

Exploring the Potential for Learning Mathematics at the Geger Hanjuang Inscription Site Through Outing Class Activities

Rizqy Amelia Putri , Mega Nur Prabawati , Eko Yulianto 

How to cite: Putri, R. A., Prabawati, M. N., & Yulianto, E. (2026). Exploring the Potential for Learning Mathematics at the Geger Hanjuang Inscription Site Through Outing Class Activities. *Kognitif: Jurnal Riset HOTS Pendidikan Matematika*, 6(1), 458–573. <https://doi.org/10.51574/kognitif.v6i1.4388>

To link to this article: <https://doi.org/10.51574/kognitif.v6i1.4388>



Opened Access Article



Published Online on 31 March 2026



Submit your paper to this journal



Exploring the Potential for Learning Mathematics at the Geger Hanjuang Inscription Site Through Outing Class Activities

Rizqy Amelia Putri¹ , Mega Nur Prabawati^{1*} , Eko Yulianto¹ 

¹Master of Mathematics Education Study Program, Postgraduate Program, Siliwangi University

Article Info

Article history:

Received Dec 12, 2025

Accepted Feb 22, 2026

Published Online Mar 31, 2026

Keywords:

Culturally Responsive Teaching
Problem Posing
Ethnomathematics
Mathematical Activities
Learning Potential

ABSTRACT

This study aims to analyze how problem posing based on the Geger Hanjuang Inscription artifacts elicits Bishop's six activities and to identify the types of mathematical ideas generated by students. The learning intervention was carried out through outing class activities, where students observed the inscription artifacts, conducted measurements and sketches, formulated mathematical questions based on their findings, and solved the problems posed. Using a descriptive and exploratory qualitative research design, this study examined how students interacted with cultural artifacts and processed them into meaningful mathematical ideas. Data were collected through observations, field notes, documentation, and student work, then analyzed using Bishop's six mathematical activities framework. Furthermore, the researcher triangulated sources to validate the validity of the data. The research findings indicate that cultural artifact-based learning has the potential to facilitate the emergence of various mathematical activities in students in contextual learning contexts such as measuring, designing, calculating, allocating, and explaining. Through tasks based on local culture, students demonstrated increased curiosity, contextual reasoning skills, and the ability to formulate mathematical problems independently. This study contributes by demonstrating the integration of ethnomathematics, problem posing and direct experience-based learning at cultural sites as a strategy to elicit students' mathematical activities.



This is an open access under the CC-BY-SA licence



Corresponding Author:

Mega Nur Prabawati,
Master of Mathematics Education Study Program,
Postgraduate Program,
Siliwangi University,
Jl. Terusan Jend. Sudirman, Baros, Cimahi Tengah District, Cimahi City, West Java 40521, Indonesia
ID Scopus: 57210969888
Email: meganurprabawati@unsil.ac.id

Introduction

Mathematics, as a fundamental discipline, is often taught abstractly and separated from the cultural context and learning environment of students. This undoubtedly causes students to have difficulty understanding concepts and applying them in real-world contexts. Furthermore,

this approach also risks creating the impression that mathematics is a foreign entity irrelevant to everyday life, especially for students whose cultural backgrounds are not represented in conventional curricula (Vavrus, 1997). To address this, a pedagogical approach is needed that connects mathematics to the cultural context and experiences of students, one of which is through Culturally Responsive Teaching (CRT).

According to Hernita (2024) CRT is a learning approach that utilizes students' cultural references as a medium to understand and learn subject matter in a more contextual and meaningful way. In this case, students will be directly exposed to culture in the form of inscription sites that are historical milestones in the birth of Tasikmalaya Regency, so that students can better understand the meaning of learning. In line with this, Buchori & Harun (2020) argue that the CRT approach is a teaching method that recognizes and accommodates cultural diversity in the classroom by integrating it into the school curriculum. This approach aims to build meaningful relationships between learning and community culture. Because in reality, mathematics is In the context of Tasikmalaya Regency, CRT is applied to create an inclusive learning environment that is relevant to local cultural values. In addition, the CRT approach also really allows students to be actively involved in communicating and collaborating with their peers, which is expected to improve students' understanding of the material.

The CRT approach has the characteristics of encouraging positive interactions among students, student-centered learning, and developing critical thinking skills (Wati et al., 2023). Therefore, to be able to use this learning approach, a learning model is needed that is proven to be effective in supporting the characteristics of the approach. Suryasubroto (in Ngaeni & Saefudin, 2017) stated that one learning model that can encourage students to think critically, dialogically, creatively, and interactively is Problem Posing. This model focuses on posing problems packaged in the form of questions, so that students are more active in exploring and understanding concepts in depth. According to Sheikhzade (Susanti, E. L. et al., 2012) Problem Posing involves creating new problems and questions to explore regarding a particular situation, as well as reformulating problems during the problem-solving process related to it. In addition, Problem Posing is also a learning model that focuses learning on students, and encourages students to be active and interact positively with other students during the learning process. This problem posing is present as motivation in the part of finding ways to improve the abilities of students and teachers by connecting them with the richness of authentic mathematical work (Toh et al., 2023).

Furthermore, almost all previous studies have focused on classroom learning or visits (outing classes) to cultural and historical sites. However, integrating elements from real locations, such as historical and cultural sites, has the potential to deepen the connection between mathematics, culture, and students' local identities. An outing class is a learning process conducted outside the classroom (Rahmawati & Nazarullail, 2020). An outing class is a teaching and learning activity that takes place outside the classroom, using a natural approach and real-world contexts, making the material easier to understand (Yuniarti et al., 2024). Outing classes can be held in locations within the school environment but are related to the material being taught. This activity provides a means of gaining new experiences and knowledge and learning to interact directly with the environment and nature. During outing classes, students can observe, explore, and analyze mathematical concepts in real environments, such as traditional buildings, weaving patterns, or cultural ornaments relevant to the material being studied. Thus, with this more contextual and interactive learning experience, understanding the concept of polygons is not only abstract, but also makes students aware of how mathematics is present in real life and enhances their creativity.

