MUBTADI: Jurnal Pendidikan Ibtidaiyah
Special Edition: The 1st ICEWISE
International Conference on Elementary Teaching and Wisdom in Education
https://ejournal.uinmadura.ac.id/index.php/ibtida
E-ISSN: 2720-8850 P-ISSN: 2715-7067

ETHNOMATHEMATIC EXPLORATION OF THE AREK LANCOR MONUMENT AS A CONTEXT FOR ELEMENTARY SCHOOL MATHEMATICS LEARNING

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Abstract
Pembelajaran matematika di sekolah dasar sering bersifat abstrak dan kurang terkait dengan kehidupan siswa. Etnomatematika menawarkan pendekatan kontekstual melalui praktik dan artefak budaya. Penelitian ini bertujuan mendokumentasikan makna sejarah dan budaya Monumen Arek Lancor di Pamekasan, Madura, mengidentifikasi konsep matematika pada bentuknya, serta menelaah potensinya sebagai konteks pembelajaran. Penelitian menggunakan pendekatan kualitatif deskriptif dengan desain etnografi. Data diperoleh melalui observasi, wawancara semi-terstruktur terhadap dua informan kunci, yakni pengamat budaya dan sejarah serta guru sekolah dasar, analisis visual serta dokumen. Analisis dilakukan melalui reduksi, penyajian, dan penarikan kesimpulan dengan triangulasi sumber. Sumber tertulis menunjukkan bahwa monumen dibangun sekitar tahun 1985 untuk mengenang perjuangan masyarakat Pamekasan pada Agresi Militer Belanda Pertama, dengan bentuk menyerupai api dari bilah celurit. Ditemukan konsep bangun datar dan ruang, garis dan sudut, simetri pantul dan rotasi, bilangan dan pola, serta pengukuran panjang. Menurut informan guru, beberapa konsep relevan dengan Fase A–C Kurikulum Merdeka, tetapi belum teruji dalam pembelajaran. Tafsir lima bilah sebagai lambang Pancasila hanya bersumber dari wawancara, tanpa dukungan dokumen tertulis. Keterbatasan penelitian mencakup jumlah informan dan belum adanya pengujian hasil belajar. Penelitian lanjutan perlu memperluas informan serta mengembangkan dan menguji perangkat pembelajaran berbasis monumen agar manfaat pedagogisnya dapat dinilai secara empiris dalam kelas nyata.
Kata Kunci: Arek Lancor Pamekasan, Sekolah Dasar, Etnomatematika, Pembelajaran Matematika

Abstract
Mathematics instruction in elementary schools is often abstract and lacks connection to students' daily lives. Ethnomathematics offers a contextual approach by incorporating cultural practices and artifacts. This study aims to document the historical and cultural significance of the Arek Lancor Monument in Pamekasan, Madura, identify the mathematical concepts embedded in its form, and examine its potential as a context for learning. A

qualitative descriptive approach with an ethnographic design was employed. Data were collected through observations, semi-structured interviews with two key informants a cultural and historical observer and an elementary school teacher as well as through visual and document analysis. Data analysis involved reduction, presentation, and conclusion drawing, supported by source triangulation. Written records indicate that the monument was constructed around 1985 to commemorate the struggle of the people of Pamekasan during the First Dutch Military Aggression; its design resembles flames formed by celurit *(sickle) blades. The study identified mathematical concepts related to 2D and 3D shapes, lines and angles, reflectional and rotational symmetry, numbers and patterns, and linear measurement. According to the teacher informant, several of these concepts align with Phases A–C of the* Kurikulum Merdeka *(Independent Curriculum), though they have not yet been tested in an actual classroom setting. The interpretation of the five blades as a symbol of* Pancasila *is based solely on interview data and lacks support from written documentation. Limitations of this study include the small number of informants and the absence of an assessment of learning outcomes. Future research should expand the number of informants and focus on developing and testing monument-based learning materials, allowing for an empirical evaluation of their pedagogical benefits in real-world classroom environments.*
Keyword: Arek Lancor Pamekasan, Elementary School, Ethnomathematics, Mathematics Learning

Received: 18-10-2026	Accepted: 09-11-2026	Published: 23-11-2026

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Prodi Pendidikan Guru Madrasah Ibtidaiyah
Universitas Islam Negeri Madura, Indonesia

https://doi.org/10.19105/mubtadi.v1i.26503

INTRODUCTION

Mathematics is often perceived by elementary school students as a difficult, abstract, and intimidating subject. Learning that is oriented toward memorizing formulas and procedures without connection to students' real-life experiences has the potential to trigger mathematics anxiety, which is consistently negatively associated with mathematics achievement (Barroso et al., 2021). This concern is reflected in Indonesia's results in the 2025 Programme for International Student Assessment (PISA): the mathematics score was 364, two points lower than the 366 recorded in 2022, a change that the OECD (2026) describes as not significant, concluding that Indonesia's average achievement in 2025 was about the same as in 2022. Only about 17% of Indonesian students reached at least proficiency Level 2 in mathematics, compared with an OECD average of 65% (OECD, 2026). The OECD country note also carries a caution that PISA sampling standards were not met, so these figures should be interpreted carefully. Because the number and composition of participating countries differ between cycles, comparisons of rank across cycles are not used here. Nevertheless, these data suggest that the ability to apply mathematics in contextual situations has

not strengthened, so learning in primary schools as a foundational level needs to be reinforced through contexts that are meaningful to students.

One of the factors contributing to this low achievement is the lack of real-world context in learning (Freudenthal, 1991). Freudenthal emphasized that mathematics should not be taught as a ready-made system, but rather as a human activity that is constructed from real phenomena and students' experiences. Learning that incorporates everyday life contexts, including cultural contexts, allows mathematical concepts to be understood more meaningfully because students can relate them to their cultural environment (Bishop, 1988), and it can also foster learning motivation (Alamsyah & Farihah, 2024).

