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EXPLORING JEPARA WOODCARVING ART AS AN ALTERNATIVE FOR CULTURE-BASED MATHEMATICS LEARNING

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Abstract: Culturally-based mathematics learning becomes an important alternative to overcome students' learning difficulties. One relevant cultural product is Jepara Carving Art, which contains geometric concepts as part of ethnomathematics. This study aims to describe the mathematical concepts embedded in Jepara carving art and implement them as an alternative culturally-based mathematics learning method. Using a qualitative approach, data were collected through interviews, observations, and field notes, with the research subjects being Jepara carving artisans. The results show that the mathematical concepts integrated into Jepara carving art include points, lines, angles, slopes (gradients), plane geometry, circles, solid geometry, congruence, and geometric transformations such as reflection and rotation. Additionally, the ethnomathematics of Jepara carving art can be implemented as an alternative culturally-based mathematics learning method, where several ethnomathematical activities relate to school mathematics materials. These findings emphasize the importance of linking local culture with mathematics learning to enhance students' understanding. Therefore, this study recommends the inclusion of Jepara carving art in the curriculum as an effective strategy for culturally-based mathematics learning.

Keywords: Ethnomathematics, Jepara woodcarving art, mathematics learning

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INTRODUCTION

Indonesia is a country rich in artistic and cultural diversity, resulting from the interaction between various ethnic groups, races, and religions (Rohman & Jarudin, 2024). Each region in Indonesia has a unique culture that characterizes its respective community. According to Collins (2019), this diversity creates a strong identity for each region. One area famous for its cultural wealth is Jepara Regency, widely known as a center for carving arts. This regency has many carving centers and is the leading producer

of wood carvings in Indonesia, earning recognition as the "City of Carving," highlighting its position in Indonesian history and culture (Amala & Gafur, 2020; Amri *et al*., 2022; Ariyanto, Wakit, & Tamrin, 2023; Ulwiyyah, 2023).

The existence of Jepara carving arts both domestically and internationally is significantly influenced by the active contributions of the community and local government. The formation and preservation of this carving art have a long history that began in the 16th century AD, specifically during the reign of Queen Kalinyamat. To beautify the Mantingan Mosque and Jirat Tomb, Queen Kalinyamat enlisted the help of the royal minister, Sungging Badarduwung, to create artistic carvings. According to Aminah & Syamsuri (2022), this initiative not only marked the beginning of the development of carving arts in Jepara but also sparked a tradition of carving that has been passed down through generations. This skill continued to evolve, becoming an integral part of Jepara's culture, and transformed the Kartini era into the modern era (Alamsyah & Laksono, 2019; Indrayani *et al*., 2022).

Culture is a complex entity that includes various elements, such as beliefs, knowledge, arts, morals, laws, customs, skills, and habits embraced by a community group (Causadias, 2020; Liew, Chung, & Lam, 2022; Makhmudova, 2022). In the context of education, cultural development in Indonesia significantly contributes to various aspects of community life. As stated by Eden, Chisom, & Adeniyi (2024), education must reflect cultural diversity. To achieve educational goals, educators, particularly teachers, are required to seek learning alternatives that can facilitate students in understanding the taught material. To achieve this goal, teachers need to build new schemes that can link formal mathematics material with informal mathematics contexts existing in the community (Fernandes *et al*., 2020; Bilir & Aydin, 2022; Susanta, Koto, & Susanto, 2022). The culture inherent in students' backgrounds becomes a crucial consideration in selecting learning alternatives, as students live daily in a cultural environment that shapes their thinking and understanding (Aryal, 2022; Belaid, 2023; Razzaq & Shahid, 2024).

Mathematics learning is often regarded as a difficult process, where students frequently experience various difficulties in understanding complex material. According to Iddrisu *et al*. (2023), difficulties in mathematics can hinder students' academic development. These difficulties have different characteristics compared to challenges in other subjects, and research shows that the complexity of mathematics material can make it difficult for students to understand (Lumbantoruan & Uly, 2022; Lumbantoruan, 2023). Therefore, teachers need to design mathematics learning in such a way that students can learn optimally and achieve deep understanding (Gravier & Ouvrier-Buffet, 2022). One

solution that is increasingly being implemented is culturally-based mathematics learning, known as ethnomathematics. Ethnomathematics is defined as the application of mathematical concepts in specific cultural contexts, encompassing various community activities in daily life (Nst & Batubara, 2024; D'Ambrosio, 1985; Gerdes, 1994; Muhtadi *et al*., 2017).

The application of ethnomathematics in mathematics education in schools has become highly relevant, especially considering the diversity of ethnicities and cultures in Indonesia. Each ethnic group has its way of solving problems encountered in daily life (Bano & Ara, 2023). This approach aligns with the view that the human ability to recognize patterns and solve problems is the essence of mathematics itself (Utami *et al*., 2020). Additionally, linking learning materials to local cultural contexts can enhance students' motivation and engagement (Ilmiyah *et al*., 2022; Akbar, Herman, & Suryadi, 2023). Therefore, culture-based mathematics education is expected to connect the taught material with real-life applications for students, enabling them to better understand and relate mathematical concepts to everyday experiences.