As explained by Hidayat (Sartika et al., 2023), culture is a legacy in the life of society, where culture develops to adapt to conditions that occur in the present and the future. One of

Indonesia's cultural heritages is the Geger Hanjuang Inscription Site. The Geger Hanjuang Inscription Site as a historical relic that holds many cultural values, can certainly provide an opportunity for students to become a learning medium through the CRT approach. The inscription is the forerunner to the birth of Tasikmalaya Regency. This is based on the relationship between the Galunggung Mandate manuscript and the Geger Hanjuang Inscription with the Anniversary of Tasikmalaya which was made on August 21, 1111 AD, as a sign of the coronation ceremony of Batari Hyang Janapati as ruler and enthroned in Galunggung (Suryani, 2017). Previous research has shown that cultural artifacts can be a source of mathematical concepts (Laukum et al., 2024), but has not examined the implementation of contextual learning through direct learning experiences in cultural environments. As a preserved cultural object, the Geger Hanjuang Inscription Site also holds a wealth of learning potential that can be integrated into learning (Putri et al., 2025). However, this potential has not been optimally utilized in learning practices, so the relationship between mathematical concepts and students' real-life experiences remains less visible.

In this case, CRT becomes a means to integrate the symbols found on the inscription site into mathematics learning, so that students can see how mathematical concepts are present in their daily lives and culture through contextual, cultural, and historical mathematical activities. The hope is to expand the application of CRT and Problem Posing to the realm of real-place-based learning, can offer authentic mathematical problems based on student findings, so as to explore and facilitate students' mathematical learning potential through contextual and meaningful mathematical activities. A number of studies that integrate problem-based learning models such as Problem Based Learning (PBL) with CRT have been conducted, and the results show an increase in mathematics learning outcomes, problem solving, mathematical communication and student learning motivation (Lestari et al., 2025; Navitri et al., 2025; Wisnu & Antonius, 2025). However, the integration of CRT with Problem Posing is still relatively rare. This indicates a research gap that deserves further review.

Method

Type of Research

This research method delineates the procedures employed by the researcher in gathering and analysing data pertinent to the application of CRT and Problem Posing-based mathematical learning during the excursion class activity at the Geger Hajuang Inscription Site. This section delineates the study design, participant demographics, equipment employed, data collection methodologies, and analytical tools utilised to ensure the research process is comprehensible and scientifically validated. This research employs a field-based qualitative design to investigate students' mathematical activities within the framework of direct learning at the Geger Hajuang Inscription Site. This design was selected to thoroughly investigate how the integration of CRT with the Problem Posing paradigm enhances mathematical learning potential through Bishop's mathematical activities within a local cultural environment. This design is appropriate for researchers aiming to comprehend learning phenomena that occur organically within contextual settings, particularly to elucidate students' cognitive processes, unprompted reactions, and direct engagements with cultural artefacts. This study is exploratory as it entails the design of learning activities derived from cultural artefacts.

Subjects/Population and Sample

The research participants were 12 high school students organised into four groups. Participants were chosen by purposive sampling, specifically selecting pupils actively engaged in the activities and capable of completing the entire series. The subjects were deemed representative as the research concentrated on students' genuine reactions in culture-oriented contextual learning.

Instrument

The research instrument comprised worksheets tailored to the stages of the problem-posing learning paradigm. Throughout the educational process, students received Student Worksheets (LKPD) prepared according to the problem-posing stages. Each level was crafted to provoke mathematical engagement, as posited by Bishop, serving as a foundation for the examination of student activities. The tools were verified by specialists to verify conformity with educational objectives and markers of mathematical engagement. The researcher utilised firsthand observations and documentation throughout the outing class activities as another instrument.

Data Collection

Learning activities were conducted over a 90-minute outdoor class session, encompassing observation, exploration, and reflection. The research commenced with the development of student workbooks and measurement tools, with interaction with the site administrator. Students received an initial briefing on the activity progression. Subsequently, students collaborated in groups to examine cultural artefacts, produce sketches, measure dimensions, identify problems, and resolve them. Researchers gathered data via observation, recorded dialogues, activity sheet outcomes, and photographic and video recordings. Upon the completion of the field trip, all student assignments were gathered, authenticated, and systematically arranged with field notes for subsequent analysis.

Data Analysis

The data analysis was performed through the phases of data reduction, data presentation, and conclusion formulation. Data reduction was executed by categorising pertinent information from observations, activity sheets, and paperwork, thereafter organising them according to Bishop's actions. The data presentation involved showcasing information through narrative descriptions and examples of job outcomes, so facilitating the clear visibility of student comprehension patterns. The researcher performed theme coding through several stages: reviewing the complete dataset, defining units of students' mathematical activities, categorising data according to six mathematical activities, and analysing the resulting activity patterns. Indicators of mathematical activity encompass counting, measuring, creating representations, identifying locations, and providing explanations. Student data were classified into distinct activities according to mathematical actions or expressions observed in worksheets, observational results, and activity documentation; for instance, measuring activities were recognised when students assessed the length, height, or distance of an object, whereas designing activities were noted when students illustrated or constructed shape representations. Ultimately, conclusions were formulated to elucidate the patterns of data and correlate them with the principles of CRT, Problem Posing, and Bishop's activities, so demonstrating how contextual learning enhances students' mathematical cognition.

