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Research Article

Integrating cultural artifacts and tradition from remote regions in developing mathematics lesson plans to enhance mathematical literacy

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This research focuses on prospective teachers who are a group that has a key role in teaching mathematics to future generations. A qualitative approach with an ethnographic design is used to understand and explain the culture and social life of a region by relating its role as a learning resource to developing local culture-based mathematics learning plans. This research method involves collecting data through observation, interviews, and analysis of cultural artifacts. We integrate these cultural elements into mathematics instructional planning. The results of this research show that through exploring local culture, it can be used as a reference for developing learning plans to increase mathematical literacy. Cultural studies as a learning resource are not only for instilling concepts but beyond that, they can be used to develop students' problem solving and critical thinking skills. This research underscores the importance of innovative approaches in mathematics teaching that utilize local cultural assets. The integration of cultural artifacts not only improves mathematical literacy, but also promotes the preservation of cultural heritage. The results of this research can be a guide for educational institutions and teachers in developing mathematics learning strategies that are more contextual and meaningful.

Keywords: Cultural artifacts; Tradition; Remote region; Lesson plan; Mathematical literacy

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1. Introduction

Many countries now recognize the importance of providing diverse skills to their young people, with a particular focus on literacy skills as a global issue in student competency (Jailani et al., 2020). This is in line with the increasing emphasis on understanding the importance of mathematical literacy in real life by students from all over the world (Bolstad, 2023). In particular, mathematical literacy emphasizes the ability to formulate problems, apply mathematical concepts, and interpret mathematical results in various contexts, so providing abundant experience in completing real-world tasks in mathematics classes is essential in developing these capacities (Hwang & Ham, 2021). Improving students' mathematical literacy skills can be achieved by providing experience in dealing with and exploring mathematics in real-world contexts, including personal, social, work and cultural situations. Thus, literacy in mathematics learning is very

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important in the current era, for reasons involving technological advances, job demands, and a deeper understanding of an increasingly complex world.

The importance of developing contextual and meaningful mathematics learning is not only limited to understanding mathematical concepts, but also includes the application of mathematics in everyday life, developing thinking skills, and preparation for a more successful future in various fields. Contextualization in mathematics education improves learning outcomes by connecting abstract concepts with real life problems, fostering understanding, motivation, increasing relevance and practicality of mathematics thereby enabling students to apply knowledge in meaningful ways, improving problem solving skills and encouraging critical thinking (Hoogland et al., 2018). Contextual integration practices in mathematics learning, using authentic materials, can accelerate the learning process. This approach makes mathematical concepts more relevant to students' daily experiences, enabling them to better understand and apply these concepts in authentic tasks. As a result, students become more motivated and develop a stronger personal connection with the subject matter (Çakıroğlu et al., 2023). One of the authentic materials related to students' daily lives is culture. The integration of culture with mathematics has a significant impact on the teaching and learning process because mathematics can be viewed as a cultural phenomenon, thereby helping to develop a broad understanding of mathematics as a cultural product and deepen understanding of the cultural values of mathematics (Zhang & Seah, 2021). However, cultural integration in mathematics learning still provides its own challenges for teachers.

Integration between culture and mathematics is very possible because mathematics was born from a series of historical human cultures and civilizations (Grattan-Guinness, 2004). One effort to introduce culture and mathematics simultaneously can be done by integrating culture and mathematics learning, which is often called ethnomathematics (Verner et al., 2019). Specifically, ethnomathematics is mathematics learning that connects mathematical concepts with the culture and mathematical practices of a particular cultural group (Sebsibe et al., 2023). Various literature notes that ethnomathematics was first introduced by D'Ambrosio and until now has developed in Indonesia into an approach that links Indonesian cultural symbols with mathematical concepts. Thus, the application of ethnomathematics is very open for use in mathematics learning.

