ETHNOMATHEMATICS IN ISLAMIC LOCAL WISDOM: A STUDY OF TRADITIONS AROUND MAULANA ISHAQ'S TOMB, LAMONGAN

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Abstract: *This study explores ethnomathematics in Islamic local wisdom in Kemantren Village, Lamongan Regency, focusing on Islamic traditions surrounding the tomb of Maulana Ishaq. Using qualitative descriptive methods through observation and literature review, this study examines mathematical elements embedded in the architecture of Maulana Ishaq's tomb, Al-Abror Mosque, heritage sites, and the Islamic cultural practices that have developed in the village. Data were collected through interviews, observations, and literature analysis involving ten participants, including religious figures, mathematics teachers, tomb caretakers, and local residents. The research findings reveal that the Muslim community in Kemantren has preserved advanced mathematical understanding through religious and cultural traditions, particularly in the context of Islamic rituals and local religious practices. This study provides an integrative framework for embedding Islamic cultural ethnomathematics into mathematics pedagogy and cultural heritage preservation.*

Keywords: *Ethnomathematics, Islamic Local Wisdom, Maulana Ishaq, Mathematics Education*

INTRODUCTION

Mathematics is a universal science that has developed across various cultures and civilizations. However, in the context of mathematics learning in Indonesia, there is a gap between formal mathematical concepts and the cultural reality of students' local contexts.[1] Mathematics learning that is too abstract and detached from students' life

[1] Inda Rachmawati, "Eksplorasi Etnomatematika Masyarakat Sidoarjo," *MATHEdunesa* 1, no. 1 (2012).

contexts leads to low motivation and conceptual understanding.[2] This condition requires a more contextual and meaningful learning approach for students.

Ethnomathematics, as the study of the relationship between mathematics and culture, offers a solution to these problems.[3] Ethnomathematics is defined as mathematics practiced by specific cultural groups, whether urban and rural communities, professional groups, or communities with specific cultural backgrounds.[4] The ethnomathematics approach enables the integration of formal mathematic with local wisdom, making learning more relevant and meaningful.[5]

Indonesia, with its diversity of cultures and religious traditions, holds a wealth of ethnomathematics that has not been extensively explored.[6] Ethnomathematics research in Indonesia has been conducted in various contexts, such as traditional games,[7] batik,[8] and traditional house architecture.[9] However, ethnomathematics research in the context of Islamic local wisdom, particularly related to religious sites, remains limited.

Lamongan Regency, specifically Kemantren Village, possesses a wealth of Islamic local wisdom centered on the tomb of Maulana Ishaq, one of the propagators of Islam in East Java in the 15th century. This tomb complex functions not only as a religious site but also as a center of cultural activities rich in mathematical values. The architecture of the tomb building, Al-Abror Mosque, Maulana Ishaq's heritage sites, geometric ornaments, as well as the religious traditions that have developed contain mathematical concepts practiced from generation to generation.

Research on ethnomathematics in the Islamic context in Indonesia is still limited. Several ethnomathematics studies include research on ethnomathematics in the architecture of the Demak Grand Mosque and found geometric concepts in mathematics.[10] Ethnomathematics in Islamic inheritance distribution.[11] And

[2] Yati Utami, "FAKTOR-FAKTOR YANG MEMPENGARUHI RENDAHNYA PEMAHAMAN KONSEP MATEMATIKA PADA SISWA SD Yati," *DIKMAT: Jurnal Pendidikan Matematika* 06, no. 01 (2025): 17–21.
[3] M. Rosa and D. C. Orey, "State of the Art in Ethnomathematics," *In Current and Future Perspectives of Ethnomathematics as a Program*, 2016, 11–37.
[4] Ubiratan D'Ambrosio, "Ethnomathematics and Its Place in the History and Pedagogy of Mathematics," *For the Learning of Mathematics* 5, no. 1 (1985): 44–48.
[5] Atje Setiawan Abdullah, "Ethnomathematics in Perspective of Sundanese Culture," *Journal on Mathematics Education* 8, no. 1 (2017): 1–16.
[6] Irma Risdiyanti and Rully Charitas Indra Prahmana, "Ethnomathematics: Exploration in Javanese Culture," *In Journal of Physics: Conference Series* 943, no. 1 (2017): 012032.
[7] (Zaenuri & Dwidayanti, 2018)
[8] Fatus Atho'ul Malik, "Analysis of Students ' Creative Thinking Skills in Mathematics Learning with The Application of Ethnomathematics of Batik Sendang," *Jurnal Cendekia: Jurnal Pendidikan Matematika* 09, no. 01 (2025): 122–36.
[9] A. P. Sulistyani et al., "Eksplorasi Etnomatematika Rumah Adat Joglo Tulungagung.," *Media Pendidikan Matematika* 7, no. 1 (2019): 22–28.
[10] Ibnu Jamalul Lail, Dyana Wijayanti, and Imam Kusmaryono, "Eskplorasi Etnomatematika Dan Filosofi Nilai-Nilai Islam Pada Masjid Agung Kauman Semarang," *Jurnal Pendidikan Sultan Agung Volume* 1, no. 1 (2021): 16–25.
[11] Pusfitasari Ika, Agung Hartoyo, and Asep Nursangaji, "Eksplorasi Konsep Matematika Dalam Sistem Hukum Waris Islam Masyarakat Semudun.," *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa (JPPK)* 8, no. 10 (2017).