Research Findings

Research Findings

The results of the study indicate that the Geger Hanjuang Inscription Site environment contains objects that can be used as learning materials. To explore students' learning potential in the Geger Hanjuang Inscription Site Environment, researchers used a mathematical activity framework (Bishop, 1997). These mathematical activities are: Counting, Measuring, Designing, Locating, Playing, and explaining. The counting activities carried out by students include calculating the base area of the octagonal symbol monument, calculating the cuboid-shaped wall, calculating the size of the stairs, and calculating the height of the gate pillar. Measuring activities include measuring the length of the octagonal side, measuring the length, width, and height of the cuboid, measuring the length, width, and height of the steps, and measuring the observer's elevation angle and the observer's distance from the gate pillar; Designing activities include students' activities in making sketch designs of the objects they will examine. Such as octagonal sketches, cuboid sketches, stair sketches, and pillar sketches; Allocating activities include students' activities in calculating the height of the gate pillar. Students assign other students as observers at a certain distance to measure the elevation angle of the gate pillars. The explanation activity occurs after the students have conducted the research. Students explain the steps of their observations and measurements and explain the results of their research. The mathematical activities carried out by students at the Geger Hanjuang Inscription Site are described as follows:

Counting

Students can calculate the area of the octagon that forms the base of the monument symbolizing the inscription, calculate the volume of the cuboid-shaped wall that houses the monument symbolizing the inscription, calculate the height of the gate pillar, and calculate the height, slope, and length of a staircase consisting of 21 steps.

To calculate the area of the octagon, students use the combined area model. In this case, students divide the octagon into other geometric shapes, namely a trapezoid and a rectangle. Therefore, students can write the formula as:

$$\begin{aligned} \text{Area of the octagon} &= \text{Area of trapezoid 1} + \text{Area of trapezoid 2} + \text{Area of rectangle} \\ \text{Area of an octagon} &= \left(\frac{1}{2}(a_1 + b_1) \times t_1\right) + \left(\frac{1}{2}(a_2 + b_2) \times t_2\right) + (p \times l) \end{aligned}$$

In their work, students assume the two trapezoids are the same size, so they only calculate the area of the trapezoid once.

$$\text{Area of trapezoid} = 6,8476 \text{ m}^2 \approx 6,85 \text{ m}^2$$

$$\text{Area of rectangle} = 17,9697 \text{ m}^2 \approx 17,97 \text{ m}^2$$

$$\text{Area of octagon} = \text{Area of trapezoid 1} + \text{Area of trapezoid 2} + \text{Area of rectangle}$$

$$\text{Area of octagon} = 6,85 + 6,85 + 17,97$$

$$\text{Area of octagon} = \mathbf{31,67 \text{ m}^2}$$

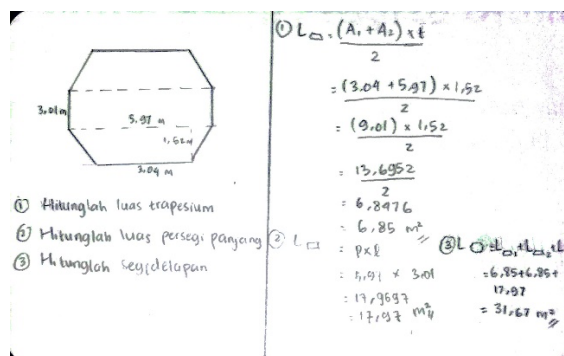


Figure 1. Steps for calculating the base of an octagon

To calculate the volume of a cuboid-shaped base wall, students utilize their knowledge of the combined volume of flat-sided solids. The base wall is divided into four solids, each shaped like a cuboid. Therefore, students can write the equation as:

$$\text{Wall volume} = \text{Wall volume 1} + \text{Wall volume 2} + \text{Wall volume 3} + \text{Wall volume 4}$$

$$\text{Wall volume} = (p_1 \times l_1 \times t_1) + (p_2 \times l_2 \times t_2) + (p_3 \times l_3 \times t_3) + (p_4 \times l_4 \times t_4)$$

After students performed the measurements, they obtained the following results:

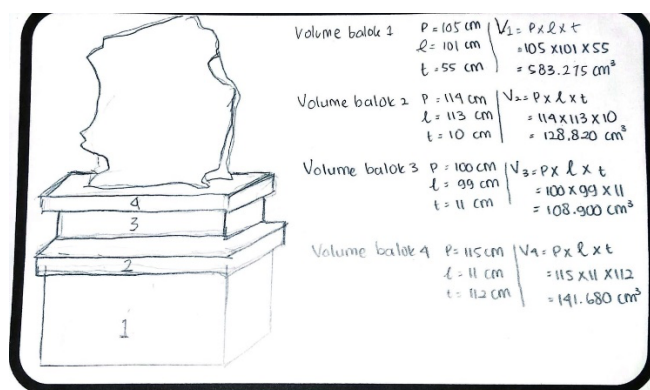


Figure 2. Steps for calculating the wall volume

After that, students can calculate the volume of each block as follows:

$$\text{Wall volume 1} = (p_1 \times l_1 \times t_1) = 105 \times 101 \times 55 = 583.275 \text{ cm}^3$$

$$\text{Wall volume 2} = (p_2 \times l_2 \times t_2) = 114 \times 113 \times 10 = 128.820 \text{ cm}^3$$

$$\text{Wall volume 3} = (p_3 \times l_3 \times t_3) = 100 \times 99 \times 11 = 108.900 \text{ cm}^3$$

$$\text{Wall volume 4} = (p_4 \times l_4 \times t_4) = 115 \times 11 \times 112 = 141.680 \text{ cm}^3$$