One concrete implementation of culture-based mathematics education is the integration of mathematics materials with Jepara carving art. The acculturation between mathematics and carving art can be achieved through the utilization of geometric concepts found in Jepara carvings. Geometry, as one of the core subjects in mathematics, is closely related to measurement and the principles of form (Jablonski & Ludwig, 2023). In the process of carving, the act of engraving is a concrete example of the application of geometric principles, including the depiction of shapes and proportions. According to Aminah & Syamsuri (2022), the integration of geometry in carving art not only enriches students' learning experiences but also provides them with a deeper understanding of the application of mathematics in life.

The application of mathematical concepts in life presented in ethnomathematics plays an important role in supporting students' understanding of the material taught. When mathematics materials are connected to real-life applications, what initially seems abstract becomes more concrete and easier to understand (Hendriyanto *et al*., 2023; Pajrin, Pujiastuti, & Sugiman, 2023; Alghar, 2024). By considering cultural contexts in the application of ethnomathematics, mathematics education can become more meaningful and relevant for students. As stated by D'Ambrosio (1985), ethnomathematics provides the necessary context for better understanding. Thus, ethnomathematics makes a significant contribution to the field of education, particularly in mathematics education.

However, the existence of ethnomathematics is often unrecognized by many parties. Students frequently encounter difficulties in learning mathematics, mainly because the material taught feels disconnected from the context of daily life (Baidoo & Ali, 2023; Akperov & Yessenkeldy, 2023; Jacinto, Towers, & Martin, 2024). This paradigm creates the impression that mathematics has no connection to culture and daily activities. In reality, every human activity always involves elements of mathematics. As explained by Rani *et al.* (2023), mathematics is an inseparable part of everyday life. Therefore, this article aims to discuss in-depth the mathematical concepts contained in Jepara carving art, as a cultural heritage still preserved in the community, and explore how the implementation of these concepts can be applied in mathematics education in schools.

METHOD

This study aims to describe the mathematical concepts embedded in Jepara carving art and its implementation in mathematics education in schools. The method used in this study is qualitative research, where the researcher acts as the primary instrument in collecting and analyzing data to gain a deep understanding of the social and cultural context relevant to the research object (Lahiri, 2023). The approach applied is an ethnographic approach, involving direct observation of Jepara carving craftsmen, semi-structured interviews with them, and the collection of field notes focused on activities and mathematical concepts in Jepara carving art (Abramson, 2021; Risku *et al.*, 2022; Snodgrass *et al.*, 2023).

Data in this study were obtained from Jepara carving craftsmen, who are the primary sources of information. Data collection techniques include semi-structured interviews, non-participatory observations, and field note-taking, with the researcher actively involved as the data collection instrument (Salmia, 2023). The collected data were then analyzed through steps including data reduction to summarize interview results and categorize information into categories related to activities and mathematical concepts in Jepara carving art relevant to school mathematics education. Data reduction allows researchers to identify patterns and themes that emerge from the data (AlKarawi & AlJanabi, 2022).

Furthermore, data presentation is done in the form of descriptions and diagrams to clarify the relationship between these activities and mathematical concepts with school mathematics material. This systematic data presentation is important to provide a clear and structured picture (Ardiansyah, 2024). Finally, this study produces conclusions

describing the implementation of ethnomathematics in Jepara carving art as a mapping of mathematics material that can be effectively applied in the context of mathematics education in schools. Thus, this study is expected to contribute to the development of more relevant and contextual culture-based mathematics learning strategies (Wulandari *et al*., 2024).

RESULTS AND DISCUSSION

Mathematical Concepts in Jepara Carving Art

Based on interview data, researchers categorized mathematical elements in Jepara carving art, encompassing activities and mathematical concepts. These categories were identified through keywords from the informants' statements. To facilitate categorization, researchers used coding. According to Taylor (2023), coding helps organize data and identify main themes. Williams & Moser (2019) added that coding breaks down complex data into simpler, more meaningful units. With this method, researchers gained an in-depth understanding of the application of mathematical concepts in Jepara carving art (Brailas, Tragou, & Papachristopoulos, 2023).

Table 1. Categorization of Mathematical Elements in Jepara Wood Carving Based on Interview Results

No.	Category of Mathematical Elements	Aspects	Code
1.	Counting	Counting	A1
2.	Locating	Locating Placing objects	A2
3.	Measuring	Measuring Estimating	A3
4.	Designing	Drawing Designing Imagining	A4
5.	Playing	Planning Setting strategies Executing procedures	A5
6.	Explaining	Explaining	A6
7.	Concepts of Point and Line	Point Line	K1
8.	Concepts of Angle and Slope	Angle Slope	K2
9.	Plane Geometry	Rectangle Triangle	K3
10.	Circle	Circle	K4
11.	Solid Geometry	Cuboid	K5
12.	Congruence	Congruent	K6
13.	Transformational Geometry	Reflection Rotation Translation	K7

Based on the coding in Tabel 1 adjusted with the results of the interviews, two groups of mathematical elements in Jepara carving art were identified. The first group is the category of mathematical activities, which consists of several subcategories: (1) counting with aspects of counting, (2) locating with aspects of locating and placing objects, (3) measuring with aspects of measuring and estimating, (4) designing with aspects of drawing, designing, and imagining, (5) playing with aspects of planning, strategy, and procedure, and (6) explaining with aspects of explaining. Based on this categorization, a chart of mathematical activity categories in Jepara carving art is obtained as in Figure 1.