Efforts to bridge formal mathematics with cultural context have given rise to the study of ethnomathematics, a term introduced by D'Ambrosio (1985) to refer to the mathematics practiced by identifiable cultural groups, such as ethnic communities, worker groups, children of certain age groups, and professional classes. Barton (1996) interprets ethnomathematics as a research program on how a cultural group understands, articulates, and uses ideas and practices that the academic world considers mathematical, regardless of whether formal mathematical concepts exist within that group. Ascher (1991) emphasizes that mathematical ideas are present in various world cultures in diverse forms, not limited to Western mathematics. Rosa and Orey (2016) added that ethnomathematics is a pedagogical action that connects culture and mathematics, thereby creating a transformative learning environment, and this perspective has been extended to the realm of STEM education in a glocal context (Rosa & Orey, 2021).

Indonesia's local culture contains various mathematical elements, present in artifacts, architecture, arts, traditional games, and historical monuments, encompassing principles of geometry, measurement, and number patterns that have been practiced from generation to generation (Gerdes, 1999; D'Ambrosio, 2006). Bibliometric reviews indicate that ethnomathematics studies have been steadily developing globally over the past decade (Deda et al., 2024; Nasrum et al., 2025), and research on historical buildings shows a consistent tendency in exploring geometric concepts (Riadi et al., 2025). Utilizing local cultural contexts also aligns with the Independent Curriculum, which emphasizes meaningful learning connected to students' real-life experiences ([Kemendikbudristek, 2024).

Previous studies can be grouped into three strands. The first examines crafts, textiles, and everyday artifacts: Arwanto (2017) identified symmetry and congruence in Trusmi Cirebon batik; Zayyadi (2017) revealed geometric concepts in Madura batik; Prahmana and D'Ambrosio (2020) linked geometry and values in Yogyakarta batik patterns; Pririzki et al. (2020) found plane shapes, congruence, similarity, and iteration in the food cover that is an icon of Bangka Belitung; and Yunian Putra and Indriani (2017) identified mathematical elements in Lampung tapis and siger crafts for elementary school levels. The second strand concerns buildings and monuments: plane and solid shapes in the Joglo traditional house of Tulungagung (Sulistyani et al., 2019) and geometric objects in the Gumuling Well of Tamansari (Alvian et al., 2021), as well as the Monument of Determined Resolution (Ni'mah & Marlina, 2021), the Monument of the Balinese People's Struggle (Cahayaningrat et al., 2024), the Selogiri Heritage Monument (Mufidah et al., 2024), the Simpang Lima Gumul Monument in Kediri (Fatmasari & Jatmiko, 2024), the Anniversary

Monument of the Regency of Dati II Tanah Laut (Anggraeni et al., 2025), the historic Tjong A Fie building (Zega & Narpila, 2025), and the Surabaya Education Museum for fifth-grade students (Putri et al., 2026). The third strand explicitly links cultural artifacts to learning, such as the Bugis cake Barongko (Pathuddin et al., 2021) and Akan ethnomathematics for measurement and geometry (Owusu-Darko et al., 2023). In Madura, the work has centered on batik and Ul-daul music (Zayyadi, 2017; Zahroh & Rizam, 2022).

Taken together, these findings show that buildings and monuments consistently contain geometry, measurement, and patterns with potential as contextual learning resources. However, three limitations recur in the studies reviewed here. First, the analysis mostly rests on the researchers' own identification of shapes, with little attention to how local people interpret the object. Second, the link to curriculum learning outcomes and to the progression across grade levels is seldom made explicit. Third, cultural meanings reported by informants are rarely distinguished from meanings supported by written sources, even though monuments often carry symbolism that is contested or undocumented.

Although ethnomathematics studies on various monuments in Indonesia have been conducted quite extensively, researchers have not yet found a study that specifically explores the Arek Lancor Monument, the main icon of Pamekasan Regency, Madura, as an object of ethnomathematics. Ethnomathematics research in Madura also tends to focus on batik and the arts (Zayyadi, 2017; Zahroh & Rizam, 2022), making it important to fill this research gap. Arek Lancor, reportedly meaning "blazing fire" in the Madurese language, stands in the center of Pamekasan City with a distinctive shape resembling flames made from rows of celurit blades, a traditional Madurese weapon, and is associated in written sources with the struggle of the people of Pamekasan (Haq, 2025). As a landmark seen every day and a public space where families gather, especially on weekends (Haq, 2025), the monument offers a context close to students' experiences and to their regional culture.

The contribution of this study is therefore conceptual and not merely descriptive; it goes beyond identifying geometric shapes in yet another monument. First, it proposes an analytic link between cultural meaning and mathematical content: every claim about the monument is classified by its source status (supported by written sources, reported only orally by an informant, or the researchers' interpretation), so that the cultural stories and the mathematics drawn from the same object are not conflated. Second, it treats undocumented oral symbolism, such as the reading of the five blades as the five principles of Pancasila, as legitimate cultural data that can be discussed as one local interpretation, while mathematical content stays grounded in what can be directly observed. Third, it offers a mapping from monument elements to mathematical concepts and to the Learning Outcomes of Phases A–C of the Merdeka Curriculum, organized along the progression from concrete observation to formal representation. Fourth, it extends Madura ethnomathematics beyond batik and music to public monumental architecture.

Based on the description above, this study aims to: (1) reveal the cultural and historical meanings of the Arek Lancor Monument based on the narratives of local cultural observers and on written sources, distinguishing documented facts from oral interpretations; (2) explore the mathematical elements and concepts in the monument's geometric forms; (3) examine the

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E – ISSN : 2720 – 8850

relationship of these concepts to elementary school mathematics learning from one teacher's perspective; and (4) formulate the proposed potential of the monument as a context for elementary school mathematics learning

METHOD

This study uses a descriptive qualitative approach with an ethnographic design, which is research that seeks to understand cultural phenomena from the perspective of cultural actors in a natural and in-depth manner (Miles et al., 2014; Sugiyono, 2018). This approach was chosen because the study aims to explore the meaning, values, and mathematical concepts in cultural artifacts, namely the Arek Lancor Monument, which need to be interpreted contextually and interpretatively, rather than measured numerically. Because it concerns one cultural object and two key informants, the design is best understood as a small-scale, focused ethnographic study (Authors to add: the period of fieldwork and interview dates).