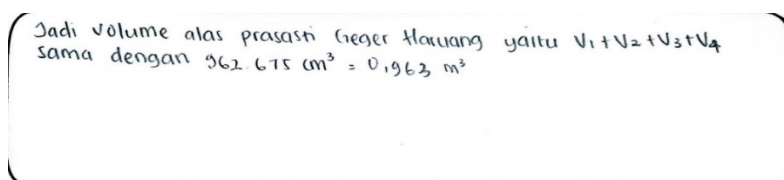


Figure 3. Conclusion of wall volume calculation

From the addition of the volume of block 1 + the volume of block 2 + the volume of block 3 + the volume of block 4, the volume of the wall is $962.675 \text{ cm}^3 = 0,963 \text{ m}^3$. Students employ trigonometric principles, notably the tangent ratio, to compute the arch pillars by comparing the front side to the side. Students initially position an observer at a specific distance

to ascertain the angle of elevation. Subsequently, students ascertain the angle of elevation employing the $(90^\circ - \alpha)$ technique. Students also determine the observer's height at the precise location of the clinometer's placement.

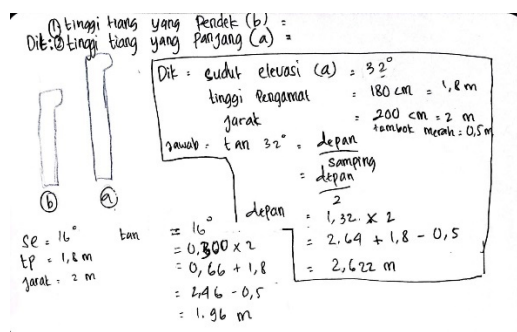


Figure 4. Student Work Process Calculating the Height of the Gate Pillars

To calculate the height, slope, and length of a staircase consisting of 21 steps, students also use the application of trigonometric ratios, namely tangents. Students calculate the length of the staircase by measuring the width of each step and then multiplying it by 21. Then, students calculate the angle to determine the height of the staircase. After that, students calculate the length of the staircase from the measurements known in the previous calculation.

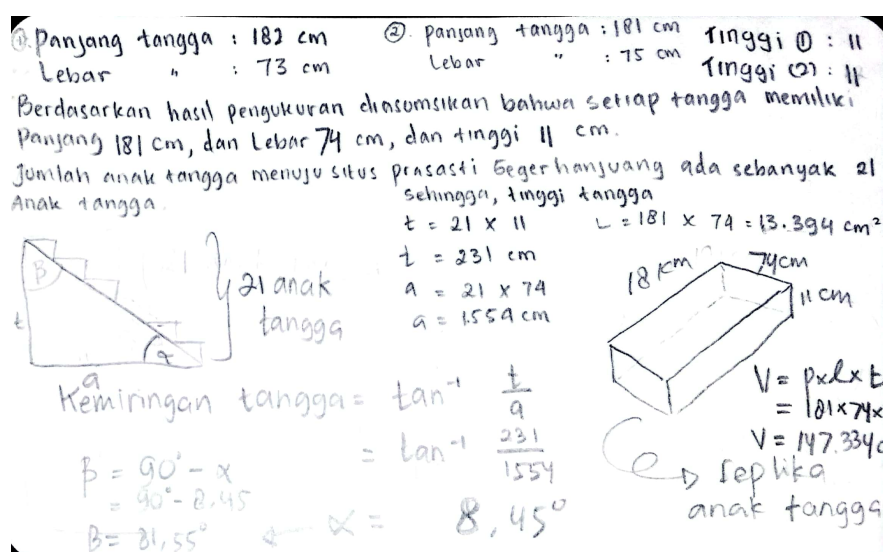


Figure 5. Steps for calculating the size of the stairs

Students performed calculations assuming each stair was the same size. For each stair, they wrote down the following measurements:
 Length = 181 cm, width 74 cm dan height = 11 cm.

After that, students calculate the height of the stairs and the length of the base of the stairs, which totals 21 steps, as follows:

$$\text{Stair height} = 21 \times 11 = 231 \text{ cm}$$

$$\text{Stair base} = 21 \times 74 = 1.554 \text{ cm}$$

Meanwhile, students can calculate the area for 1 step as: $181 \text{ cm} \times 74 \text{ cm} = 13.394 \text{ cm}^2$

After that, students calculate the volume of each step as follows:

$$V = p \times l \times t = 181 \times 74 \times 11 = 147.334 \text{ cm}^3$$

Finally, students calculate the slope of the stairs using the inverse tangent as follows:

$$\tan^{-1} \alpha = \frac{t}{a}$$

$$\tan^{-1} \alpha = \frac{231}{1.554}$$

$$\alpha = 8,45^\circ$$

$$\beta = 90^\circ - 8,45^\circ$$

$$\beta = 81,55^\circ$$



Figure 6. Image of students doing counting activities

Measuring

At the Geger Hanjuang Inscription Site, students can measure the length of each side of the octagonal base, the length of the wall, the width of the wall, the height of the wall, the dimensions (length and width) of each step, and the distance from the observed object to the observer using a measuring tool in the form of a meter. In addition, students can also measure the elevation angle of the gate pillar using an angle measuring tool, namely a clinometer.



Figure 7. Image of students carrying out length measuring activities



Figure 8. Image of students carrying out angle measuring activities

Designing

At the Geger Hanjuang Inscription Site, students can design drawings or sketches of the objects they will be calculating, such as octagonal sketches, cuboid sketches, ladder sketches, and pillar sketches.