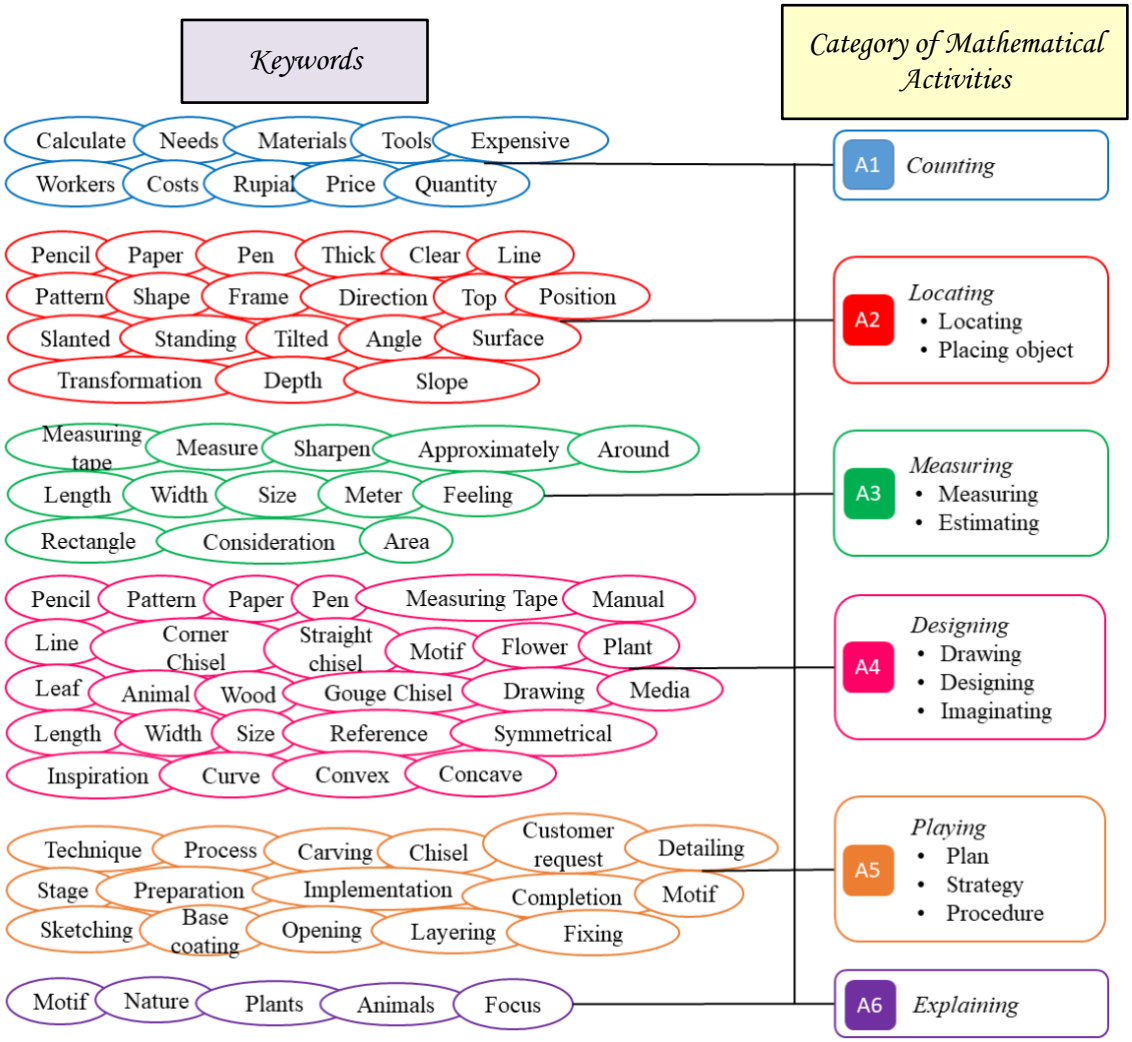


Figure 1. Diagram of keywords and categories of mathematical activities in Jepara woodcarving art

The second group is the category of mathematical concepts which consists of several subcategories: (1) points and lines, (2) angles and slopes, (3) plane geometry with aspects of quadrilaterals and triangles, (4) circles, (5) solid geometry with aspects of blocks, (6) congruence, and (7) transformation geometry with aspects of reflection,

rotation, and translation. Based on this categorization, the following diagram of the categorization of mathematical concepts in Jepara carving art is obtained as in Figure 2.

