaching (CRT). According to Cyntya et al. (2025), CRT emphasizes the integration of students' cultural backgrounds into the learning process, making the material more relevant, inclusive, and meaningful. Through this approach, students are not only able to understand mathematical concepts abstractly but also relate them to their cultural experiences in everyday life. The implementation of CRT in mathematics learning can be strengthened through the use of local cultural elements as learning contexts. One potential form of local culture is traditional food, which not only represents the cultural identity of a community but also involves systematic processes that can be utilized as meaningful contexts for mathematics learning (Purwaning Tyas, 2017; Sausanti et al., 2024).

In the context of this study, the cultural element highlighted is the local culture of Garut Regency. According to Sari et al. (2020) Garut Regency is known as a region with strong cultural potential, including its well-known traditional food product, Dodol Garut.

Figure 1. Dodol Garut as a traditional specialty food of Garut Regency

Dodol Garut is not merely a culinary icon but also reflects cultural values such as cooperation, perseverance, and systematic processes in its production. Integrating Dodol Garut into mathematics learning provides an opportunity to connect abstract mathematical concepts with students' real cultural experiences, making the learning process more concrete, meaningful, and relevant to their daily lives. This approach is also aligned with the principles

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of constructivism, which emphasize the importance of constructing knowledge based on students' social and cultural environments.

The integration of cultural context through the CRT approach can be further optimized when combined with inquiry-based learning models. In line with this, the study by Balqis et al. (2025) shows that CRT-based inquiry learning provides students with opportunities to actively participate through exploration, hypothesis formulation, and concept testing that are directly linked to their experiences and cultural backgrounds.

Several previous studies have demonstrated that the CRT approach has a positive impact on various cognitive abilities of students. CRT has been shown to improve collaboration skills, literacy, conceptual understanding, and various mathematical thinking abilities (Kurniawati & Mawardi, 2024; Mustaqfiroh et al., 2024; Ray et al., 2024; Solihin & Hidayat, 2025). However, studies that specifically integrate local traditional food as a context in mathematics learning, particularly in composition function topics, are still limited. In addition, research that explicitly examines the effect of CRT on mathematical Problem-Solving ability with comparison to other approaches remains scarce.

Therefore, this study offers novelty through the implementation of the CRT approach using Dodol Garut as the primary cultural context in mathematics learning. This study also employs the Contextual Teaching and Learning (CTL) approach as a comparison to examine differences between the two approaches in improving students' mathematical Problem-Solving ability. The novelty of this research lies in the integration of CRT with inquiry-based learning, traditional food context, and composition function material within a systematic instructional framework.

The implications of this study are expected to contribute not only theoretically to the development of culturally based mathematics learning but also practically to assist teachers in designing more contextual, innovative, and relevant instruction. Thus, mathematics learning is no longer perceived as abstract, but rather as part of a cultural reality closely related to students' daily lives. Based on this rationale, this study aims to examine the effect of the Culturally Responsive Teaching (CRT) approach using Dodol Garut traditional food on students' mathematical Problem-Solving ability.

Method

Research Design

This study employed a quasi-experimental method. According to Saputri & Mardianti (2025), a quasi-experimental design is a quantitative research approach that provides an opportunity for researchers to manipulate the independent variable in order to observe its effect on the dependent variable. This method was chosen because the researcher intended to examine the impact of the independent variable on the dependent variable, although not all extraneous variables could be strictly controlled. In addition, the selection of this method was also based on the condition of the student population, which had already been divided into fixed classes at SMA Negeri 18 Garut. The research design used was the Posttest-Only Control Group Design.

Population, and Sample

The population of this study consisted of all eleventh-grade students of SMA Negeri 18 Garut, comprising 12 classes. The sample was determined using a cluster random sampling technique. Based on the randomization results, class XI-4 was designated as the experimental class, which received instruction using the Culturally Responsive Teaching (CRT) approach, while class XI-5 was designated as the control class, which received instruction using the Contextual Teaching and Learning (CTL) approach. Each class consisted of 37 students.