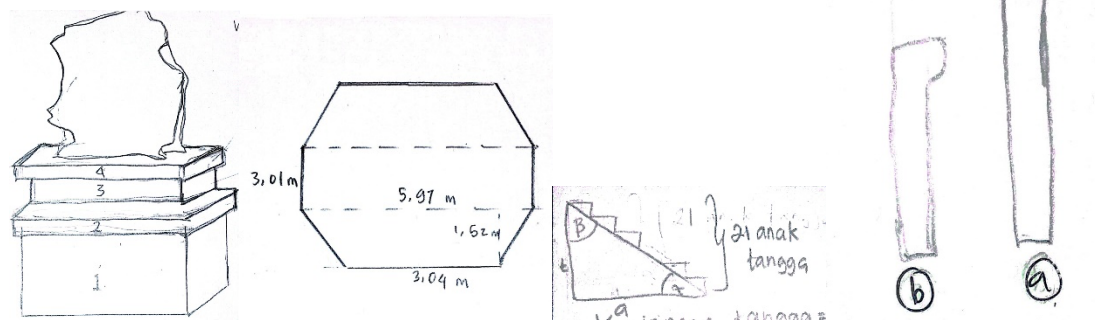


Figure 9. Sketches made by students

Locating

In this activity, one group of students performed the placement activity, namely the group that calculated the height of the pole. Students determined the observer's location to be able to measure the elevation angle of the pole to be measured.



Figure 10. Image of students allocating observers to measure angles

Explaining

In this activity, students can explain the object of their calculations, explain the steps they took, and explain the calculation process.



Figure 11. Figure of students explaining the results of their work.

Discussion

As a site filled with objects, the Geger Hanjuang Inscription Site certainly has many forms that can be used as a means of exploring mathematical activities. As with the objects that have been analyzed, students can perform counting activities. The counting activities carried out by students include calculating the volume and area of flat shapes that have mathematical shapes, calculating the height of an object, and calculating the slope of an object. Students begin the calculation by asking a question, in accordance with the stages of the Problem Posing learning model applied. The local cultural context makes students more active in formulating mathematical questions relevant to their daily experiences (Darmayasa, 2019).

In group 1, students calculated the area of the octagon that serves as the base of the monument symbol inscription. This activity shows how cultural objects can be a source of authentic mathematical ideas, as explained in ethnomathematics that cultural artifacts always contain geometric structures that students can explore (Gerdes, 1994; Rosa & Orey, 2011). To calculate the area of the octagon, students divided the octagon into 2 trapezoids and 1 rectangle. This is also included in the designing activity which is a universal mathematical activity that arises from the cultural context (Bishop, 1997). Students assume the size of the two trapezoids is the same so they only calculate one of them. The size of one of the trapezoids is $A_1 = 3,04$, $A_2 = 5,97$ $t = 1,52$ so that the area of the trapezoid can be calculated as $6,85 m^2$. For the area of the rectangle, the student got the measurement The area of the rectangle is $5,97 m \times 3,01 m = 17,97 m^2$. So the area of the octagon is $6,85 + 6,85 + 17,97 = 31,67 m^2$. From the results of these calculations, there are three errors made by the student. First, the student was wrong in measuring the size of the front side of the octagon. The size the student got was 3,04 m or 304 while the actual size was 316 cm or 3,16 m. Second, the student was wrong in determining the size of the area of the second trapezoid. The student's assumption that the two trapezoids formed would be the same is wrong. In reality, the length of the back side of the octagon is 313 cm or 3,13 cm so it is certainly different from the size of the first trapezoid. Third, the student assumed the other shape formed was an octagon. In fact, the octagon is an irregular octagon so the student cannot make a rectangle from it.

In group 2, students calculated the height of the stairs, the length of the base of the stairs, the volume of the unit of stairs, the square area of the unit of stairs and the slope of the stairs. Students measured the length, width and height of each step using several samples. From each step, the length and width were obtained which were different but still close, for example, on the first step, the length was 182 cm and the second step was 182 cm. Then for the width, the width of the first step was 73 cm and the second step was 75 cm. Then for the height of each step, the size was the same, namely 11 cm. So from all the measurements obtained, students made the assumption that the length, width and height of each step were the same, namely 181 cm long, 74 cm wide and 11 cm high. So students can calculate the overall height of the stairs is $21 \times 11 \text{ cm} = 231 \text{ cm}$ and the overall size of the base of the stairs is $21 \times 74 \text{ cm} = 1,554 \text{ cm}$. Meanwhile, the square area for 1 step that students can calculate is $181 \text{ cm} \times 74 \text{ cm} = 13,394 \text{ cm}^2$. In addition, students also calculate the unit volume of the steps, namely $181 \text{ cm} \times 74 \text{ cm} \times 11 \text{ cm} = 147,334 \text{ cm}^3$. Finally, students calculate the slope of the stairs using the inverse tangent. The results of the calculations obtained the slope of the stairs, namely $\alpha = 8.45^\circ$ and $\beta = 81.55^\circ$.

From the calculation results, there were two errors made by the students. First, the students assumed that the length, width, and height of each step were the same, resulting in answers for the height and base of the stairs that differed from the actual measurements. Second, the students calculated the angle formed by the stairs using the inverse tangent and called it the

slope. However, the slope is not an angle measure. Therefore, there is a misconception between the slope and the angle formed by the measurements of the front and side of the angle.

In group 3, students successfully calculated the volume of the cuboid that serves as the base of the monument symbol inscription. Students divided the cuboid into 4 smaller cuboid parts, calculated the area of each cuboid and added them all together. Students were able to determine the total volume of the cuboid, which is 926.675 cm^3 . In terms of calculation, students have been able to calculate it well, but there was inaccuracy in determining the dimensions for the 4th cuboid. Students wrote the length of the 4th cuboid as 115 cm, width 11 cm and height 112 cm. In fact, the width of the 4th cuboid is 112 cm and the height is 11 cm. Even so, the results of the volume calculation are still correct, namely 141.680 cm^2 but this is still a correction for students to be more careful in determining the length, width and height of the cuboid space. This finding confirms that measuring and analyzing real cultural forms can improve the residual understanding of geometric concepts (Ndani et al., 2025).