Numerous ethnomathematics studies have been conducted. While some research related to investigating geometric ornaments and developing competency in teaching geometry in a cultural context through analysis activities and posing geometric problems related to it (Verner et al., 2019), others focused on ethnomathematics learning challenges oriented to local culture for students who experience difficulties in geometric construction (Verner et al., 2013), the use of real-world situations in the context of students' culture used in learning scenarios to increase students' sense of connectedness to the material (Sumirattana et al., 2017), the use of joint interrogation methodology towards various cultural perspectives as approaches to implementing different educational practices (Adam, 2010). Additionally, other topics include research on teachers' views on the importance of incorporating cultural experiences and students' daily lives into geometry teaching (Sunzuma & Maharaj, 2021), exploring the mathematical practices of the Cigugur indigenous people in Indonesia, especially related to with their habits in determining the best time to start house building activities (Umbara et al., 2021), ethnomathematical exploration of the traditional game of marbles (Akintunde et al., 2019), development of interactive multimedia learning media for traditional cooking utensils (Faqih et al., 2021). This research study takes a different cultural context from previous studies. Current study is devoted to the use of artifacts and traditions in remote areas, especially in Purworejo Regency, Central Java. Remote areas were chosen because they usually have limitations in providing learning resources, especially information technology-based (Dubey & Pandey, 2020). With these limitations, there is significant potential to use local artifacts and culture as a source of study for residents or students.

In principle, every region has cultural diversity, including even areas that are considered remote. Educational challenges in remote areas include limited resources and infrastructure,

teacher shortages and qualifications, student achievement gaps, linguistic diversity, lack of policy implementation, coverage, and quality of education, and limited leadership development (Ledger et al., 2021). Managing and developing schools in remote areas is a difficult and challenging task due to demographic challenges, infrastructure limitations, and economic conditions that hinder children from receiving proper educational services, resulting in low motivation for learnin (Juharyanto et al., 2020). However, this does not mean that improving the quality of learning cannot be done in remote areas. This condition actually provides a great opportunity to provide education by optimizing regional potential. Community-based professional development, increasing teacher knowledge about active student learning, and reducing dependence on external resources can contribute to improving the quality of learning in remote areas in Indonesia (Harjanto et al., 2018). This solution can be answered by linking local culture to mathematical content. Linking cultural content will increase community participation, encourage children to learn actively with contextual material in their blood, and be an answer to the lack of learning facilities in the area. Therefore, local artifacts and culture have significant potential to address the challenge of enhancing the quality of education in remote regions. The problem here is how to integrate cultural context with mathematics learning. This is in line with the view that careful reflection is needed regarding appropriate ways to develop mathematical literacy in schools and appropriate ways to integrate contextual issues (local culture) into mathematics teaching (Kolar & Hodnik, 2021).

Cultural integration in mathematics learning, as in previous studies, has been widely carried out but has not been widely practiced in classrooms. This occurs due to a lack of understanding of how to integrate this culture into the learning process. Referring to several things above, it is worth asking about the important role of teachers or prospective teachers in developing learning plans based on local culture in remote areas to increase students' mathematical literacy. Understanding the cultural context will enable teachers to be able to develop learning materials that integrate cultural elements, such as folklore, traditions or local practices, traditional games or local artifacts into mathematics learning. Of course it would be interesting to see how this planning can help students feel connected to mathematical examples that are relevant to everyday life in these remote areas. Thus, not only does it increase their mathematical literacy, but students also feel that mathematics has strong relevance to their lives in these remote areas. Based on this idea, the question is asked, how can the integration of cultural artifacts from remote areas in preparing mathematics learning plans increase mathematical literacy in student teachers?

2. Method

2.1. Research Design

A qualitative approach was chosen because it aligns with the objectives of this research, which aims to investigate the knowledge of prospective teachers in designing mathematics lesson plans based on local artifacts and culture in remote areas. Prospective mathematics teachers need to receive training to be able to identify and explore local wisdom that can be integrated into learning design. Apart from that, this research practice also involves accompanying teachers, so that local wisdom in the form of local artifacts and traditions can be discovered more optimally. This allows the learning plans created to be immediately implemented in the classroom learning process. Thus, this approach not only enhances the role of prospective teachers, but also ensures that local resources are utilized effectively in the learning context.

2.2. Research Subject

In this research, two local residents who are respected as cultural figures and local traditional figures were involved to provide philosophical views regarding local cultural artifacts and traditions which will be explored as a basis for developing learning plans. In addition, in accordance with the research objectives, we also involved prospective mathematics teachers and accompanying teachers who played an important role in the learning plan development process. It

is important to note that this research has received permission from local authorities in Bagelen and Kaligesing Districts, Purworejo Regency, Central Java, Indonesia.

2.3. Data Collection

Exploration of local wisdom is carried out through observations and interviews with indigenous communities as the main source of information. In particular, views are taken from individuals who are considered cultural figures and traditional leaders, with the aim of exploring traditional knowledge that can be used as a basis for designing learning. The data collected will be used in designing a Mathematics Learning Plan.