The research was conducted in the Arek Lancor Monument area, in the center of Pamekasan City, East Java. The location was chosen because this monument serves as the main icon of the region as well as a public space that is accessed daily by the community, including elementary school students. The objects of the study were the geometrical and philosophical elements of the monument's physical form. Informants were selected purposively based on the relevance of their expertise to the research focus, namely (1) a cultural and historical observer of Pamekasan Regency who understands the background of the monument's establishment, and (2) an experienced elementary school teacher in teaching mathematics to ensure that the results of the mathematical exploration of Arek Lancor are appropriate for elementary education, as well as to explore the relevance and feasibility of its integration into learning. The identities of both informants were anonymized with initials in accordance with research ethics. The informants' profiles are presented in Table 1.

Recruitment and expertise. Each informant was chosen because he or she represents a distinct kind of knowledge that this exploratory study needed and that the other informant could not provide. I-1 was chosen because of his position as Chairperson of the Pamekasan Regency Arts Council and his standing as a native resident who follows the culture and history of the regency; I-2 was chosen because she is a class teacher with experience in teaching mathematics at an elementary school in Pamekasan. Expertise was judged against three criteria: formal role, length of experience, and relevance to the research focus. (Authors to complete: how each informant was approached or recommended; I-1's years of involvement and any written works on Pamekasan culture; I-2's years of teaching, grades taught, and experience with contextual or local-culture-based learning; and confirmation that informed consent was obtained).

Why two informants. The study does not aim to generalize the views of a community or of teachers. It aims (a) to obtain an informed local account of the monument's meaning, which was then checked against written sources, and (b) to obtain a practitioner's judgement on whether the mathematical concepts suit elementary school learners. For these narrow and specific aims a small number of well-positioned informants can provide sufficient information (Malterud et al., 2016).

Even so, the informants' accounts were not treated as stand-alone evidence: I-1's account was compared with news and web sources, and the mathematical content was derived from the researchers' own observation and documentation, with I-2 providing a pedagogical check. The small number of informants is acknowledged as a limitation in the Discussion.

Table 1 - Research Informant Profiles

Code	Identity	Role/Expertise	Basis of Selection	Information Focus Explored
I-1	Mr. A. (a native resident and an observer of the culture and history of Pamekasan Regency)	Chairperson of the Pamekasan Regency Arts Council	Formal role in the regency's arts institution; native resident; follows local culture and history	The history of the monument's establishment, the background of the struggle event, the philosophy of the sickle's shape and the flames, as well as the symbolic meaning of the five sickle blades.
I-2	Ms. S. (A class teacher at one of the Elementary Schools in Pamekasan Regency)	Elementary School Teacher	Experience in teaching elementary mathematics; able to judge age-appropriateness of concepts	Ensuring the accuracy of Arek Lancor's mathematical exploration results for elementary school learning, the relevance of their application, as well as the challenges and strategies of contextual learning.

Data were collected through three techniques. First, field observation was conducted directly on the physical form of the monument, including the shape of the sickle blade, the arrangement of the fence, as well as the dimensions and proportions of the building, to identify visible geometric elements. Second, semi-structured interviews were conducted with both informants using a pre-prepared interview guide, while still allowing room for flexible question development according to the flow of the conversation, in order to explore the history, philosophical meaning, and pedagogical perspectives on the use of Arek Lancor in mathematics learning. Third, documentation was conducted through photographing the monument from various angles and tracing supporting documents and literature, including reports on the history of the monument's establishment, to complement and confirm the interview and observation data. No official document explaining the monument's design intentions was found; written sources were mainly news reports and web pages. (Authors to add: the search terms or sources used).

The research instruments include the researcher as the main instrument (human instrument), semi-structured interview guidelines, a camera for visual documentation, and an audio recorder. Data analysis follows the interactive model of Miles, Huberman, and Saldaña (2014), which consists

of data reduction (sorting and focusing interview and observation data on relevant mathematical and historical elements), data display (arranging data in the form of narratives and tables), and drawing conclusions or verification.

Coding process. Coding proceeded in three steps. First, the interview recordings were transcribed and, together with field notes and photographs, read repeatedly. Second, meaningful units (an informant's statement or a visible feature of the monument) were given short descriptive codes, for example "blade tip = triangle" or "textbooks far from children's experience." Third, codes were grouped into categories, and categories into themes aligned with the research aims: cultural and historical meaning, mathematical concepts, and relevance to elementary learning. Mathematical categories were named with the terms of elementary geometry and of the Learning Outcomes of the Merdeka Curriculum. Table 2 shows examples of how statements and observations were developed into themes. (Authors to confirm: whether coding was done by one or several researchers, manually or with software, and how disagreements were resolved.)

Table 2 - Examples of The Codding Procces

Data excerpt	Open code	Category	Theme
I-1: "There are five celurits representing the five principles of Pancasila."	Symbolic meaning of the five blades (informant's reading)	Oral interpretation, not found in written sources	Cultural and historical meaning
I-1: "...from a distance, it looks like two flames symbolizing the fervent spirit..."	Flame shape; spirit of the fighters	Form and philosophy	Cultural and historical meaning
Observation/photo: blade tip is pointed; panel surface is rectangular; supporting pole resembles a beam	Triangle; rectangle; rectangular prism	Plane and solid shapes	Mathematical concepts
Observation/photo: flame outline mirrored about the vertical axis; blades arranged around a center	Axis of symmetry; rotation about a center	Reflection and rotational symmetry	Mathematical concepts
I-2: "...relied heavily on images from textbooks, which are not very close to the children's everyday experiences."	Textbook dependence; need for familiar contexts	Perceived need for local context	Relevance to elementary learning

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Data excerpt	Open code	Category	Theme
I-2: "...can be used to introduce flat shapes, lines, angles, and even symmetry."	Concepts perceived as suitable	Perceived fit with Phase A–C concepts	Relevance to elementary learning

Data saturation. We do not claim data saturation. Saturation is usually examined with larger numbers of interviews (Guest et al., 2006) and cannot be demonstrated with two informants. The analytic cycle was repeated until every observation record and interview statement had been assigned to a category and no further category was needed to account for them; this indicates completeness of coding for this dataset only. The validity of the data was examined through source triangulation (Nowell et al., 2017), by comparing interview results with cultural observers, interview results with elementary school teachers, field observation results, as well as data from literature and news regarding the history of the Arek Lancor Monument. Triangulation was also used to assign each claim about the monument a source status (Table 3).