In group 4, students calculated the height of the gate pillars at the front of the Geger Hanjuang Inscription Site. Of the 4 pillars, students only calculated 2 pillars that were close to each other. The height of the first pillar was coded a and the height of the second pillar was coded b. Students were able to calculate the height of the pillars well and with full accuracy. The measurement results obtained were very close to the actual size. The difference obtained may have come from inaccuracy when using a clinometer to calculate the magnitude of the elevation angle. Nevertheless, the results of the answer were very good, equipped with a reduction in the size of the wall that became the base of the pillar by 0.5 m so that the height of pillar a was obtained was 2.622 m and the height of pillar b was 1.96 m. From the results of this calculation, the results obtained were quite different from the actual size. The actual height of the pillars was 3.14 m and 2.13 m. This was due to the student's inaccuracy when measuring the elevation angle formed by the observer's eye who made the measurement. Students made an error in determining the magnitude of the angle on the clinometer formed so that the results were inaccurate. However, students have been able to calculate and use trigonometry applications well.

The findings of counting activities on cultural objects such as octagons, blocks, stairs, and gate pillars show that students are able to utilize visual representations of culture as a basis for mathematical modeling. These results are in line with research by Lestari et al., (2025) which shows that the integration of CRT and PBL can strengthen conceptual abilities through contexts close to students' lives. These findings confirm that when students are given space to connect mathematical objects with cultural experiences, higher-order thinking processes (HOTS) are more facilitated.

The second mathematical activity that students can do is measuring. In this measuring activity, students have been able to do it well. Group 1 successfully measured the right side, front side, width of the octagon, and height of the trapezoid on part of the base of the octagonal monument using a meter. The results of the group's measurements were the length of the right side 3.01 m, the front side 3.04 m, the width of the octagon 5.97 m, and the height of the trapezoid on part of the octagon was 1.52 m. Group 2 was able to measure the length, width and height of each step using a meter so that it could be used to calculate and answer the questions they had asked. The measurements obtained for each step were 181 cm long, 74 cm wide and 11 cm high. Group 3 was able to measure the length, width and height of the 4 blocks they had set to be able to calculate a wall that became the base where the inscription symbol monument stood. The measurements obtained by group 1 on the first block were 105 cm long, 101 cm wide, and 55 cm high. The second block has a length of 114 cm, a width of 113 cm, and a height of 10 cm. The third block has a length of 100 cm, a width of 99 cm, and a height

of 11 cm. Meanwhile, in the fourth block, the student made an error in determining the width and height of the block. The width of the block should be 112 cm and the height of the block 11 cm. But the student wrote the width 11 cm and the height 112 cm. So the size that the student got for the fourth block is a length of 115 cm, a width of 11 cm, and a height of 112 cm. In group 4, students can calculate the size of the elevation angle of the 2 poles they observed using a clinometer. The size of the first pole's elevation angle is 32° while the size of the second pole's elevation angle is 16° . In addition, students also measured the distance between the observer and the pole using a meter, and the size was 2 m.

The third math activity students can undertake at the Geger Hanjuang Inscription Site is locating. This math activity was carried out by Group 4, who successfully calculated the height of the gate pillar at the Geger Hanjuang Inscription Site. They performed this locating activity when calculating the elevation angle of the pillar. They assigned one of their friends to aim at the top of the pillar to determine the elevation angle of the pillar they were about to measure.

The fourth mathematical activity that students can do in the Geger Hanjuang Inscription Site is designing. To facilitate answering the questions posed, students create sketch designs of the objects they will calculate and solve. In group 1, students create a sketch of an octagon using a pencil and ruler. Students begin their sketch design by drawing a straight line as the front side of the octagon, then continue by drawing the other sides according to the actual physical shape they see. In group 2, students design the shape of the stairs and steps whose dimensions they will calculate. In group 3, students design sketches of walls and monuments to facilitate the calculation of the volume of the wall, which they have divided into several blocks. Finally, group 4 designs sketches of two pillars whose height they will calculate.

The fifth mathematical activity that students can do in the Geger Hanjuang Inscription Site environment is explaining. Each group is able to explain the steps they took to solve the questions they have posed. For example, in group 2, students can explain their steps to be able to measure the degree of slope of the stairs, the square area of a unit of steps, the volume of a unit of steps, the height of the stairs and the length of the base of the stairs. The first step they took was to calculate the length, width and height of the stairs. Students explained that their group only calculated a few steps, then because the sizes were almost the same and close together, students made the assumption that the measurements were the same. Then after that, students calculated the height and length of the base of the stairs as a whole. Next, students can calculate the square area of a unit of steps and the volume of a unit of steps. Finally, students can calculate the degree of slope of the stairs using the inverse tangent formula assisted by the height and base measurements that have been obtained previously. This finding confirms that the integration of local cultural experiences through the Culturally Responsive Teaching approach and problem posing not only brings out students' mathematical activities, but also increases activeness, creativity, and problem-solving abilities in mathematics learning. These results are in line with the findings of [Fitriyah et al. \(2024\)](#) which shows that the use of local cultural experiences in learning activities contributes to improving the quality of students' mathematical involvement and thinking processes.