Instrument

The research instrument used was a mathematical Problem-Solving ability test. This test was designed to measure students' problem-solving abilities in the topic of composite functions after participating in learning using the Culturally Responsive Teaching (CRT) approach in the context of the traditional food Dodol Garut. The test items were developed based on the indicators of mathematical Problem-Solving ability according to Krulik & Rudnick (1988), which include: (1) reading and understanding the problem (read and think), (2) exploring and planning a solution (explore and plan), (3) selecting a solution strategy (select a strategy), (4) finding the answer (find and answer), and (5) reflecting and extending the solution (reflect and extend). The items were constructed in the form of essay questions that relate the concept of composite functions to the process of making Dodol Garut as a local cultural context. The test blueprint and the complete set of mathematical Problem-Solving ability questions are presented in Table 1

Table 1. Blueprint of the Mathematical Problem-Solving Ability Test Items

Learning Outcomes	Learning Objectives	Indicators
At the end of Phase F, students are able to solve problems related to composite functions.	Understanding the concept of composite functions, using the properties of operations, and determining the constituent functions of a given composite function through examples of contextual problems by relating mathematical concepts to the process of making Dodol Garut as part of local culture in everyday life.	*Read and Think*
		Explore and Plan
		Select a Strategy
		Find and Answer
		Reflect and Extend

Table 2. Posttest Questions of Mathematical Problem-Solving Ability

No.	Question
1.	 A home-based entrepreneur produces soursop fruit dodol and intends to model the production process mathematically in order to estimate the number of ready-to-sell packages. In one production cycle, the entrepreneur has an initial material weight of 60 kg, with an average cooking time of 45 minutes per batch. At the mixing stage, there is an increase in weight of 11% of the initial weight due to the addition of other ingredients such as coconut milk, agar-agar, vanilla, citric acid, salt, flavor enhancers, and other additional materials whose prices vary between Rp 8,000 and Rp 20,000 per kg. After mixing, the dodol is cooked until there is a weight reduction of 40% from the weight after mixing due to high water evaporation. The next stage is cooling and solidification, during which there is no change in weight, so the weight of the dodol after this stage is the same as after cooking. In the cutting and packaging stage, every 0.5 kg of dried dodol is packaged into one ready-to-sell package, and if there is a remainder of less than 0.5 kg, it is still counted as one additional package. The steps you need to follow are as follows: (a) Clearly state the information that is truly necessary to answer the problem, and which information is additional and not required, as well as what is being asked in the problem. (b) Express each of the four process stages above in the form of mathematical functions with respect to the initial weight. (c) Solution strategy: - Strategy A (Main Strategy): Construct a composite function that relates the initial weight to the number of ready-to-sell dodol packages. - Strategy B (Alternative/Verification Strategy): Model the relationship among the process stages in the form of a system of three-variable linear equations. (d) Find the answer for an initial weight of 60 kg using the main strategy, including step-by-step procedures according to the composite function that has been constructed.

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No.	Question
(e)	Recheck the answer you obtained using Strategy B (system of three-variable linear equations), then conclude whether both methods yield the same result and state the final outcome of the problem.

Before being used in the study, the test instrument had first been evaluated by experts, namely mathematics education lecturers, and then piloted on students outside the research population.

Instrument Validity Testing

The validity test was conducted using the Pearson Product Moment correlation. The Pearson Product Moment formula is (Yulia et al., 2024) :

$$r_{count} = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{(N\sum X^2 - (\sum X)^2)\,((N\sum Y^2 - (\sum Y)^2)}}$$

Description:

r_{count} : Correlation coefficient
X : Independent variable
Y : Dependent variable
n : Number of respondents

To interpret the level of validity, the correlation coefficient is categorized according to the following criteria:

Table 3. Test Instrument Validity Criteria

r Value	Interpretation
0.81 – 1.00	Very High
0.61 – 0.80	High
0.41 – 0.60	Moderate
0.21 – 0.40	Low
0.00 – 0.20	Very Low