RESULT

The Cultural and Historical Meaning of Arek Lancor

This section separates what is supported by written sources from what was reported only orally. Table 3 summarizes the source status of each claim.

Based on an interview with informant I-1, the Arek Lancor Monument was built around 1985 to commemorate the Pamekasan people's battle in defending independence. I-1 stated:
"The Arek Lancor Monument was built approximately in 1985, and the background was the Pamekasan people's struggle against the colonizers. It is shaped like a celurit, which in Madurese is commonly called 'arek.' There are five celurits representing the five principles of Pancasila, and from a distance, it looks like two flames symbolizing the fervent spirit and fighting soul of the Madurese people." (I-1, interview)

Supported by written sources. The year and purpose given by I-1 are consistent with written news sources: the monument was erected in 1985 as a reminder of the people's sacrifice (Haq, 2025), and it was built around 1985 on the initiative of the then Regent, H. Adiatoellah, as an emblem of the people's struggle (NU Online, 2026; RRI, 2022). Its background is related to the First Dutch Military Aggression: on August 4, 1947, Dutch forces landed in Camplong and Branta Pesisir, and two days later occupied Pamekasan City, facing resistance from the Indonesian National Army's Jokotole Regiment along with people's militias led by religious leaders, including the Indonesian People's Rebellion Front (BPRI) and the Hizbullah–Sabilillah Militia (Haq, 2025; NU Online, 2026). The name 'Arek Lancor' originates from the Madurese language and is reported to mean 'blazing fire,' which represents an unyielding fighting spirit (Haq, 2025). Two further details were found in only one news source (RRI, 2022): that the monument was funded by Pamekasan figures in Jakarta, and that it was designed by the architect Ersyad Broto Amidarmo. Because they could not be corroborated by an official document or a second source, they are reported as "reportedly" and are not treated as established fact.

Interpretations reported in written sources. Philosophically, the shape of the monument resembling a flame made from sickles (arek) is said to symbolize the spirit of the fighters that continues to burn against the colonizers (Madurapedia, 2025). News sources describe a monument of five pillars of varying heights shaped like a question mark (RRI, 2022), interpreted as a symbol of reflection: whenever a Madurese person is about to use a sickle, he asks himself whether the action aligns with the values of humanity. In addition, the path surrounding the monument forms a pattern resembling the Arabic script for Allah, which is interpreted as an acknowledgment that the success of the struggle is inseparable from God's grace (opensource.petra.ac.id, n.d.). These sources are popular or web-based and do not attribute the interpretations to the designer or to an official statement, so they are treated as published interpretations and not as verified design intentions.

Interpretation reported only orally. The meaning of the five celurits as the five principles of Pancasila, stated by I-1, was not found in any written source. A review of written sources has not found an official document explicitly stating that the five parts of the monument were designed to represent the five principles of Pancasila. In this study it is therefore treated as an oral tradition that is alive among the local community. It remains valuable as qualitative data, but it is not presented as a documented fact or a design intention. The same status applies to I-1's description of the monument as "two flames" seen from a distance.

Table 3 - Source Status of Claims About the Arek Lancor Monument

Claim	Source	Status
Built around 1985 to commemorate the people's struggle	I-1; Haq (2025); NU Online (2026); RRI (2022)	Supported by several written (news) sources; no official archival document located
Built on the initiative of the then Regent (H. Adiatoellah)	NU Online (2026); RRI (2022)	Supported by two written (news) sources
Background in the First Dutch Military Aggression (1947)	I-1; Haq (2025); NU Online (2026)	Supported by written sources
Funded by Pamekasan figures in Jakarta; designed by Ersyad Broto Amidarmo	RRI (2022)	Single written source; not corroborated, reported as "reportedly"
"Arek Lancor" means "blazing fire"; the form is a flame of sickles symbolizing fighting spirit	Haq (2025); Madurapedia (2025); I-1	Supported by written sources; interpretive
Five pillars shaped like a question mark, symbolizing reflection; surrounding path resembling the script for Allah	RRI (2022); opensource.petra.ac.id (n.d.)	Published interpretation in popular/web sources; not attributed to the designer

Claim	Source	Status
Five celurits represent the five principles of Pancasila; "two flames" seen from a distance	I-1 only	Oral only; no written source found
Triangles, rectangles, symmetry, patterns, and angles in the monument's form	Researchers' observation and documentation	Researchers' interpretation; not a designer's intention

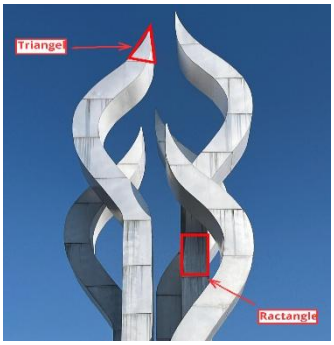


Figure 1 - Arek Lancor Monument, Pamekasan, East Java

Mathematical Concepts Found in Arek Lancor

The results of field observation and documentation indicate that the geometric shapes of the Arek Lancor Monument are rich in mathematical elements, which can be grouped into four conceptual categories: plane and solid shapes, lines and angles, reflection and rotational symmetry, and numbers and patterns. In addition, the physical dimensions of the monument and its fence provide context for length measurement activities. These readings are the researchers' interpretations of observed features and not meanings intended by the monument's designers. These concepts, along with their possible implementation in elementary school learning, are presented in Table 4. The red marks in each photo indicate the elements being referred to.

Table 4 - Mathematical concepts in the Arek Lancor Monument and their possible implementation in elementary school learning

No	Ethnomathematics	Mathematical Concept	Elemants of the Arek Lancor Momen	Implementation of Learning in Elementari School
1.		Plane Figures and Solid Figures	The blade of the sickle is composed of a combination of a triangular shape at the tip of the blade and a rectangular shape on the surface panel, whereas the supporting pole resembles a beam.	Students identify flat shapes and three-dimensional shapes in photos or replicas of monuments, redraw their forms, and mention their properties (Phase A–B).