Data was collected from indigenous communities who live in Bagelen and Kaligesing Districts, Purworejo Regency, Central Java, Indonesia. This area is located in the highlands and has many historical remains dating back to the Java War (1825-1830). The artifacts found and used in this study are the house of WR Supratman (composer of the song Indonesia Raya, the national song of the Republic of Indonesia), the Santren Bagelen mosque (built in 1631 with traditional Javanese architecture), and the Jolenan Somongari Tradition in Kaligesing District (a tradition of expressing gratitude on agricultural products).

In the data collection process, a series of observation and interview activities were carried out which focused on identifying and documenting artifacts and the community's daily activities. We made observations by observing and taking photos of relevant artifacts as a form of documentation. Simultaneously, we observe the daily activities conducted by the residents. Interviews were conducted to understand more deeply about the activities and objects used by residents. Each interview session lasts approximately 30 minutes and is conducted daily for seven consecutive days.

In an effort to ensure the quality and accuracy of the data collected, data collection also involved prospective mathematics teachers and accompanying teachers as research assistants. They play a role in documenting interviews and observed activities, as well as taking photos and measuring artifacts that are the focus of research. The knowledge they gain during this process is not only used to develop mathematics learning plans, but also becomes an important ingredient in the learning design that is designed. With this collaboration, to ensure that the data collected truly describes local wisdom that will be used in the context of mathematics education.

2.4. Data Analysis

Qualitative procedures are employed in data analysis to generate mathematical interpretations and values within the context of local wisdom. This analysis is also closely related to the concept of the relationship between local artifacts and mathematics curriculum content. The results of this analysis form the basis for developing relevant mathematics lesson plans. Prospective teachers actively participated in the data analysis process, engaging in discussions related to indigenous artifacts and their connection to mathematical concepts, as well as contributing to the design of lesson plans. In other words, this data analysis is a collaboration involving indigenous communities in developing mathematics education that is appropriate to the local context.

3. Results

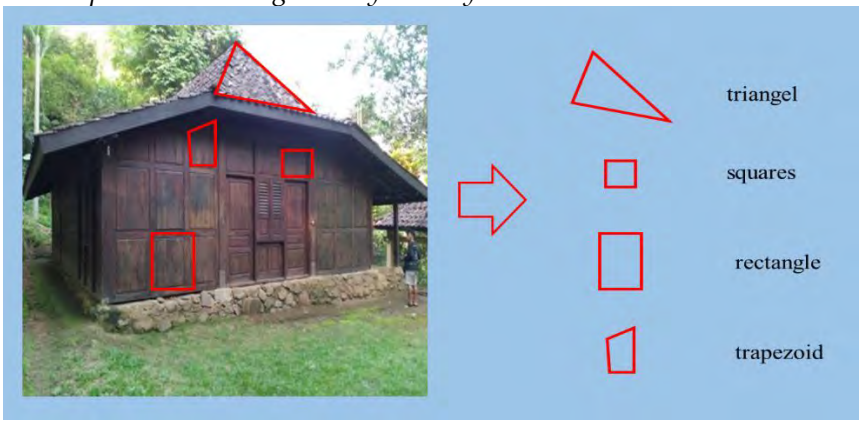
3.1. Artifacts and Cultural Traditions of Remote Areas linked to Mathematics

Increasing mathematical literacy is carried out through ethnomathematics studies by exploring local artifacts and traditions that are integrated into mathematics learning. Identification of artifacts and local wisdom traditions is explored with the help of local traditional leaders. Sequentially, exploration was carried out on WR Supratman's birthplace (in the areas of Trembeleng, Somongari, Kaligesing, Purworejo, Central Java), the Bagelen Islamic Boarding School Mosque, and the Jolenan Somongari Tradition. The mathematical content that you want to explore is geometry.

The house where WR Supratman was born is dominated by the appearance of wooden planks on the walls, doors and windows. The roof uses clay tiles with typical Javanese architecture (limasan). According to local figures, based on the results of interviews in Javanese, it is explained: *Sanajan wis ana pemugaran, omah iki tetep njaga wujud asline awujud limasan kanthi lantai sing isih digawe saka lempung. Omah sederhana sanga meter persegi iki kaperang dadi telung perangan, yaiku senthong (kamar) ukurane 3 x 7 meter papan lair Wage cilik, ruang tamu lan pawon (dapur)* [Even though restoration has been carried out, this house still maintains its original form in the form of a five-story building with floors still made of clay. This simple house covering an area of nine square meters is divided into three parts, namely senthong (room) measuring 3 × 7 meters where little WR Supratman was born, living room and kitche].