In the context of this research, direct learning experiences at cultural sites serve as triggers for the construction of meaningful mathematical problems for students. In addition, the findings of this study indicate that utilizing cultural contexts through direct learning experiences not only uncovers mathematical concepts in cultural artifacts, but also encourages the development of students' mathematical thinking skills through activities of observing, representing, and formulating problems meaningfully, as explained by [Wikasari et al., \(2025\)](#) who emphasized that ethnomathematics-based learning supports students' conceptual understanding. Through a problem-posing learning model that requires students to ask questions and solve them

themselves, it shows that the integration of a culturally based contextual learning approach significantly improves students' mathematical problem-solving abilities (Budiarsih et al., 2026).

Conclusion

The research findings indicate that the incorporation of culture-based learning via the Culturally Responsive Teaching approach and problem-posing tasks during the outing class at the Geger Hanjuang Inscription site resulted in diverse student mathematical activities, specifically measuring, calculating, designing, allocating, and explaining. Direct learning experiences with cultural artefacts fostered the development of significant mathematical enquiries among students, enhancing their involvement, creativity, and problem-solving abilities in mathematics education. Unlike prior research, which typically analysed ethnomathematics as the identification of concepts within cultural artefacts or the implementation of problem-posing in formal educational environments, this study illustrates that the incorporation of authentic cultural experiences and student-generated problem construction can serve as a contextual learning mechanism to enhance mathematical engagement. These findings theoretically reinforce the significance of cultural context in the development of pupils' mathematical understanding. This study offers an alternate framework for experiential mathematics education aimed at enhancing students' mathematical engagement within a contextual learning environment. Experiential learning within a cultural framework can serve as an alternate technique for contextual mathematical education. This study was constrained by a low sample size and the execution of activities inside a single learning session, thus necessitating care in the generalisation of the findings. Subsequent investigations could evaluate this methodology across other levels and materials, as well as with a broader cohort of students.

Acknowledgments

The authors would like to thank the teachers and students who participated in this research and provided support during the data collection process. They also extend their deepest appreciation to the Master of Mathematics Education Program at Siliwangi University for their academic guidance and facilities that supported this research. Furthermore, they would like to thank the reviewers and colleagues who provided suggestions and input to improve this work.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

R.A.P. conceived the research idea presented and collected the data. M.N.P. actively participated in the development of the theory, organization and division of tasks. E.Y. actively participated in the development of the methodology, organization and analysis of the data, discussion of the results and approval of the final version of the work. All authors declare that the final version of this paper has been read and approved. The total percentage of contributions to the conceptualization, preparation, and correction of this paper is as follows: R.A.P.: 40%, M.N.P.: 30%, and E.Y.: 30%

Data Availability Statement




The authors state that the data supporting the findings of this study will be made available by the corresponding author, [M.N.P.], upon reasonable request.

References

- Bishop, A. (1997). *The Relationship Between Mathematics Education and Culture*. https://www.researchgate.net/profile/Alan-Bishop-3/publication/255590052_THE_RELATIONSHIP_BETWEEN_MATHEMATICS_EDUCATION_AND_CULTURE/links/549a5a1f0cf2b8037135936a/THE-RELATIONSHIP-BETWEEN-MATHEMATICS-EDUCATION-AND-CULTURE.pdf
- Buchori, A., & Harun, L. (2020). Desain E-Modul Flipbook Berbasis Culturally Responsive Teaching (Crt) Pada Materi Transformasi Geometri Di Sekolah Menengah Kejuruan. *Lebesgue : Jurnal Ilmiah Pendidikan Matematika, Matematika Dan Statistika*, 1(1), 63–73. <https://doi.org/10.46306/lb.v1i1>
- Budiarsih, W. A., Patmawati, H., & Madawistama, S. T. (2026). *Effect of Inquiry Learning and Culturally Responsive Teaching and Mathematical Problem Solving*. 6(February), 227–239. <https://doi.org/https://doi.org/10.51574/kognitif.v6i1.4741>
- Darmayasa, J. B. (2019). *Exploration Of Problem-Posing Ability Of The Students Of Class Vii-D Of State Junior High School 4 Kintamani Through Mathematical Problem-Based Ethnomathematics*. 7(1), 102–114. <https://doi.org/https://doi.org/10.33477/mp.v7i1.1049>
- Fitriyah, A., Fiantika, F. R., & Rusminati, S. H. (2024). Penerapan Model Problem Based Learning (Pbl) Berbasis Ethnomatematika Pada Peserta Didik Sekolah Dasar. *Jurnal Ilmiah Wahana Pendidikan*, 10(April), 223–231. <https://doi.org/https://doi.org/10.5281/zenodo.11080282>.
- Gerdes, P. (1994). Reflections on Ethnomathematics. *For the Learning of Mathematics*, 14(2), 19–22. <https://www.semanticscholar.org/paper/Reflections-on-Ethnomathematics.-Gerdes/3e8f21baf8fa7b1f566d18830d688e60b301adf9>
- Hernita, L. V., Istihapsari, V., & Widayati, S. (2024). Peningkatan Pemahaman Konsep Matematika Siswa Kelas XI-2 SMAN 2 Bantul dengan Pendekatan Culturally Responsive Teaching (CRT) Berbantuan Google Sites. *Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika*, 7(2), 517–523. <https://doi.org/10.30605/proximal.v7i2.3590>
- Laukum, M., Rosmiati, Sedia, M. E., Khadijah, & Hindi, A. N. A. (2024). Eksplorasi Etnomatematika pada Konsep Segitiga dalam Rumah Adat Bugis-Makassar Melania. *Kognitif: Jurnal Riset HOTS Pendidikan Matematika*, 4(May), 44–56. <https://doi.org/https://doi.org/10.51574/kognitif.v4i1.1194>
- Lestari, M. Z. D., Alifiani, A., & Yakusni, Y. (2025). Penerapan Model Problem Based Learning dan Culturally Responsive Teaching untuk Meningkatkan Pemahaman Konsep Peserta Didik. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 9(2), 845–856. <https://doi.org/10.31004/cendekia.v9i2.4115>
- Navitri, R. Y., Untari, M. F. A., & Kanitri, N. (2025). Pembelajaran dengan Pendekatan CRT Berbasis PBL untuk meningkatkan Hasil Belajar Siswa Sekolah Dasar. *Ainara Journal (Jurnal Penelitian Dan PKM Bidang Ilmu Pendidikan)*, 6(1), 100–107. <https://doi.org/10.54371/ainj.v6i1.778>
- Ndani, Y. E., Putri, R., & Oktafia, M. (2025). *Integrasi budaya lokal anyaman desa sungai liuk dalam pembelajaran matematika pada materi geometri menggunakan geogebra*. 11(1), 312–324. <https://doi.org/10.29100/jp2m.v11i1.7258>
- Ngaeni, E. N., & Saefudin, A. A. (2017). Menciptakan pembelajaran matematika yang efektif