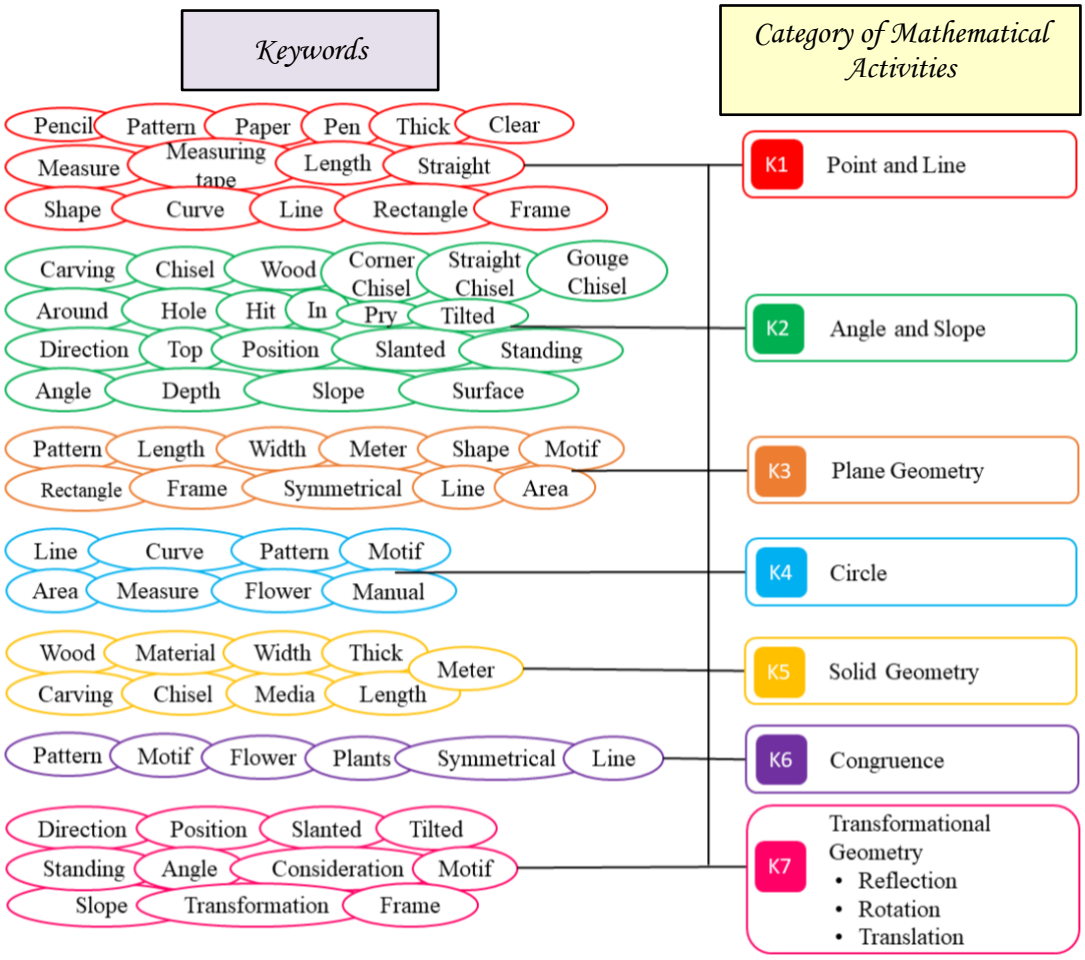


Figure 2. Diagram of keywords and categories of mathematical activities in Jepara woodcarving art

Based on the exploration of Jepara carving art that has been conducted, it was found that several school mathematics concepts are integrated into the process of making and the final products of Jepara carvings. This is in line with the research by Utami *et al.* (2021) which shows that mathematical elements are integrated into the mindset and carving processes performed by artisans. The activities involved include counting, locating, measuring, designing, playing, and explaining. The concepts that emerge include points, lines, angles, slopes, plane geometry, circles, solid geometry, congruence, and transformational geometry (Kencanawaty & Irawan, 2017; Salma, Fevironika, & Zuliana, 2022; Aminah & Syamsuri, 2022).

The process of making Jepara carvings requires a deep understanding of proportion and symmetry, which are important parts of geometry. According to Kerscher, Franco & Flores (2023), geometry is not only limited to theory but is also applied in everyday practice, including in art. School mathematics concepts in the process of

creating Jepara carving art refer to the mathematical ideas or notions embedded in the artisans' thinking during the creation stages. According to D'Ambrosio (1985), understanding ethnomathematics is very important to connect culture with mathematics learning. This shows that artisans often unconsciously use mathematical principles in their daily activities.

Moreover, the mathematical concepts in the final products of Jepara carvings refer to the mathematical topics or materials contained in the motifs of the products. The carvings produced not only reflect beauty but also hold mathematical meanings that can be further explored. Jepara carving art contains aesthetic elements that are closely related to mathematical principles, where each motif and design has a profound geometrical structure (Salma *et al*., 2022).

In this context, the exploration shows that carving artisans use various mathematical concepts applied in their techniques and design patterns. Here are the results of the exploration regarding the application of school mathematics concepts in Jepara carving art:

1. Counting Activity

   Artisans often perform calculations to determine the number of elements in a pattern. According to Braeutigam & Kenning (2022), the ability to count is the foundation for understanding more complex mathematical concepts. Zulfayani *et al*. (2023) also revealed that basic counting skills can enhance students' overall understanding of mathematics. Azizah (2022) added that counting activities also improve critical and creative thinking skills. Thus, counting is not only important for basic mathematical skills but also for the development of other cognitive skills.