After obtaining the validity coefficient value for each test item, the next step is to compare this value with the r value from the table at a significance level of 5% and 1% with df = n – 2. If $r_{count} > r_{table}$, then the test item is declared valid at the significance level used. The results of the validity test of the mathematical Problem-Solving ability test can be seen in Table 4

Table 4. Results of Validity Testing

Item Number	r_{count}	Interpretation	r_{count}	r_{table}	Validity
1a	0,5362	Moderate	0,5362	0,3338	Valid
1b	0,6269	High	0,6269	0,3338	Valid
1c	0,6834	High	0,6834	0,3338	Valid
1d	0,5958	Moderate	0,5958	0,3338	Valid
1e	0,7680	High	0,7680	0,3338	Valid

Based on the validity test using the Pearson Product Moment correlation, all items 1a–1e have r_{count}values greater than $r_{table} = 0.3338$at the 5% significance level (df = 33). The validity coefficients fall within the moderate to high categories, so all items are declared valid and feasible to be used. In addition, the results of expert validation conducted by two lecturers with expertise in the field of Mathematics Education are presented in Table 5.

Table 5. Expert Validation Results

First Validation	Second Validation
The initial validation stage focused on improving linguistic aspects, including restructuring the wording of the questions, adjusting the instructions to make them clearer, and revising the sentences in indicators a to e to be more precise and easier to understand.	The test items were declared to have met the criteria and can be used.

Instrument Reliability Testing

The measurement of instrument reliability was carried out by applying the Cronbach's Alpha formula. The Cronbach's Alpha formula is as follows: (Sihombing et al., 2021)

$$r_{11} = \frac{k}{(k-1)}\left(1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right)$$

Description :

r_i	:	Reliability Coefficient
k	:	Number of items
σ_t^2	:	Total variance
$\sum \sigma_b^2$	:	Sum of item variances

Interpreting the degree of reliability uses the Guilford criteria. In this case, r_{11} is interpreted as the reliability coefficient. The criteria for the degree of reliability can be seen in Table 6.

Table 6. Classification of Reliability Degree

Reliability Coefficient	Criteria
$0{,}800 \leq r_{11} \leq 1{,}000$	Very high reliability
$0{,}600 \leq r_{11} \leq 0{,}800$	High reliability
$0{,}400 \leq r_{11} \leq 0{,}600$	Moderate reliability
$0{,}200 \leq r_{11} \leq 0{,}400$	Low reliability
$0{,}000 \leq r_{11} \leq 0{,}200$	Very low reliability

Source: (Astutik et al., 2022)

After obtaining the reliability coefficient r_{11}, the value is compared with the standard at a significance level of $\alpha = 0.05$. The instrument is declared reliable if $r_{11} \geq 0{,}60$, and not reliable if $r_{11} < 0{,}60$. The results of the reliability test of the mathematical Problem-Solving ability test instrument can be seen in Table 7.

Table 7. Reliability Results

Cronbach's Alpha	Criteria	Standard	Decision
0,6453	High reliability	0,60	Reliable

Based on Table 7, the results of the reliability test show a Cronbach's Alpha value of $0{,}6453 > 0{,}60$, with a high reliability category. Thus, the instrument is declared reliable and feasible to be used as a research measurement tool.

Data Collection Techniques and Data Analysis

Data collection in this study was carried out through administering a mathematical Problem-Solving ability test to students after the learning process was completed in the experimental class and the control class. The test was administered individually to measure students' mathematical Problem-Solving ability after receiving the learning treatment. The research data were obtained from the results of the mathematical Problem-Solving ability test.

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The assessment was conducted using a scoring rubric modified from Sesa et al. (2022) based on the problem-solving steps according to Krulik & Rudnick. Table 8 below shows the scoring guidelines for mathematical Problem-Solving ability.