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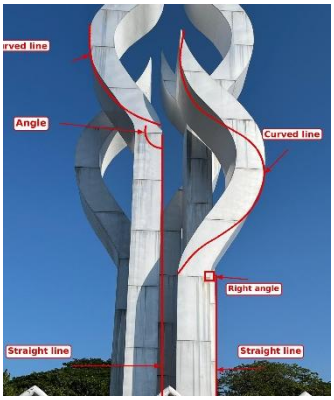
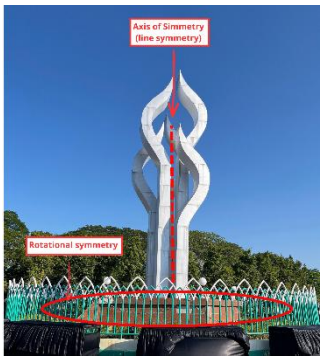
2.		Lines and Angles	The blade of the sickle is dominated by curved lines with wave patterns, combined with straight lines on the supporting pole; angles are visible at the junction of the blade with the pole.	Students recognize straight lines and curved lines on objects around them (Phase A), recognize angles on monument shapes (Phase B), and measure the size of angles using a protractor (Phase C).
3.		Reflection Symmetry and Rotational Symmetry	The flames demonstrate fold symmetry with respect to the vertical axis; the arrangement of blades surrounding the central point can be examined as rotational symmetry with a certain angle of rotation.	Students identify the axis of symmetry in images of monuments and determine the number of fold symmetries (Phase B), as well as investigate rotational symmetry and create patterns of symmetrical plane figures (Phase C).
4.		Numbers and Patterns	The number of five machetes involves elements of counting and estimation; the arrangement of fences around the monument shows a pattern of regular repetition of shapes.	Students count the slats and arches of the fence, identify patterns in the fence ornaments, as well as determine number sequences and continue the given patterns (Phase A–C).

The Teacher's Perspective on Relevance to Elementary School Mathematics Learning

An interview with informant I-2, an elementary school teacher, was conducted to obtain a practitioner's judgement on whether the results of the mathematical exploration of the Arek Lancor Monument are suitable for elementary school learning. Her views represent one teacher's

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perspective and should not be read as evidence that classroom implementation is already feasible or effective.

"So far, mathematics learning in class has still relied heavily on images from textbooks, which are not very close to the children's everyday experiences. If Arek Lancor is used as a medium, in my opinion it is very appropriate because children have often seen it directly, and even frequently play around the monument with their families. Its unique shape, with curved lines and symmetry, can be used to introduce flat shapes, lines, angles, and even symmetry. In addition to learning mathematics, children also become more familiar with their local history." (I-2, interview)

Three points can be drawn from I-2's statement. First, she reported that classroom learning still relies largely on textbook illustrations that she perceives as distant from students' experiences. Second, she regarded plane shapes, lines, angles, and symmetry as the concepts that the monument could be used to introduce. Third, she expected that children would also become more familiar with their local history. This third point is the teacher's expectation; no student outcome was measured in this study, so no effect on students is claimed.

Proposed Mapping of the Monument to Elementary School Learning Outcomes

Based on the results of the exploration and input from the teacher informant, the researchers formulated a proposed ethnomathematics mapping of Arek Lancor onto the Mathematics Learning Outcomes (LO) of the Merdeka Curriculum (Kemendikbudristek, 2024), as presented in Table 5. This mapping serves as an initial proposal to guide teachers in designing teaching modules, student worksheets (LKPD), and learning media, and it needs to be validated against the LOs and the characteristics of each class, by more teachers, and through classroom trials.

Table 5 - Mapping of Arek Lancor Ethnomathematics to Elementary School Mathematics Learning Outcomes

Phase	Grade	Mathematics Learning Outcomes (CP) domain	Ethnomathematical content of Arek Lancor
A	I–II	Number; Geometry	Counting the sickle blades and the arches of the monument fence; recognizing basic plane shapes as well as straight and curved lines in the form of the monument.
B	III–IV	Measurement; Geometry	Measuring the length of a fence or the perimeter of the monument area using standard units; recognizing angles; identifying reflection symmetry in the shape of a flame.
C	V–VI	Geometry; Algebra (number patterns)	Measuring the angle size in a photo of the monument using a protractor; investigating rotational symmetry; determining patterns or number sequences in fence ornaments.

P – ISSN : 2715 – 7067
E – ISSN : 2720 – 8850

The findings in Table 2 reinforce the view that mathematics is not always abstract and detached from real life; rather, it can be found and learned through interaction with the local environment and culture (Richardo, 2017; Rosa & Orey, 2021). The pointed ends of the blades resemble triangles, the openings between the blades resemble ellipses, and the panel surfaces of the poles shaped like rectangles can serve as concrete objects for introducing plane and solid shapes (Zega & Narpila, 2025). The symmetry of the flame shapes relative to the vertical axis can be used to concretely introduce reflective symmetry, while the arrangement of the blades around the central axis can be examined as rotational symmetry, as illustrated by the symmetry principles also found in other cultural ornaments (Gerdes, 1999; Prahmana & D'Ambrosio, 2020). The repeating ornament patterns on the monument fence align with the findings of repeating patterns in other cultural artifacts, such as food covers (Pririzki et al., 2020).

Discussion

Documented Facts and Oral Interpretation

The findings show that the meaning of the monument exists at several levels of evidence. The year, purpose, and historical background are supported by several written sources, whereas the Pancasila reading of the five blades and the "two flames" image rest on oral testimony, and the designer and funding details rest on a single news source. This distinction matters for ethnomathematics. Culturally rooted stories are what make a context meaningful to students, but if undocumented meanings are presented as historical fact, classroom use of the monument could spread unverified claims. Oral tradition is a legitimate form of local knowledge, consistent with the view of ethnomathematics as the knowledge of identifiable cultural groups (Barton, 1996; D'Ambrosio, 1985). We therefore suggest that teachers present oral interpretations as "what some local cultural figures say" and present dated, documented facts separately (Table 3).