ethnomathematics in mosque architectural design that integrates Islamic geometric art.[12] Previous ethnomathematics research in Indonesia has focused on batik, traditional houses, and games, but not on Islamic religious heritage sites that combine geometry, architecture, and rituals.

This research is essential for uncovering and documenting the mathematical knowledge embedded within Islamic local wisdom in Kemantren Village. Beyond contributing to the ethnomathematics literature, this study holds practical implications for developing culturally-responsive mathematics pedagogy and cultural heritage preservation initiatives. Given this context, this research pursues three primary objectives: (1) to identify and analyze mathematical elements embedded in the architecture of Maulana Ishaq's tomb, Al-Abror Mosque, and associated heritage sites; (2) to explore ethnomathematical practices within the religious traditions of the Kemantren Village community; and (3) to provide evidence-based recommendations for integrating ethnomathematics in Islamic local wisdom to mathematics learning.

METHODS

This study employs a qualitative approach with descriptive research design. The qualitative approach was selected as this research aims to explore and comprehensively understand the phenomenon of ethnomathematics within the context of Islamic local wisdom. Descriptive research is utilized to describe and interpret mathematical elements present in the architecture and religious traditions surrounding Maulana Ishaq's tomb.

The research was conducted in Kemantren Village, Paciran District, Lamongan Regency, East Java, focusing on the Maulana Ishaq tomb complex area, Al-Abror Mosque, and heritage sites. The study was carried out in 2024, encompassing the commemorative period of *Maulana Ishaq's haul* (death anniversary) to comprehensively observe religious traditional practices.

The research subjects comprised ten individuals selected through purposive sampling based on the criterion of possessing comprehensive knowledge of Maulana Ishaq's history and local traditions, consisting of: two local religious figures, two administrators of Al-Abror Mosque, two tomb caretakers *(juru kunci)* of Maulana Ishaq's tomb, two local residents, and two mathematics teachers from schools in proximity to the research site.

Direct observations were conducted on the architectural structures of Maulana Ishaq's tomb, Al-Abror Mosque, and heritage sites, as well as the community's religious traditional practices. Observations were carried out using prepared observation guidelines and documented through photographs, videos, and field notes.

Interviews were conducted with research subjects using semi-structured interview guidelines. The interviews aimed to elicit information regarding the history and symbolic meanings of architectural structures, heritage sites, and religious traditional practices

[12] Zulfikar Taqiuddin and Siti Zulfa Yuzni, "Etnomatematika Dalam Perancangan Arsitektur Masjid: Integrasi Seni Geometri Islami Dalam Arsitektur Mesjid Harun Keuchik Leumik Banda Aceh," *Jurnal Serambi Engineering* 9, no. 2 (2024).

containing mathematical elements, as well as the community's perspectives on the relationship between mathematics and culture.

RESULTS AND DISCUSSION

Ethnomathematics in the Architecture of Maulana Ishaq's Tomb and Al-Abror Mosque

Based on observational findings, multiple mathematical elements are embedded within the architectural structures of Maulana Ishaq's tomb and Al-Abror Mosque. These findings indicate that the mathematical knowledge of communities develops according to their cultural needs, where regular geometric forms emerge and are passed down from generation to generation without being taught formally.[13] The identification of these geometric forms corroborates the proposition that architectural elements in traditional buildings frequently embody systematic geometric structures, although such mathematical principles may not have been explicitly articulated by their original designers.[14]

The architecture structures of Maulana Ishaq's tomb and Al-Abror Mosque demonstrates the application of mathematical concepts through the utilization of diverse geometric forms. These geometric patterns reflect design activities that demonstrate that the ability to create forms and patterns is a natural part of the richness of every culture.[15] The application of these geometric forms serves not merely as decorative elements, but also reflects structural principles and mathematical regularity.[16]

Various plane figure concepts such as squares, rectangles, circles, and triangles are discernible in both structures.