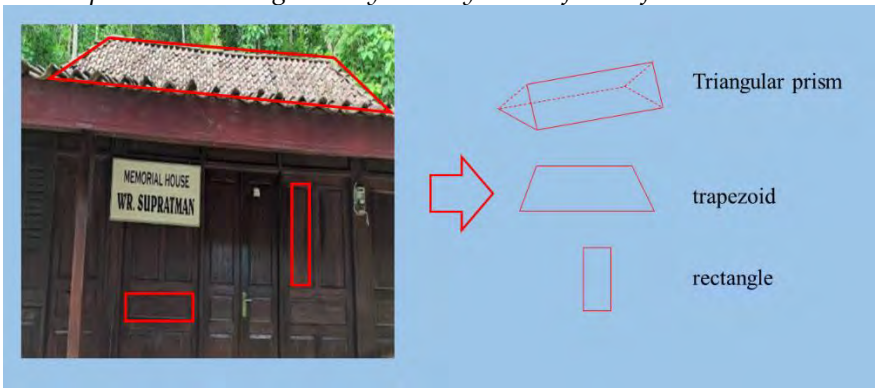
Mathematical literacy skills in the exploration activities of WR Supratman's house include the ability to analyze traditional house artifacts that reflect geometric aspects. Identification of geometric elements in the artifact, such as patterns, shapes, and structures. Observations were made on each side of the house which highlighted geometric aspects. An exploration of the geometry of a traditional house on the outer wall is shown in Figure 1. On the wall, sections appear that display geometric shapes such as rectangles, squares, and trapezoids. In this way, traditional house construction can be linked to geometric concepts.

Figure 1
WR Supratman house geometry literacy on the outer side walls



Further exploration of the front side of the house can also identify geometric shapes on the front wall and the shape of the roof which are shown in Figure 2. The front wall displays a predominantly rectangular shape, and the roof displays a trapezoidal shape. Further exploration shows that the shape of the roof of the house also shows a triangular pyramid shape.

Figure 2
WR Supratman house geometry literacy on the front of the house



Improving mathematical literacy skills can be done by identifying the shape of local artifacts whose structure corresponds to geometric concepts. The relationship between WR Supratman artifacts and geometric studies for mathematics learning is shown in Table 1. In the learning

process, geometric concepts can be introduced with house artifacts displayed on the wall structure and roof of the house. Furthermore, learning can be further developed for problem solving activities, including: 1) calculating the area or perimeter of walls, 2) calculating the area of the roof, 3) calculating the number of roof tiles needed, 4) enriching critical thinking by evaluating whether the information from the resource person is relevant. the area of the house is true or not. In this way, the mathematical literacy process of geometric shapes from WR Supratman's house can be developed further into the concepts of flat area and arithmetic. Apart from that, it can also encourage critical thinking.

Table 1
Artifacts structure, form, and mathematical materials from WR Supratman's house

No	*Artifacts structure*	*Mathematical Form*	*Mathematical Materials*
1	Wall	Trapezoid, rectangle, square	a. Quadrilateral concept b. Math problems c. Area and perimeter problems
2	Roof	Trapezoid	a. Quadrilateral concept b. Math problems c. Area and perimeter problems
3	Roof	Triangular prism	a. Three-dimensional space concept b. Math problems c. Volume and surface area problems
4	Floor	Rectangle	a. Quadrilateral concept b. Math problems c. Area and perimeter problems d. Arithmatics

Mathematical literacy is then displayed in cultural artifacts in the form of the SANTREN mosque in Bagelen Purworejo District. This mosque is included as a Cultural Heritage because it is very old (built in 1631). According to figures there, this mosque was architected by Kasan Muhammad Shuufi, as a messenger from the wife of the King of Mataram, Sultan Agung (1613-1645). The mosque was dedicated to Kiai Baidowi for his services in helping Mataram fight the Dutch. Presentation of traditional figures in Javanese: "*Masjid Santren Bagelen iku digawe nganggo "arsitektur" carane tradisional Jawa, yaiku wangunan omah kang awujud empyak tajuk tumpuk siji Manawa kayune padha karo kang ono ing Masjid Menara Kudus lan mesjid Kajoran Klaten, mula bisa dikira Manawa wangunan kabeh saka jaman kang bebarengan*" [The Bagelen SANTREN Mosque was built using traditional Javanese "architecture", namely building houses in the form of stacked roofs].