Mathematical Concepts in Relation to Previous Studies

In line with findings from other monuments and historical buildings (Alvian et al., 2021; Cahayaningrat et al., 2024; Mufidah et al., 2024; Ni'mah & Marlina, 2021; Zega & Narpila, 2025) as well as cultural artifacts from various countries (Gerdes, 1999; Owusu-Darko et al., 2023), the mathematical elements in this monument fall into plane and solid shapes, lines and angles, reflection and rotational symmetry, and numbers and patterns. The findings in Table 4 reinforce the view that mathematics is not always abstract and detached from real life; rather, it can be found and learned through interaction with the local environment and culture (Richardo, 2017; Rosa & Orey, 2021). The pointed ends of the blades resemble triangles, the openings between the blades resemble ellipses, and the panel surfaces of the poles shaped like rectangles can serve as concrete objects for introducing plane and solid shapes (Zega & Narpila, 2025). The symmetry of the flame shapes relative to the vertical axis can be used to introduce reflection symmetry concretely, while the arrangement of the blades around the central axis can be examined as rotational symmetry, as illustrated by the symmetry principles also found in other cultural ornaments (Gerdes, 1999; Prahmana & D'Ambrosio, 2020). The repeating ornament patterns on the monument fence align with the findings of repeating patterns in other cultural artifacts, such as food covers (Pririzki et al., 2020).

The Teacher's View and the Literature on Elementary Mathematics Learning

I-2's view is consistent with arguments in the literature, but it does not confirm them. The concepts that she considered suitable can be understood in light of the fact that elementary school students are generally at the concrete operational stage, so learning should be based on objects that can be directly observed and manipulated (Piaget, 1964; Sirate, 2012). Studies on contextual mathematics teaching modules at the elementary level reported the practicality and effectiveness of learning materials that are close to students' context (Al Aluf et al., 2025), appropriate learning media have been found to enhance elementary students' learning outcomes (Agustira & Rahmi, 2022), and learning materials based on local wisdom have been developed at the elementary level (Nurul, 2023). Binasdevi (2021) emphasized the importance of motivation and critical thinking in mathematics achievement in basic education, so meaningful contexts may support that motivation, although this remains to be tested for Arek Lancor. In the international realm, the integration of cultural artifacts into geometry and measurement learning has been reported to be beneficial (Owusu-Darko et al., 2023; Pathuddin et al., 2021). However, as Rowlands and Carson (2002) remind us, ethnomathematics needs to be positioned as a bridge to academic mathematics, not a replacement; the context of Arek Lancor should therefore be used to foster conceptual understanding before moving toward more formal representation.

Possible Implementation and Potential

The mapping in Table 5 could be implemented through the Realistic Mathematics Education approach, in which learning begins from real contexts familiar to students before moving toward formal concepts (Freudenthal, 1991). In Phase B, for example, a teacher could invite students to observe photos or visit the monument, identify curved lines and axes of symmetry in the flame shape, and then guide students to fold a paper replica of the flame to find the number of lines of symmetry by themselves. In Phase C, a teacher could ask students to measure angles in monument photos using a protractor and continue patterns in the fence ornaments. Relating these activities to the monument's history could also be an opportunity for character education, provided that documented facts and oral interpretations are kept apart (Table 3). These activities are proposals; their feasibility and their effects on students' understanding, motivation, or appreciation of local history have not been tested. This approach aligns with the idea of ethnomathematical pedagogical action, which positions cultural diversity as a learning resource rather than merely a supplement (Rosa & Orey, 2016)

Overall, the potential of the Arek Lancor Monument lies in three aspects: (1) the proximity of the object to the daily experiences of students in Pamekasan; (2) the richness of geometric elements that encompass most of the mathematics learning outcome domains from Phase A to Phase C; and (3) its historical and national-character content, which teachers may use as a starting point for discussion. Any effect on the affective dimension of learning or on students' identity and love for their region remains a hypothesis to be tested.

Conceptual Contribution

Beyond a catalogue of shapes, this study contributes a way of linking three things that are often treated separately: the cultural meaning of an object, the mathematics that can be read from it, and the curriculum outcomes that it could serve. The classification of claims by source status (Table

3) can be reused for other monuments whose meanings are partly oral, and the progression from concrete observation to formal representation (Tables 4 and 5) gives teachers a way to use such objects without turning the cultural story into mathematical fact.

Limitations and Recommendations

This study has four limitations. First, it relied on two key informants; the views of other community members, historians, local officials, and teachers were not included, and no claim of generalization or data saturation is made. Second, written sources on the monument are mostly news and web articles, and no official document on its design was located, so claims about the designer, funding, and symbolism remain provisional. Third, the mathematical interpretations are the researchers' own and were checked by one teacher only. Fourth, no learning was implemented or tested, so the effects on understanding, motivation, or appreciation of history are unknown. Future research should (a) interview more informants, including historians, local cultural officials, and the people involved in building the monument, and consult archives; (b) validate the mapping with several teachers through expert judgement; and (c) develop learning tools (teaching modules, student worksheets, or media) based on Arek Lancor ethnomathematics and test their effects on understanding and attitudes in elementary school classes.

CONCLUSION

The Arek Lancor Monument, an icon of Pamekasan Regency that written sources report was built around 1985 to commemorate the struggle of the people of Pamekasan during the First Dutch Military Aggression, holds cultural significance as well as rich ethnomathematical concepts. The flame shape formed by the blades of sickles incorporates concepts of plane and solid geometry, lines and angles, reflection and rotational symmetry, as well as numbers and patterns, and provides a context for measuring length. The oral narrative interpreting the five sickle blades as the five principles of Pancasila is part of local wisdom that is important to document, yet it has not been found in written sources and therefore needs to be presented as an oral interpretation. One elementary school teacher regarded the concepts of plane shapes, lines, angles, and symmetry as relevant to Phase A–C learning; this is one informant's perspective, and the feasibility and effects of classroom use remain to be tested. The proposed mapping suggests that Arek Lancor has the potential to serve as a contextual mathematics learning context for elementary schools. This study is limited to two informants and did not measure student outcomes. Further research is recommended to involve more informants, to develop learning tools based on Arek Lancor ethnomathematics, and to test their effectiveness in elementary schools.