Table 8. Scoring Guidelines

No.	Krulik and Rudnick Steps	Description	Score
1.	Read and Think	Writing what is known and what is asked completely and accurately.	2
		Writing what is known and what is asked in the problem, but incomplete or less accurate.	1
		Not writing anything that is known and asked.	0
2.	Explore and Plan	Writing the mathematical model to be used appropriately as a solution plan.	2
		Writing the mathematical model to be used, but not yet appropriate or not suitable as a solution plan.	1
		Not writing the mathematical model to be used.	0
3.	Select a Strategy	Writing an appropriate and complete solution strategy to solve the problem.	2
		Writing a solution strategy, but less appropriate or incomplete.	1
		Not writing a solution strategy.	0
4.	Find and Answer	Carrying out the solution procedure correctly and obtaining the correct result.	2
		Carrying out the solution procedure correctly, but the result is incorrect due to calculation errors.	1
		Not carrying out the solution procedure or the result is completely incorrect.	0
5.	Reflect and Extend	Performing result verification and writing a conclusion that is consistent with the problem context.	2
		Performing result verification but not writing a conclusion, or writing a conclusion without performing result verification.	1
		Not performing result verification and not writing a conclusion.	0

Source: (with modification Sesa et al., 2022).

Data analysis was conducted using descriptive and inferential statistics. The initial step in statistical analysis included determining descriptive statistical measures, namely: the number of data (n), maximum value (db), minimum value (dk), mean value ($\bar{x}$), range (r), standard deviation (σ), and variance (σ^2). Furthermore, hypothesis testing was carried out using the nonparametric Mann Whitney U test, because the research data did not meet the assumption of normal distribution. This test aims to determine differences in mathematical Problem-Solving ability between the experimental class and the control class. The research hypothesis is: "There is an effect of the Culturally Responsive Teaching approach using the traditional food Dodol Garut on students' mathematical Problem-Solving ability."

The testing decision was based on the Z statistical value obtained from the Mann Whitney test at a 5% significance level. To provide interpretation of the Mann Whitney test results, the scores of mathematical Problem-Solving ability were subsequently classified into categories of students' ability. The classification was carried out using the ideal mean (Mi) and ideal standard deviation (SBi) (Asri et al., 2023) :

Table 9. Category of Mathematical Problem-Solving Ability Test Assessment

Score Interval	Interpretation
$X \geq Mi + Sbi$	High
$Mi - Sbi \leq X < Mi + Sbi$	Moderate
$X < Mi - Sbi$	Low

This classification is used to describe the level of students' mathematical Problem-Solving ability after the implementation of learning. In addition to statistical significance testing, the magnitude of the treatment effect was analyzed using Cohen's effect size for the nonparametric Mann–Whitney test with the formula:

$$\eta^2 = \frac{Z^2}{N}$$

with the following description : (Tomczak & Tomczak, 2014)
η^2 = effect size,
Z = Mann–Whitney test statistic value,
N = total number of research samples.

The effect size value is then interpreted to determine the level of treatment effect based on the following criteria (Cohen, 1988) :

Table 10. Category of Effect Level

Score Interval	Category
$\eta^2 \geq 0{,}14$	High
$0{,}06 \leq \eta^2 \leq 0{,}14$	Moderate
$0{,}01 \leq \eta^2 \leq 0{,}05$	Low

Research Findings

Data on mathematical Problem-Solving ability were obtained through the administration of a posttest after students participated in learning for three meetings in both the experimental class and the control class. The assessment was based on one essay item containing five indicators of Problem-Solving ability according to Krulik and Rudnick, with a maximum score of 10.

Descriptive Statistics

The results of descriptive statistics of mathematical Problem-Solving ability are presented in Table 11.

Table 11. Descriptive Statistics

Class	*n*	*db*	*dk*	$\bar{x}$	*r*	σ	σ²
Experimental	37	10	4	8,1892	6	1,4301	2,0453
Control	37	10	3	7,4865	7	1,4818	2,1958

Based on Table 11, the average mathematical Problem-Solving ability of students in the experimental class is higher than that in the control class. This indicates that learning using the Culturally Responsive Teaching (CRT) approach through the traditional food Dodol Garut tends to improve mathematical Problem-Solving ability compared to the Contextual Teaching and Learning (CTL) approach.