2. Locating Activity

   The application of coordinates and the placement of elements in carving design demonstrates the importance of understanding location. Gilligan (2019) emphasizes that understanding location is a vital aspect of the mathematical problem-solving process, as this ability enables individuals to effectively visualize and manipulate objects in space. According to Firmanti *et al*. (2024), the ability to locate objects is fundamental in mastering geometry, as geometry is inherently related to the placement and relationships between objects in space. Therefore, localization skills not only help in understanding geometric concepts but also enhance spatial and analytical abilities, which are crucial in various fields of mathematics and its applications. This ability is also relevant in everyday contexts, such as in architecture and design, where precision and accuracy in the placement of elements are essential.

3. Measuring Activity

The use of measuring tools to ensure the proportions and dimensions of carvings is a common practice in the art of carving. According to Torres Irribarra (2021), measurement is an integral part of mathematical practices in everyday life, as it involves applying concepts of length, width, height, and volume to produce precise and aesthetic works. Research by Lehrer & Schauble (2023) shows that understanding measurement can enhance students' mathematical thinking skills, while Atit, Uttal, & Stieff (2020) emphasize that measuring activities help students develop critical spatial skills, which are important in mathematics, science, technology, and engineering. Kwan (2022) also indicates that practical experience with measurement can improve students' understanding of more complex mathematical relationships, such as ratios and proportions. Therefore, measuring activities are not only important in carving art but also in developing a broad range of mathematical and cognitive skills that are more widely applicable.

4. Designing Activity

The creation of initial sketches involving geometric concepts underpins every process of creation in the art of carving. Utami *et al*. (2020) noted that designing is a very important initial step in the application of mathematics, as it involves the use of shapes, symmetry, and proportions, which are the foundations of geometry. This process requires careful planning to ensure that every design element aligns with applicable mathematical principles. According to Pramesti & Dewi (2023), the design process not only requires analytical skills to solve technical problems but also creative skills to produce aesthetically pleasing works. These two skills are closely related to mathematical understanding, where the ability to analyze and visualize geometric concepts is crucial. In another study, King, Ouanes & Doh (2023) highlighted that math-based design not only produces unique works of art but also enhances students' understanding of more abstract mathematical concepts such as fractals and geometric transformations. Therefore, the activity of designing not only supports the creation of beautiful works of art but also develops important mathematical skills in a broader context, such as in engineering and architecture.

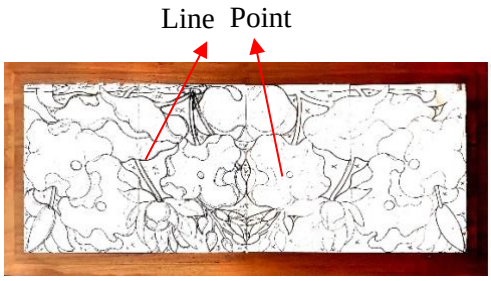
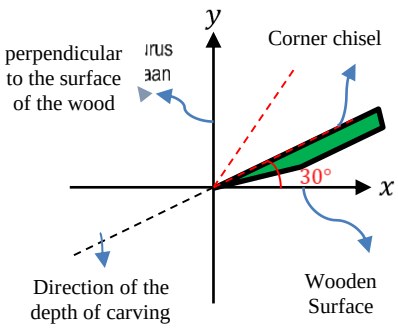
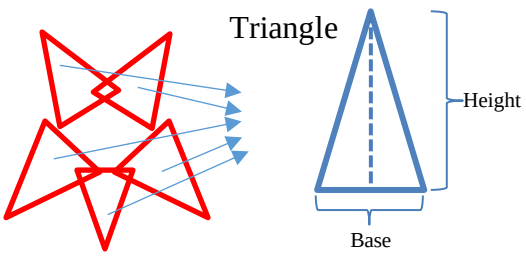
5. Concept of Geometry