REFERENCES

Agustira, S., & Rahmi, R. (2022). Penggunaan media pembelajaran untuk meningkatkan hasil belajar siswa pada tingkat SD. MUBTADI: Jurnal Pendidikan Ibtidaiyah, 4(1), 72–80. https://doi.org/10.19105/mubtadi.v4i1.6267

Al Aluf, W., Irawan, W. H., & Abdussakir. (2025). Pengembangan modul ajar matematika terintegrasi nilai-nilai Islam pada materi penjumlahan dan pengurangan kelas 1 MIS

Miftahul Ulum Bundah Sreseh Sampang. MUBTADI: Jurnal Pendidikan Ibtidaiyah, 7(1), 41–53. https://doi.org/10.19105/mubtadi.v7i1.20103

Alamsyah, E., & Farihah, U. (2024). Implementasi teori behavioristik dalam motivasi belajar peserta didik pada pembelajaran matematika di SD. MUBTADI: Jurnal Pendidikan Ibtidaiyah, 5(2), 119–124.

Alvian, D. N., Agustito, D., Arigiyati, T. A., Harini, E., & Widodo, S. A. (2021). Identifying geometrical objects in Sumur Gumuling Tamansari: An ethnomathematics analysis. Journal of Physics: Conference Series, 1778, Article 012021. https://doi.org/10.1088/1742-6596/1778/1/012021

Anggraeni, D. I., Wicaksono, B. A., & Mardhiyatirrahmah, L. (2025). Eksplorasi etnomatematika pada Tugu Hari Jadi Kabupaten Dati II Tanah Laut. Mandalika Mathematics and Educations Journal, 7(4). https://doi.org/10.29303/jm.v7i4.10802

Arwanto, A. (2017). Eksplorasi etnomatematika batik Trusmi Cirebon untuk mengungkap nilai filosofi dan konsep matematis. Phenomenon: Jurnal Pendidikan MIPA, 7(1), 40–49.

Ascher, M. (1991). Ethnomathematics: A multicultural view of mathematical ideas. Brooks/Cole.

Barroso, C., Ganley, C. M., McGraw, A. L., Geer, E. A., Hart, S. A., & Daucourt, M. C. (2021). A meta-analysis of the relation between math anxiety and math achievement. Psychological Bulletin, 147(2), 134–168. https://doi.org/10.1037/bul0000307

Barton, B. (1996). Making sense of ethnomathematics: Ethnomathematics is making sense. Educational Studies in Mathematics, 31(1–2), 201–233.

Binasdevi, M. (2021). Hubungan kegiatan literasi sekolah dan motivasi belajar melalui mediasi kemampuan berpikir kritis dengan prestasi belajar matematika siswa pendidikan dasar. MUBTADI: Jurnal Pendidikan Ibtidaiyah, 3(1), 70–82. https://doi.org/10.19105/mubtadi.v3i1.4793

Bishop, A. J. (1988). Mathematical enculturation: A cultural perspective on mathematics education. Kluwer Academic Publishers.

Cahayaningrat, P. W., Pratiwi, N. W. D. A., Alvionitha, N. P. M., & Srinadi, I. G. A. M. (2024). Eksplorasi etnomatematika pada Monumen Perjuangan Rakyat Bali. Journal on Education, 6(2), 12651–12659.

D'Ambrosio, U. (1985). Ethnomathematics and its place in the history and pedagogy of mathematics. For the Learning of Mathematics, 5(1), 44–48.

D'Ambrosio, U. (2006). Ethnomathematics: Link between traditions and modernity. Sense Publishers.

Deda, Y. N., Disnawati, H., Tamur, M., & Rosa, M. (2024). Global trend of ethnomathematics studies of the last decade: A bibliometric analysis. Infinity Journal, 13(1), 233–250. https://doi.org/10.22460/infinity.v13i1.p233-250

Fatmasari, O. A., & Jatmiko. (2024). Eksplorasi etnomatematika pada Monumen Simpang Lima Gumul Kediri. Prosiding Seminar Nasional Sains, Kesehatan, dan Pembelajaran, 3, 279–285.

Freudenthal, H. (1991). Revisiting mathematics education: China lectures. Kluwer Academic Publishers.

Gerdes, P. (1999). Geometry from Africa: Mathematical and educational explorations. Mathematical Association of America.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. Field Methods, 18(1), 59–82. https://doi.org/10.1177/1525822X05279903

Haq, M. F. (2025, 2 November). Monumen Arek Lancor, ikon perjuangan masyarakat Pamekasan. detikJatim. https://www.detik.com/jatim/berita/d-8190457/monumen-arek-lancor-ikon-perjuangan-masyarakat-pamekasan

Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. (2024). Capaian pembelajaran pada pendidikan anak usia dini, jenjang pendidikan dasar, dan jenjang pendidikan menengah pada Kurikulum Merdeka (Keputusan Kepala BSKAP No. 032/H/KR/2024). Badan Standar, Kurikulum, dan Asesmen Pendidikan.

Madurapedia. (2025, 4 November). Monumen Arek Lancor: Simbol sejarah & ikon Kota Pamekasan. https://madurapedia.com/baca/1424/sejarah-makna-arek-lancor-pamekasan/

Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample size in qualitative interview studies: Guided by information power. Qualitative Health Research, 26(13), 1753–1760. https://doi.org/10.1177/1049732315617444

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). Qualitative data analysis: A methods sourcebook (3rd ed.). Sage Publications.

Mufidah, A., Ishartono, N., & Masduki. (2024). Enhancing mathematical understanding through ethnomathematics: A study of the Pusaka Monument's geometric structures. Jurnal Derivat: Jurnal Matematika dan Pendidikan Matematika, 11(2), 176–188.