Prerequisite Test for Analysis

Normality Test

The normality test was conducted using the Shapiro–Wilk test at a significance level of $\alpha = 0{,}05$ because the sample size was less than 50. The test results are presented in Table 12.

Table 12. Results of the Shapiro Wilk Normality Test

Class	n	W_{hitung}	W_{tabel}	α

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Experimental	37	0,889	0,936	0,05
Control	37	0,934	0,936	

The values of $W_{calculated} \leq W_{table}$ in both classes indicate that the data are not normally distributed (Sianturi, 2025). Therefore, hypothesis testing was continued using nonparametric statistics.

Hypothesis Testing

Mann Whitney U Test

The Mann Whitney U test was used to determine the difference in mathematical Problem-Solving ability between the two groups. The test results are shown in Table 13.

Table 13. Results of the Uji *Mann–Whitney U*

	Mathematical Problem-Solving ability	$Z_{alculated}$	Z_{table}
Mann–Whitney U	494,5	2,149	1,645

Since $Z_{calculated} > Z_{table}$, there is a significant difference between the two classes. Thus, the mathematical Problem-Solving ability of students who received instruction using the CRT approach is better than that of students who received CTL instruction. This means that there is an effect of the CRT approach through the traditional food Dodol Garut on students' mathematical Problem-Solving ability.

Distribution of Categories of Students' Mathematical Problem-Solving Ability

Experimental Class

Most students are in the high category. The highest achievement is found in the indicators of understanding the problem (read and think) and selecting a strategy (select a strategy), while the reflection indicator (reflect and extend) is still relatively low.

Table 14. Categories of Mathematical Problem-Solving Ability in the Experimental Class

Score Interval	Frequency	Frequency (%)	Category
$X \geq 8$	25	67,57%	High
$6 \leq X < 8$	11	29,73%	Moderate
$X < 6$	1	2,70%	Low

Control Class

The distribution of the control class is also dominated by the high category; however, its percentage is lower compared to the experimental class. Students still experience difficulties at the reflection and evaluation stages of the solution. To clarify the difference in the frequency of mathematical Problem-Solving ability between the experimental class and the control class, the data distribution is subsequently presented in Figure 2.

Table 15. Categories of Mathematical Problem-Solving Ability in the Control Class

Score Interval	Frequency	Frequency (%)	**Category**
$\boldsymbol{X \geq 7,67}$	20	54,05%	High
$\boldsymbol{5,33 \leq X < 7,67}$	15	40,54%	Moderate
$\boldsymbol{X < 5,33}$	2	5,41%	Low

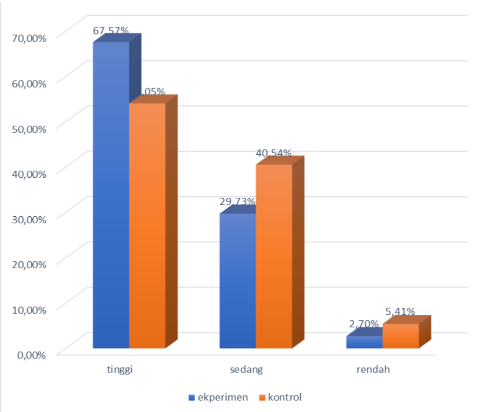

Figure 2. Frequency of the Experimental Class and the Control Class

In general, as shown in the figure, both classes exhibit a similar distribution pattern; however, the experimental class has a greater proportion in the high category and a smaller proportion in the moderate-low categories compared to the control class. This finding reinforces that the integration of cultural context through the traditional food Dodol Garut in the CRT approach is able to assist students in improving their mathematical Problem-Solving ability more effectively and meaningfully, thereby making the solution strategies more appropriate.