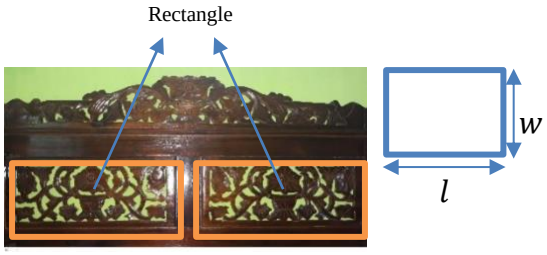
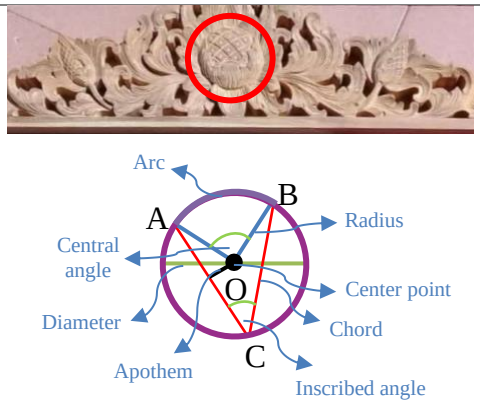
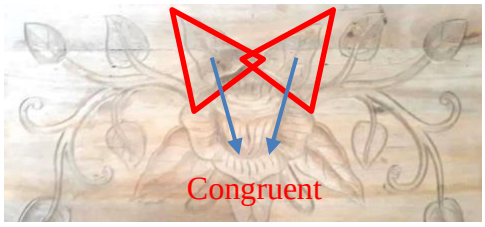
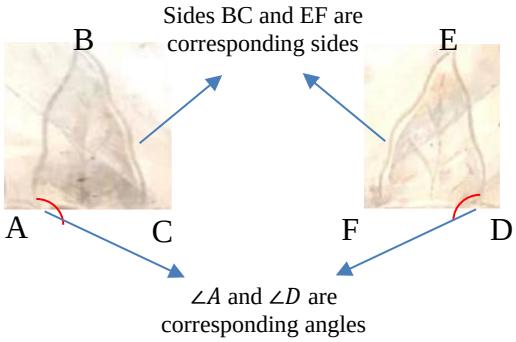
You carve using geometric shapes such as flat shapes and solid figures as the main foundation in the design, illustrating that mathematical principles are inseparable from this artwork (Ariyanti & Malasari, 2023). Geometry also plays a key role in mathematical practice and art, helping to understand structure and symmetry in design

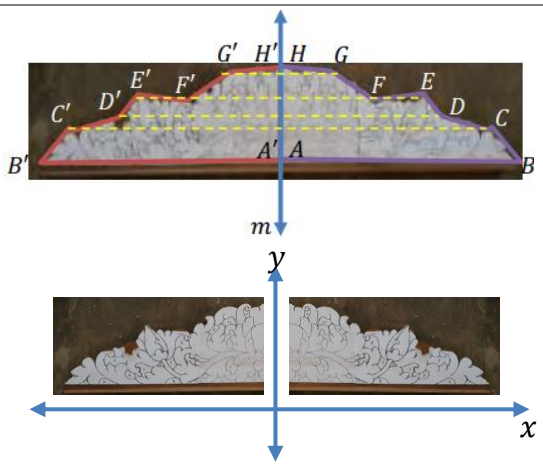
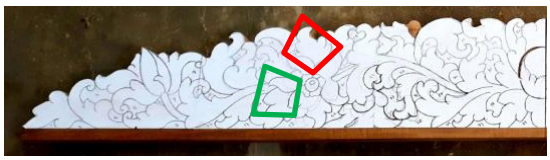
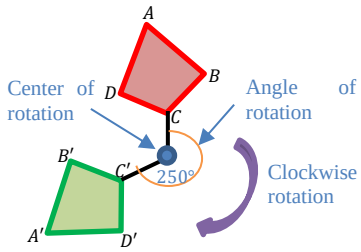
(Desai & Safi, 2020). Other research shows that the use of geometry in art not only enriches artistic expression but also enhances visual analysis and problem-solving skills (Schoevers, Leseman, & Kroesbergen, 2020), reinforcing the essential relationship between mathematics and visual arts in a creative and practical context.

Thus, this exploration confirms that Jepara carving art not only possesses artistic value but also supports mathematical understanding that can be applied in an educational context. This research shows that ethnomathematics in Jepara carving art significantly contribute to creating a more contextual and meaningful learning experience for students (Ariyanto, Diva, & Khafidin, 2022; Aminah & Syamsuri, 2022). Additionally, the application of ethnomathematics can help students relate mathematical material to their real-life experiences (see Table 2), thereby increasing motivation and engagement in learning (Turmuzi *et al*., 2024).

Table 2. School Mathematics Concepts in Jepara Woodcarving Art

No.	Ethnomathematics	School Mathematics Concepts
1.		***Point and Line*** A point is symbolized by a dot (.) and has a position but no size, which means that a point has no dimension. Meanwhile, a line is a set of points with an infinite number of them (Alexander & Koeberlein, 2020).
2.		***Slope (Gradient)*** Slope or gradient is the degree of inclination of a line or the ratio between vertical displacement and horizontal displacement (Agus, 2008; Dudeja, Madhavi, & Ali, 2014). ***Angle*** An angle is defined as the meeting point between two rays that share the same endpoint (Alexander & Koeberlein, 2020).
3.		***Triangle*** A triangle is a type of flat shape that is bounded by three sides and has three vertices (Kemendikbud, 2016).

No.	Ethnomathematics	School Mathematics Concepts
		***Rectangle*** A rectangle is a type of quadrilateral flat shape that has two pairs of parallel sides, two pairs of sides of equal length, and four right-angled corners.
4.		***Circle*** A circle is a type of flat geometric shape that consists of a simple closed curve dividing the plane into two parts: the interior of the circle and the exterior of the circle (Kemendikbud, 2017).
5.		***Cuboid*** A cuboid is a type of three-dimensional geometric shape that has length, width, and height.
6.	 	***Congruence*** Two shapes are said to be congruent if they have the same shape and size (Kemendikbud, 2018).