Exploration of geometric shapes was carried out on the front of the mosque as shown in Figure 3. The notable feature of the Santren Mosque is the shape of the roof with a 3-level or layered structure. This is a characteristic of Islamic-style buildings that are still strong in Hindu culture. The three levels of the roof are interpreted as Iman, Islam and Ihsan as the pillars of the Islamic religion. The roofs on the first and second levels are trapezoidal, and the third level is triangular. On the outer wall there is a large window which is a flat, rectangular shape with curved sides.

The literacy of geometric shapes in this mosque building is not much different from that found in WR Supratman's house. The striking difference is the flat rectangular shape with one curved side which is found in the front window of the SANTREN mosque. This shape can enrich students' geometric literacy that geometric shapes do not only have straight sides but can also have curved sides. A flat shape with curved sides can be seen as a combination of a square and a semicircle whose diameter is the same as the side of the square.

The presentation of literacy on geometric shapes at "SANTREN mosques" in mathematics learning is shown in Table 3. As a form of enrichment, learning can also be designed to include: 1) calculating the area or perimeter of walls, 2) calculating the area of the roof, 3) calculating the number of roof tiles needed, 4) Calculate the ratio of tile area at each roof level. In this way, the

process of mathematizing the geometric shapes of Islamic boarding school mosques can be developed further in the concepts of area, congruence, and arithmetic. Apart from that, it can also encourage problem solving activities.

Figure 3
Geometric Literacy of "SANTREN Mosque" on the Front

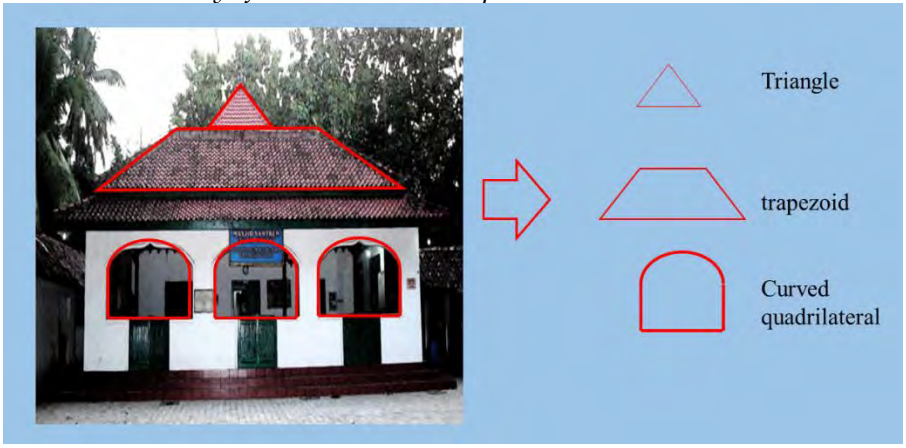


Table 2
Artifact Structure, form, and mathematical material from the bagelen santren mosque

No	*Artifacts structure*	*Mathematical Form*	*Mathematical Materials*
1	Windows	Curved-sided quadrilateral	a. Curved-sided Quadrilateral b. Math problems c. Area and perimeter problems
2	Roof	Triangle, Trapezoid	a. Quadrilateral concept b. Math problems c. Area and perimeter problems d. Arithmatics

Jolenan Somongari is a unique cultural tradition in Kaligesing Purworejo District. Because it only exists in Somongari, this unique tradition was designated as one of Indonesia's intangible cultural heritage by the Indonesian Ministry of Education and Culture in 2016. This tradition is carried out as a form of gratitude for the abundance of produce from the local community. As a form of tradition, many migrants return home to celebrate Jolenan. *Jolen* is a container or place to place tumpeng and roast chicken. *Jolen* itself is a kind of basket with a four-square base and a pyramid-shaped lid. *Ledre* and *Binggel* are tied and hung from the end of a piece of bamboo, stuck around the decorated *Jolen*. Contains the intention of embodying or depicting that the Somongari mountain area is rich in agricultural products, both from the forest and others. In the ceremony, the *jolen*s (the number can reach forty jolen) are paraded around the village. The line was also joined by local residents wearing traditional clothing. There are also those who wear dancer clothes. *Jolen* was escorted by *Bregada* (the name for Mataram era war soldiers) who lined up behind *Jolen*.