- dalam pemecahan masalah matematika dengan model pembelajaran problem posing. *Jurnal Aksioma*, 6(2), 264–268. <https://doi.org/10.1093/oseo/instance.00208803>
- Putri, R. A., Yulianto, E., & Mulyani, E. (2025). Eksplorasi Etnomatematika pada Situs Prasasti Geger Hanjuang sebagai Cikal Baka Kabupaten Tasikmalaya. *Primatika: Jurnal Pendidikan Matematika*, 14(1), 41–62. <https://doi.org/10.30872/primatika.v14i1.4722>
- Rahmawati, R. L., & Nazarullail, F. (2020). Strategi Pembelajaran Outing Class Guna Meningkatkan Aspek Perkembangan Anak Usia Dini. *Jurnal PG-PAUD Trunojoyo : Jurnal Pendidikan Dan Pembelajaran Anak Usia Dini*, 7(2), 9–22. <https://doi.org/10.21107/pgpaustrunojoyo.v7i2.8839>
- Rosa, M., & Orey, C. (2011). *Ethnomathematics : the cultural aspects of mathematics* *Etnomatemática : os aspectos culturais da matemática*. <https://dialnet.unirioja.es/download/articulo/3738356.pdf>
- Sartika, B., Litik, Y., Argarini, D. F., & Utomo, I. B. (2023). Eksplorasi Etnomatematika pada Artefak Peninggalan Sejarah di Kota NTT. *Jurnal Ilmiah Matematika Realistik (JI-MR)*, 4(1), 79. <https://doi.org/10.33365/ji-mr.v4i1.2668>
- Suryani, E. (2017). Batari Hyang Janapati Dalam Perspektif Gender. *JENTERA: Jurnal Kajian Sastra*, 6(2), 181–196. <https://doi.org/10.26499/rnh.v6i2.177>
- Susanti, E. L., Sukestiyarno, Y. L., & Sugiharti, E. (2012). Efektivitas Pembelajaran matematika Dengan Metode Problemposing Berbasis Pendidikan Karakter. *Unnes Journal of Mathematic Education*, 1(1), 13–19. <https://journal.unnes.ac.id/sju/index.php/ujme/article/view/255/296>
- Toh, T. L., Santos-trigo, M., Chua, P. H., Abdullah, N. A., & Zhang, D. (2023). Problem Posing and Problem Solving in Mathematics Education. In *Problem Posing and Problem Solving in Mathematics Education*. <https://doi.org/10.1007/978-981-99-7205-0>
- Vavrus, M. (1997). *Culturally Responsive Teaching* (pp. 49–57).
- Wati, S., Kurnisar, K., & Mutiara, T. M. (2023). Peningkatan Minat Belajar Peserta Didik melalui Metode Pendekatan Culturally Responsive Teaching (CRT). *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 8(2), 6260–6268. <https://doi.org/10.23969/jp.v8i2.10224>
- Wikasari, R., Pardi, M. H. H., & Negara, H. R. P. (2025). Effects of Ethnomathematics-Based Problem-Based Learning on Students' Conceptual Understanding in Mathematics. *Kognitif: Jurnal Riset HOTS Pendidikan Matematika*, 5(September), 1409–1421. <https://doi.org/10.51574/kognitif.v5i3.3854>
- Wisnu Ardi Saputra, & Antonius Wahyana. (2025). Penerapan Pendekatan Culturally Responsive Teaching Dan Model Problem Based Learning Untuk Meningkatkan Hasil Belajar Materi Pecahan. *Jurnal Ilmiah Pembelajaran Sekolah Dasar*, 7(1), 38–47. <https://doi.org/10.36709/jipsd.v7i1.62>
- Yuniarti, T., Oktavia, D. E. A., & Novianti, V. A. (2024). Pengaruh Penerapan Metode Pembelajaran Berbasis Outing class Terhadap Minat Belajar Siswa Kelas VI MI Al Amin Tengah Jakarta Timur. *JUPENSAL Jurnal Pendidikan Universal*, 2(1), 323–331. <https://journalwbl.com/index.php/jupensal/article/view/229>

Author Biography

	<p>Rizqy Amelia Putri. Master of Mathematics Education Student, Postgraduate Program, Siliwangi University. Email: 258102111010@student.unsil.ac.id</p>
	<p>Mega Nur Prabawati is lecturer in the Master of Mathematics Education study program, Postgraduate Program, Siliwangi University, Indonesia. Her current research focuses on ethnomathematics. Email: meganurprabawati@unsil.ac.id</p>
	<p>Eko Yulianto is a lecturer and researcher lecturer in the Master of Mathematics Education study program, Postgraduate Program, Siliwangi University, Indonesia. Email: ekoyulianto@unsil.ac.id</p>