Nasrum, A., Salido, A., & Chairuddin. (2025). Unveiling emerging trends and potential research themes in future ethnomathematics studies: A global bibliometric analysis (from inception to 2024). International Journal of Learning, Teaching and Educational Research, 24(2), 206–226. https://doi.org/10.26803/ijlter.24.2.11

Ni'mah, N. T., & Marlina, R. (2021). Eksplorasi etnomatematika pada Monumen Tugu Kebulatan Tekad. JIPMat, 6(1), 76–84. https://doi.org/10.26877/jipmat.v6i1.8018

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. International Journal of Qualitative Methods, 16(1), 1–13. https://doi.org/10.1177/1609406917733847

NU Online. (2026, 21 Februari). Monumen Tugu Garuda di Pamekasan, saksi bisu perjuangan Laskar Hizbullah dan Sabilillah. https://www.nu.or.id/daerah/monumen-tugu-garuda-di-pamekasan-saksi-bisu-perjuangan-laskar-hizbullah-dan-sabilillah-PRa9o

Nurul, H. (2023). Pengembangan modul pembelajaran IPS materi sosial budaya berbasis kearifan lokal. MUBTADI: Jurnal Pendidikan Ibtidaiyah, 4(2), 162–176. https://doi.org/10.19105/mubtadi.v4i2.7117

OECD. (2023). PISA 2022 results (Volume I): The state of learning and equity in education. OECD Publishing. https://doi.org/10.1787/53f23881-en

OECD. (2026). PISA 2025 results (Volume I): Country notes – Indonesia. OECD Publishing. https://www.oecd.org/en/publications/pisa-2025-results-volume-i-country-notes_2d4ff9ea-en/indonesia_9c880f8a-en.html

opensource.petra.ac.id. (n.d.). Monumen Arek Lancor. Retrieved September 25, 2026, from https://opensource.petra.ac.id/~m26412037/guide/area.php?id_destination=6

Owusu-Darko, I., Sabtiwu, R., Doe, F., Owusu-Mintah, B., & Ofosu, E. K. (2023). Akan ethnomathematics: Demonstrating its pedagogical action on the teaching and learning of mensuration and geometry. Journal of Mathematics and Science Teacher, 3(2), Article em042. https://doi.org/10.29333/mathsciteacher/13281

Pathuddin, H., Kamariah, & Nawawi, M. I. (2021). Buginese ethnomathematics: Barongko cake explorations as mathematics learning resources. Journal on Mathematics Education, 12(2), 295–312. https://doi.org/10.22342/jme.12.2.12695.295-312

Patton, M. Q. (2015). Qualitative research & evaluation methods (4th ed.). Sage Publications.

Piaget, J. (1964). Part I: Cognitive development in children: Piaget development and learning. Journal of Research in Science Teaching, 2(3), 176–186. https://doi.org/10.1002/tea.3660020306

Prahmana, R. C. I., & D'Ambrosio, U. (2020). Learning geometry and values from patterns: Ethnomathematics on the batik patterns of Yogyakarta, Indonesia. Journal on Mathematics Education, 11(3), 439–456. https://doi.org/10.22342/jme.11.3.12949.439-456

Pririzki, S. J., Verlia, A., Nurdiani, S., & Amelia, R. (2020). Eksplorasi etnomatematika pada tudung saji sebagai ikon Bangka Belitung. Prosiding Seminar Penelitian dan Pengabdian pada Masyarakat, 20–23.

Putri, N. E., Mariana, N., & Cahapay, M. B. (2026). Ethnomathematics exploration of geometry concepts for grade V at the Surabaya Education Museum as a cultural heritage. Glocal Praxis in Elementary Education, 2(1).

Riadi, A., Turmudi, & Juandi, D. (2025). Pattern of ethnomathematics research towards historical buildings. Ethnomathematics Journal, 6(1), 1–17. https://doi.org/10.21831/ej.v6i1.78748

Richardo, R. (2017). Peran ethnomatematika dalam penerapan pembelajaran matematika pada kurikulum 2013. Literasi: Jurnal Ilmu Pendidikan, 7(2), 118–125.

Rosa, M., & Orey, D. C. (2016). State of the art in ethnomathematics. In M. Rosa, U. D'Ambrosio, D. C. Orey, L. Shirley, W. V. Alangui, P. Palhares, & M. E. Gavarrete (Eds.), Current and future perspectives of ethnomathematics as a program (pp. 11–37). Springer. https://doi.org/10.1007/978-3-319-30120-4_3

Rosa, M., & Orey, D. C. (2021). An ethnomathematical perspective of STEM education in a glocalized world. Bolema: Boletim de Educação Matemática, 35(70), 840–876. https://doi.org/10.1590/1980-4415v35n70a14

Rowlands, T., & Carson, R. (2002). Where would formal, academic mathematics stand in a curriculum informed by ethnomathematics? A critical review of ethnomathematics. Educational Studies in Mathematics, 50(1), 79–102. https://doi.org/10.1023/A:1020532926983

RRI. (2022, 4 November). Monumen Arek Lancor, simbol perjuangan melawan penjajahan Belanda. https://rri.co.id/daerah/78799/monumen-arek-lancor-simbol-perjuangan-melawan-penjajahan-belanda

Sirate, F. S. (2012). Implementasi etnomatematika dalam pembelajaran matematika pada jenjang pendidikan sekolah dasar. Lentera Pendidikan: Jurnal Ilmu Tarbiyah dan Keguruan, 15(1), 41–54.

Sugiyono. (2018). Metode penelitian kualitatif, kuantitatif, dan R&D. Alfabeta.

Sulistyani, A. P., Windasari, V., Rodiyah, I. W., & Muliawati, N. E. (2019). Eksplorasi etnomatematika rumah adat Joglo Tulungagung. Media Pendidikan Matematika, 7(1), 22–28.

Yunian Putra, R. W., & Indriani, P. (2017). Implementasi etnomatematika berbasis budaya lokal dalam pembelajaran matematika pada jenjang sekolah dasar. Numerical: Jurnal Matematika dan Pendidikan Matematika, 1(1), 9–14. https://doi.org/10.25217/numerical.v1i1.118

Zahroh, F., & Rizam, M. M. (2022). Kajian etnomatematika pada musik tradisional Ul-daul Madura. Proceedings of the 6th International Conference on Islamic Studies (ICONIS) 2022, 39–46. Institut Agama Islam Negeri Madura.

Zayyadi, M. (2017). Eksplorasi etnomatematika pada batik Madura. Sigma, 2(2), 35–40.

Zega, F. R. H., & Narpila, S. D. (2025). Etnomatematika: Pengenalan geometri bangun datar dan bangun ruang melalui bangunan bersejarah Tjong A Fie. Jurnal Pendidikan Matematika (Judika Education), 8(4), 530–545. https://doi.org/10.31539/8g4xp151