Jolen is a rectangular pyramid-shaped container, as shown in Figure 4. The *Jolen* can be used as a model for building a pyramid-shaped space. The pyramid shown in *Jolen* can be identified as a rectangular pyramid with a square base. Identification of geometric shapes in Jolen can be used for learning geometry, shown in Table 3. Jolen shapes can increase students' geometric literacy as a representation of pyramids in everyday contexts (local traditions). The Jolen appearance given by Ledre and Binggel on the outside can also be further developed for problem solving activities. Furthermore, the use of Jolen does not only stop at measuring volume or surface area but can also be developed to calculate the number of ledres and bingels, and other mathematical problems.

Figure 4
Geomeric Literacy in the Jolenan Somongari Tradition

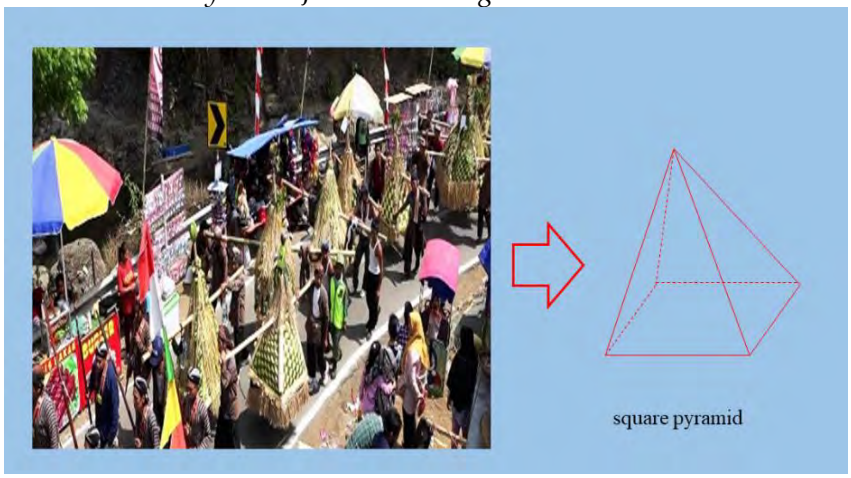


Table 3
Artifacts structure, form, and mathematical materials from Jolenan somongari tradition

No	*Artifacts structure*	*Mathematical Form*	*Mathematical Materials*
1	Jolen	Square Pyramids	a. Three-dimensional space concept b. Math problems c. Volume and surface area problems

3.2. Developing Learning Plans based on Cultural Artifacts and Traditions in Remote Areas

The results of cultural studies at WR Supratman's house, the Santren Mosque, and Jolenan Somongari can be used to improve students' mathematical literacy, especially in the introduction of geometric shapes. Indirectly, ethnomathematics studies on traditional artifacts and community traditions can be used as a learning resource. The context of authentic material contained in local cultural artifacts and traditions has great potential to be developed into interesting, fun and meaningful mathematics learning activities. This learning plan is prepared jointly between prospective teachers and accompanying teachers.

Preparation of learning plans that are aligned with the syllabus, learning objectives and specified learning achievement indicators. This is done with the aim that the learning plan can be implemented in learning according to the current curriculum. The learning objectives to be achieved are: 1) Understand basic geometric concepts, 2) Apply basic geometric concepts in everyday life, and 3) Develop geometric problem solving abilities. This learning plan is prepared by looking at the components of the type of artifact, the material that can be taught, the mathematical activities contained therein, as well as the learning activities that can be implemented in the classroom.

In Table 4, the achievement of learning objectives to introduce basic geometric concepts was carried out through artifact exploration activities. Student learning activities are carried out by exploring artifacts and looking for geometric representations that appear from each of these cultural heritages. Students will create geometric representations, whether squares, rectangles, trapezoids, or triangles from the views they find. In this way, students not only get to know rectangular areas abstractly but also get to know them in the cultural context they encounter. Students are also encouraged to make presentations to get feedback on the results of their exploration as well as to inform the results of their observations.