Effect Size

The magnitude of the treatment effect was calculated using Cohen's effect size based on the Mann Whitney statistic with the formula:

$$\eta^2 = \frac{Z^2}{N}$$

The results of the calculation are presented in Table 16.

Table 16. Learning *Effect Size*

Z Value	N	$\boldsymbol{\eta^2}$	Category
2,149	74	0,0624	Moderate

The effect size value of 0.0624 indicates that the CRT approach has a moderate effect on mathematical Problem-Solving ability.

Discussion

Results of Mathematical Problem-Solving Ability

Based on the statistical results, the mathematical Problem-Solving ability of students who received instruction using the Culturally Responsive Teaching (CRT) approach through the inquiry model shows a higher tendency compared to students who received instruction using

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the Contextual Teaching and Learning (CTL) approach through the Problem Based Learning (PBL) model. The mean difference of 0,70 and the effect size value of $\eta^2 = 0{,}0624$, which falls into the moderate category, indicate that the CRT approach provides a meaningful contribution to students' mathematical Problem-Solving ability. However, this finding does not merely indicate a general effect, but also suggests that there are specific components in the implementation of CRT based on Dodol Garut that play a significant role in students' problem-solving. More specifically, students' mathematical Problem-Solving ability is influenced by the structure of the Dodol Garut production process, which is systematic, sequential, and measurable, and is directly aligned with the stages of Problem-Solving according to Krulik & Rudnick. The process of making dodol consists of:

Figure 3. The Process of Making Dodol Garut

1. Measurement of ingredients
   The main ingredients of dodol consist of sugar and glutinous rice flour with a ratio of 2:1 of the total initial ingredients.
2. Processing stage (reduction)
   The mixed ingredients are then cooked for several hours until they undergo a reduction of 20% of the initial weight. Thus, the mass of the dodol after this process becomes 80% of the original mass.
3. Cooling
   The cooked dodol is cooled in a tray with a ratio of 18:5 for 12 hours.
4. Cutting
   After the cooling process, the dodol is cut into small pieces with uniform weight, namely 25 grams (0.025 kg) per piece.

Each stage in the process of producing Garut dodol can be modelled as functions arranged sequentially, thereby forming a composite function. Through this context, students are not only able to identify relationships among variables from the initial materials to the final product, construct mathematical models, and understand the concept of composite functions contextually, but also gain a deeper understanding of their own local culture, particularly the dodol-making process, which was previously generally recognised merely as a product without understanding its processing stages. Mathematically, the sequence of stages can be represented in the form of a composite function as follows:

$$(f \circ g \circ h \circ k)(x) = 144\left(\frac{0{,}8x}{3{,}6}\right)$$

The equation indicates the relationship between the quantity of initial materials and the number of dodol pieces produced. As an illustration, if 90 kg of raw materials are used, then through all stages of production, a total of 2,880 pieces of dodol will be obtained. Thus, the Garut dodol context possesses procedural and transformational characteristics, in which each stage of production results in quantitative changes that can be mathematically modelled. This contributes to developing students' problem-solving abilities, which include understanding the problem (interpreting the production context), planning strategies (constructing function models), carrying out the solution (operating composite functions), and evaluating results (interpreting outcomes within real contexts), while simultaneously fostering awareness and appreciation of their own local culture.

In addition, the Culturally Responsive Teaching (CRT) approach in this study not only integrates local culture through the context of Garut dodol but also utilises the mother tongue, namely Sundanese, as the medium of instruction throughout the learning process. The use of Sundanese is consistently applied from the apperception stage, discussions, to teaching materials and student worksheets (LKPD). The use of a language that is close to students' daily lives has been proven to have a more significant impact, particularly at the stage of understanding the problem (read and think). Students in the experimental class tend to be more capable of identifying known information, determining what is being asked, and accurately understanding the relationships among information from the outset. This advantage at the initial stage subsequently influences students' performance in the following stages, namely planning solutions (explore and plan), selecting strategies (select a strategy), obtaining solutions (find an answer), and conducting reflection (reflect and extend). These findings indicate that the use of familiar language not only aids general comprehension but specifically strengthens the initial foundation in the mathematical problem-solving process. This is in line with the concepts of prejudice reduction and facilitating knowledge construction according to Hernandez et al. (2013), which emphasise the importance of utilising students' language and cultural backgrounds in building understanding. Furthermore Gay (2010) also asserts that students' linguistic habits can serve as an effective cognitive bridge to enhance the quality of learning and deepen conceptual understanding.