No.	Ethnomathematics	School Mathematics Concepts
7.		***Reflection*** Reflection is a part of the geometric transformation that moves a point on a geometric shape using the properties of objects and their images in a plane mirror (Kurniasih & Handayani, 2017).
	 	***Rotation*** Rotation is a type of transformation that turns each point on a shape by a specific angle and direction (rotation angle) around a fixed point known as the center of rotation (Kemendikbud, 2018).

Implementation of Ethnomathematics in Jepara Carving Art as a Cultural-Based Mathematics Learning Alternative

Exploration of ethnomathematics in Jepara carving art, as discussed previously, shows that there are mathematical elements integrated into Jepara carving. These mathematical elements in Jepara carving align with school mathematics concepts, as Kusuma *et al.* (2023) state that ethnomathematics enriches learning by connecting students' cultural experiences with formal mathematical concepts, thereby helping students better understand the material taught. Sulistyowati & Mawardi (2023) add that mathematical practices within a local culture can serve as an effective learning resource for linking mathematical concepts with students' real-life experiences. Moreover, research by Dewi *et al.* (2022) indicates that culture-based learning can help reduce gaps in mathematical understanding among students from diverse cultural backgrounds. Jia & Zhang (2023) also emphasize that integrating culture into mathematics education helps students see the relevance of mathematics in daily life. Kusaeri *et al.* (2019) acknowledge

the importance of cultural context in mathematics education, which can enhance conceptual understanding and practical relevance for students.

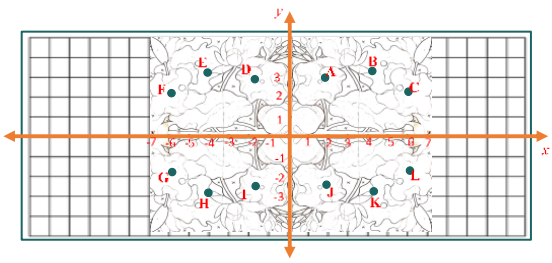
Thus, Jepara carving art can be implemented in the development of school mathematics materials as a cultural-based mathematics learning alternative. This implementation can cover several chapters and topics in the mathematics curriculum at the junior high school/MTS level. For example, geometric motifs in carvings can be used to teach concepts such as symmetry, reflection, and rotation, which are part of the mathematics curriculum at this level (Zainul, 2018). Pajrin, Pujiastuti, & Sugiman (2023) state that by adopting an ethnomathematics approach, teachers can create a more inclusive and relevant learning environment for all students. Integrating Jepara carving art into mathematics education not only facilitates students' understanding of mathematical concepts but also enriches their learning experience with familiar cultural contexts, thereby increasing their engagement and interest in learning mathematics.

Here is the mapping of school mathematics material that aligns with the Jepara carving art ethnomathematics.

1. Positioning Objects in the Creation of Jepara Carving Pattern Motifs

The activity of positioning objects in these pattern motifs aligns with the material on the Position of Points relative to the x-axis and y-axis in the Cartesian Coordinate System. Table 3 will show the implementation.

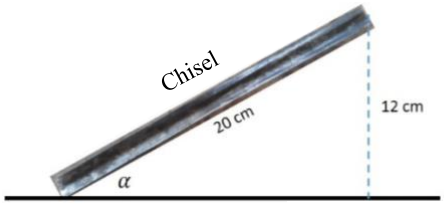
Table 3. Implementation of Object Position Placement in Jepara Carving Motif Patterns in Learning

Forms of ethnomathematics	Implementation
	One day, a Jepara carving artisan will draw a motif pattern inspired by the lotus flower. This motif is called the Lotus Motif. The motif consists of two main shapes: the lotus flower shape and the lotus leaf shape. To create a cohesive overall motif, the artisan needs to arrange several objects to ensure balance, as shown in the following pattern. The artisan draws the pattern using Cartesian coordinates to facilitate the placement of points on the objects. Now observe the positions of the points relative to the x-axis and the y-axis. After that, determine the coordinates of these points!

2. The Placement of Chisel Tools in the Crafting of Jepara Carvings

The activity of positioning the chisel during the carving process corresponds to the concept of Slope or Gradient in Linear Equations. Table 4 will show the implementation.

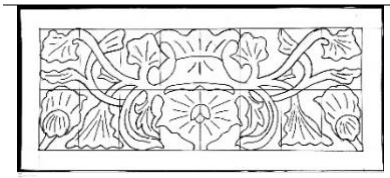
Table 4. Implementation of The Placement of Chisel Tools in the Crafting of Jepara Carvings

Form of Ethnomathematics	Implementation
	A Jepara carving artisan will perform carving activities. To carve, the artisan uses a chisel with a length of 20 cm in the following position. What is the inclination of the chisel? Then, what is the angle of inclination?

3. Creation of Jepara Carving Motifs with Quadrilateral Elements

The activity of creating Jepara carving motifs with rectangular shapes is related to the material on the Perimeter and Area of a Rectangle. Table 5 will show the implementation

Table 5. Implementation of Creating Jepara Carving Patterns with Rectangular Elements in Learning

Form of Ethnomathematics	Implementation
	A Jepara woodcarver is going to create a naturalistic plant motif that is overall rectangular in shape. The craftsman first draws the pattern on paper. If the length of the motif is 40 cm and the width is 20 cm, what are the perimeter and area of the motif?