In Table 5, students explore the size of the walls, floor, and building structures of the specified artifacts. This activity can encourage students to involve geometric concepts in the context of everyday life. Activities can be developed to determine the size of the roof, floor, area of each room

Table 4
Lesson Plan for learning objectives: understand the basic concepts of geometry

No	*Artifacts*	*Materials*	*Mathematical Activities*	*Student's Learning Activities*
1	WR Supratman's house	Quadrilateral	Exploration of contextual problems from WR Supratman's house 	Students observed and explored WR Supratman's house, both walls and roof. It is also possible for students to talk about the history of the house.
			Identify the geometric shapes in the house, both on the walls and roof of the house	Students (both individuals and groups) identify and group geometric shapes that appear on the walls and roofs of houses.
			Geometric representation	Students create a geometric representation of the appearance of the explored artifact and present it.
2	Santren Mosque	Quadrilateral and Curved-sided quadrilateral	Exploration of contextual problems from Santren Mosque 	Students observed and explored Santren Mosque. It is also possible for students to talk about the history of the mosque.
			Identify the geometric shapes in the mosque: the front walls and roof	Students (both individuals and groups) identify and group geometric shapes that appear on the walls and roofs of houses.
			Geometric representation	Students create a geometric representation of the appearance of the artifact being explored and present it

Table 5
Lesson Plan for learning objectives: Apply basic geometric concepts in everyday life

No	*Artifacts*	*Materials*	*Mathematical Activities*	*Student's Learning Activities*
1	WR Supratman's house	Quadrilateral	Solve the problem of calculating the area of one side of the house wall	Students make measurements or estimates regarding the area of one of the walls of the house by determining the size of the sides of the wall or estimating it by adding up all the geometric shapes on the walls of the house.
			Calculate the area of the house	Students determine the size of the house and calculate the perimeter and area based on the dimensions they have obtained
2	Santren Mosque	Curved-sided quadrilateral	Determine the perimeter of the window	Students identify the shape of the mosque window (a rectangular, curved side). Students determine the size of the rectangular side and the diameter of the curved side. Students create an equation to measure the circumference of all windows
3	Jolen Somongari	Pyramid Square	Calculate volume and surface area 	Students determine the dimensions of the base, hypotenuse, and height of Jolen. Students determine the volume and surface area from the measurements they have obtained. Students compare the volume ratios of one Jolen with another

and others. In the Jolen tradition, students can determine the size of the Jolen to calculate its volume and surface area. In these activities, students are exposed to everyday contexts that incorporate mathematical concepts.

Table 6 shows problem-solving learning activities that involve cultural artifacts and traditions so that they become more contextual and relevant. This activity allows students to experience how mathematics is closely linked to their cultural realities. For example, using house roof artifacts, students are invited to solve geometry problems along with arithmetic, namely calculating the costs incurred to buy roof tiles. Apart from that, students are also encouraged to determine the sequence pattern of Ledre and Binggel. These activities can directly encourage creativity, critical thinking, and a deeper understanding of mathematical concepts while respecting the richness of their own culture.

Table 6
Lesson Plan for learning objectives: Develop geometric problem solving abilities

No	*Artifacts*	*Mathematical Activities*	*Student's Learning Activities*
1	WR Supratman's house	Make an estimate of the number of tiles to cover the roof of the house	Students determine the geometric shape of the roof of the house. Students determine the size of each side of the flat shape that forms the roof of the house. Students determine the area of 1 tile. Students estimate the number of tiles needed by dividing the roof area by the area of 1 tile. This activity can be enriched by determining the total price required if the price of 1 tile is known.
		Critical thinking	Students compare the land area information on the house according to the resource information by determining the actual size of the house.
2	Jolen Somongari	Number sequences	Determine the number sequence pattern formed from the many *ledres* and *binggels* attached to *Jolen*

The learning activities presented in this lesson plan gradually encourage students to learn actively through artifact exploration activities, identifying geometric concepts displayed in artifacts and local traditions, connecting local artifacts and traditions with mathematical concepts, developing mathematical material (calculating the area and perimeter of shapes flat and calculating the volume and surface area of geometric figures), and encouraging students in mathematical problem solving activities.

Mathematical problem-solving activities can be linked to several other concepts such as arithmetic. For example, in the case of calculating the purchase price of roof tiles to cover the entire roof. Students need to understand the concept of the total area of a roof, compare it with the area of 1 roof tile, then calculate it with the unit price of the tile. When calculating the number of ledere and bingel, students can also determine the number in the first row (1st term), the second row (2nd term), and so on. Indirectly, students can see the connection between mathematical concepts.