The Role of the Inquiry Learning Model in Problem-Solving Ability

In addition to the learning approach, the use of the inquiry learning model in the experimental class also contributes to students' mathematical problem-solving abilities. The inquiry model provides opportunities for students to construct knowledge through processes of questioning, investigating, formulating hypotheses, testing strategies, and drawing conclusions independently. The findings of this study are consistent with Talib & Ihsan (2025) and Yulita & Samosir (2024), who state that the inquiry model can positively influence students' mathematical problem-solving abilities. Research by Rhamayanti et al. (2025) also indicates that the inquiry model can improve and demonstrate that inquiry-based learning encourages engagement in exploratory activities that play an important role in independently discovering solutions. Based on these findings, it can be concluded that the implementation of the inquiry learning model contributes positively to improving students' mathematical problem-solving abilities through active engagement and exploratory processes that encourage students to independently find solutions.

The inquiry learning process aligns with perspectives that emphasise the importance of direct experience and real problem-solving as the core of learning. Students are not only directed to obtain final answers but also to understand the thinking processes used to achieve solutions. This condition encourages deeper cognitive engagement, thereby supporting the

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development of mathematical problem-solving abilities. The results of this study can also be explained through the perspectives of Piaget's and Vygotsky's constructivist theories. Through CRT-based inquiry learning, students actively construct knowledge based on their prior cultural experiences. Social interaction during group discussions functions as scaffolding that helps students gradually develop their understanding.

Research Implications

Based on the research findings, the implementation of the Culturally Responsive Teaching (CRT) approach through the inquiry model provides a positive contribution to students' mathematical problem-solving abilities. The integration of the local culture of Garut dodol, along with the use of regional language, is able to create meaningful learning, enhance students' cognitive engagement, and assist them in understanding mathematical problems more deeply. Conceptually, this study implies that integrating local culture into mathematics learning can serve as an effective alternative instructional strategy, particularly in developing higher-order thinking skills such as mathematical problem-solving. The researcher also encountered several obstacles.

Conclusion

Based on the research findings, the Culturally Responsive Teaching (CRT) approach applied to the traditional food Garut dodol has been proven to exert a positive influence on students' mathematical problem-solving abilities through learning that is more contextual, meaningful, and aligned with their own cultural experiences, thereby enhancing engagement and the quality of thinking processes in solving problems. These findings confirm that the integration of local culture into mathematics learning is a relevant strategy for improving problem-solving abilities. However, this study still has limitations in terms of the limited use of cultural context, the scope of material that is not yet extensive, and the management of instructional time. Therefore, future research is recommended to explore more diverse cultural contexts, broaden the scope of material, and optimise time allocation in order to obtain more comprehensive results.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

S.A.H. played an active role in the entire research process, starting from the implementation of the study, data collection, preparation and development of instruments, drafting of the initial manuscript, discussion of results, to the refinement of the manuscript up to the final stage. E.H. and D.S. contributed to the development of the main research ideas, strengthening the theoretical foundation, designing the methodology, processing and analysing data, interpreting the findings, and providing approval for the final manuscript. All authors have read and approved the final version of the article. The proportion of contributions in conceptualisation, writing, and manuscript revision is as follows: S.A.H.: 40%, E.H.: 30%, and D.S.: 30%.

Data Availability Statement

The authors declare that data sharing cannot be conducted, as no new data were generated or analysed in this study.

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