4. Creation of Jepara Carving Patterns with Circular Elements

The activity of creating Jepara carving motifs with circular elements is related to the material on the circumference and area of a circle. Table 6 will show the implementation.

5. Choosing the Size of Wooden Boards in the Making of Jepara Carvings

The activity of choosing the size of wooden boards in the creation of Jepara carvings is related to the concepts of Surface Area and Volume of a Rectangular Prism. Table 7 will show the implementation.

Table 6. Implementation of Creating Jepara Carving Patterns with Circular Elements in Learning

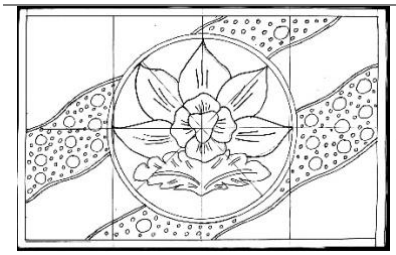
Form of Ethnomathematics	Implementation
 25 cm 40 cm	Mr. Ahmad is a craftsman of Jepara carvings. He will create a carving pattern by looking at a motif like the one in the picture next to this text. In the middle of the motif, there is a circular shape. What is the area of the motif with the circular shape? And what is the circumference of the circle that Mr. Ahmad needs to draw?

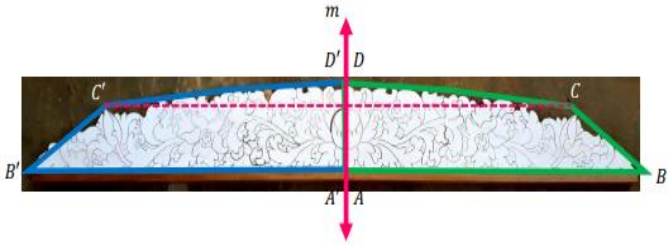
Table 7. Implementation of Choosing the Size of Wooden Boards in the Making of Jepara Carvings

Form of Ethnomathematics	Implementation
	Mr. Banu is a Jepara woodcarver. He will make a carved decoration from a piece of wood with the dimensions of 80 cm in length, 20 cm in width, and 2 cm in thickness. Determine: What is the volume of the wood? If the wood needs to be sanded first, what is the surface area of the wood that Mr. Banu needs to sand?

6. Creation of Symmetrical Pattern Motifs in Jepara Carving Art

The activity of creating symmetrical patterns of Jepara carvings corresponds with the material of Reflection (Mirror Image) in Transformational Geometry. Table 8 will show the implementation.

Table 8. Implementation of Creating Symmetrical Pattern Designs in Jepara Carving Art for Learning

Form of Ethnomathematics	Implementation
	Mr. Heri is a Jepara carving artisan. He will create carving patterns with a naturalistic and symmetrical design as shown in the picture. To create symmetrical motifs between the right and left sides, what concept does Mr. Heri use?

Based on the exploration and analysis conducted, it is evident that Jepara carving art contains mathematical elements that can be integrated into the school mathematics curriculum. These elements include activities such as counting, locating, measuring, designing, playing, and explaining, as well as concepts like points, lines, angles, slopes, plane geometry, circles, spatial geometry, congruence, and transformation geometry (Utami *et al*., 2021). In line with the research by Anisa *et al*. (2023) and Gerdes (1994),

integrating local culture into mathematics education provides students with opportunities to see the practical relevance of mathematics in their daily lives, which in turn enhances their engagement and interest in learning. This is also supported by D'Ambrosio (2001), who emphasizes that incorporating culture into mathematics education helps students see the relevance of mathematics in everyday life.

The integration of ethnomathematics, particularly Jepara carving art, into the school mathematics curriculum, shows great potential in bridging the gap in mathematical understanding among students from diverse cultural backgrounds (Dewi *et al*., 2022). Kusaeri *et al*. (2019) recognize the importance of cultural context in mathematics learning, which can enhance conceptual understanding and practical relevance for students. Pajrin *et al*. (2023) state that by adopting an ethnomathematics approach, teachers can create a more inclusive and relevant learning environment for all students. Zainul (2018) mentions that geometric motifs in carvings can be used to teach concepts such as symmetry, reflection, and rotation, which are part of the middle school mathematics curriculum. Therefore, integrating Jepara carving art into mathematics education not only makes learning more engaging and relevant but also helps students to better understand and apply mathematical concepts.

CONCLUSION

Based on research, Jepara carving art integrates school mathematics concepts such as points, lines, angles, slopes, plane geometry, circles, spatial figures, congruence, and geometric transformations. These concepts are found in the process of creating and the final results of the carvings, showing that Jepara carving art contains mathematical principles relevant to math education. Jepara carving can be implemented as a culturally-based alternative for teaching mathematics because several aspects align with school math materials. For example, the positioning of objects in the carving pattern corresponds to the Position of Points in the Cartesian Coordinate System, and creating symmetrical patterns aligns with Reflection in Geometric Transformations. This research indicates that Jepara carving not only has high cultural value but also significant potential as a contextual learning resource in math education.

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