Some of the studies carried out above can be used to improve mathematical literacy, especially geometry. Geometric literacy in the ethnomathematical context of local artifacts and traditions can help students demonstrate by connecting mathematical understanding with local culture and heritage. This not only enriches our understanding of mathematics, but also honors and celebrates the contributions of diverse cultures in the development of mathematical knowledge. Several aspects related to geometric literacy in the ethnomathematics study of local artifacts and traditions: 1) Introduction to the concept of Geometry in Artifacts: Geometric literacy includes the ability to recognize geometric shapes that may be contained in cultural artifacts, such as geometric patterns,

symmetry, or geometric constructions in traditional fine arts or textile design, and 2) Use of Geometric Concepts: This includes the ability to apply geometric concepts, such as size, comparison, and spatial relationships in local artifacts and traditions.

4. Discussion

Sustainable education in remote areas depends on teachers' creative abilities in designing Learning Implementation Plans [RPP], including utilizing artifacts from indigenous communities. Lesson planning is considered important for teachers to ensure effective teaching and to achieve meaningful learning (Hammer & Ufer, 2023). Therefore, preparing a learning plan is very urgent to achieve the set learning objectives. Preparing learning plans by integrating cultural context has the potential to introduce culture and mathematical concepts at the same time. The use of these artifacts should be an integral part of mathematics learning materials because incorporating objects that students recognize, such as authentic artifacts, can foster an appreciation for their culture and render mathematics learning more relevant to the cultural context. This aligns with the notion that creating an effective learning plan must involve the utilization of pertinent knowledge, an understanding of students' needs, and reflection on the teaching and learning process (Beckmann & Ehmke, 2023), tailored to students' needs and circumstances. Exploring the meaning of indigenous artifacts also holds the potential to establish connections between culture and mathematics. Therefore, it is important for teachers or prospective teachers to have a strong understanding of these artifacts and be involved in developing lesson plans that take into account the environment known to students.

In addition, the involvement of prospective teachers in expressing their culture becomes essential, as they can incorporate these cultural elements into their lesson plans and thereby facilitate meaningful mathematics learning for students. Not only the integration of culture into mathematics, but much more important is facilitating the mathematization process with its cultural context. The process of mathematization is an important process in the integration of culture with mathematics so as to enable the application of mathematical concepts and principles to real world situations, including local artifacts and traditions (Cimen, 2014). Therefore, prospective teachers must be trained to design lesson plans by considering the environmental context familiar to their students. This also requires them to be adaptive, creative, and innovative in educational contexts in remote areas.

To address this challenge, this study engages prospective teachers as assistants in various activities, including interviews, observations, and measurements. They are also invited to participate in discussions about how to interpret the mathematical value of artifacts and how these artifacts can be used in designing lesson plans. The experience of prospective teachers developing learning plans based on local culture will genuinely assist students in recognizing the link between their own culture and mathematics. This will enhance students' comprehension and involvement in mathematics, provide them with a sense of belonging to their cultural identity, motivate students to explore their own culture and the cultures of others while also studying mathematics (d'Entremont, 2015). This context underlines the importance of integrating local wisdom in mathematics learning for trained and prospective teachers, which should be part of an ethnomathematics-based education curriculum.

In the future, challenges may arise in efforts to explore mathematical knowledge in the cultural contexts of different regions. This also encourages the importance of recognizing the value of the perspective of cultural variations in mathematics learning. Interpreting mathematical values in the context of indigenous knowledge requires certain skills, but provides significant benefits in more meaningful learning. Moreover, it enables a learning approach that is more suited to the context with which students are familiar.

5. Conclusion

The conclusion of this study, this approach shows that artifacts found in remote areas can be adopted in mathematics lesson plans and can help connect mathematics with students' culture, as well as increase the meaning of mathematics learning. Therefore, it is important for prospective teachers to prepare their learning materials by considering the cultural context known to their students, and to be adaptive, creative, and innovative in education in remote areas in order to achieve sustainable education.

Integration of local culture in mathematics learning will provide additional meaning to the learning process. Students can see how mathematics has direct relevance to their culture and everyday lives. This can increase students' interest and motivation in understanding mathematics which is often considered difficult. Thus, it is important for prospective teachers to prepare their teaching materials by considering the cultural context familiar to their students. This requires creativity and adaptability in designing lesson plans that suit students' cultural richness. Cultural integration can also be considered a form of creativity and innovation in learning resources amidst the limitations that exist in remote areas through creating relevant and meaningful learning experiences for students in their environment. The main thing from these findings is making local culture-based learning not just a temporary trend, but part of ongoing efforts to provide relevant and meaningful education in remote areas. It also includes preserving local culture in an educational context.

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