1. The ceiling design of Maulana Ishaq's tomb exhibits geometric configurations comprising squares and triangles, as illustrated in Figure 1.

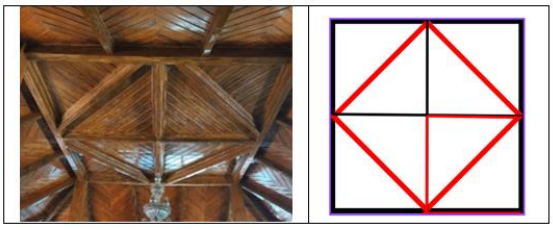

Figure 1. Ceiling Design of the Tomb and Its Illustration

2. The ceiling design of Al-Abror Mosque exhibits geometric configurations comprising squares, circles, and triangles, as illustrated in Figure 2.

[13] Milton Rosa et al., *Current and Future Perspectives of Ethnomathematics as a Program ICME-13 Topical Surveys*, *Current and Future Perspectives of Ethnomathematics as a Program*, 2016.
[14] U D'Ambrosio, *Ethnomathematics: Link between Traditions and Modernity* (Sense Publishers, 2006).
[15] Alan Bishop, *Mathematical Enculturation: A Cultural Perspective on Mathematics Education (Vol. 6)* (Springer Science & Business Media, 1991).
[16] A Fauzi and H Setiawan, "Etnomatematika: Konsep Geometri Pada Kerajinan Tradisional Sasak Dalam Pembelajaran Matematika Di Sekolah Dasar," *Didaktis: Jurnal Pendidikan Dan Ilmu Pengetahuan* 20, no. 2 (2020): 118–128.

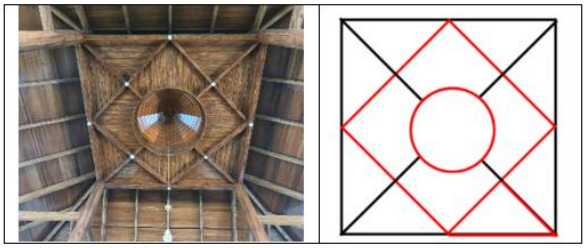

Figure 2. Ceiling Design of Al-Abror Mosque and Its Illustration

3. Rectangular shapes are also identified in several sections of both the mosque and the tomb, as illustrated in Figure 3.

Figure 3. Sections of the mosque and tomb that exhibit Rectangular shapes

4. The circle shape are prominently featured throughout the mosque and tomb structures, particularly in the design of Arabic calligraphy, as illustrated in Figure 4.

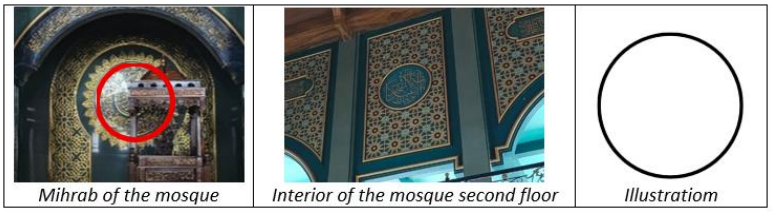

Figure 4. Sections of the mosque and tomb that exhibit circle and Its Illustration

Based on the identification of plane figure concepts in tomb and mosque architecture, several plane figure concepts were identified, such as squares, rectangles, triangles, and circles. The use of squares, rectangles, triangles, and circles in tomb and mosque architecture is not merely an aesthetic choice, but rather a manifestation of the concepts of "measuring" and "designing".[17]

The symmetry and proportion created from the combination of these figures demonstrate an implicit understanding of visual and structural balance. Geometric patterns in sacred architecture reflect "ethnomodelling," where communities encode their mathematical knowledge through culturally meaningful visual representations.[18]

[17] A Bishop, *Mathematical Enculturation, A Cultural Perpective on Mathematics Education* (Kluwer Academic Publishers, 1988).

[18] Milton Rosa and Daniel Clark Orey, "Ethnomodelling as a Research Lens on Ethnomathematics and Modelling," *International Perspectives on the Teaching and Learning of Mathematical Modelling* 6, no. 2 (2013): 117–27, https://doi.org/10.1007/978-94-007-6540-5_10.

Geometric patterns emerge as a response to Islamic cultural and religious needs, with emphasis on the transmission of knowledge through repetitive design practices.[19] Furthermore, geometric proportions also reflect an understanding of spatial efficiency and proportion, where geometric proportion systems function as "cultural tools" that are selected due to their resonance with values of simplicity and harmony in Islamic tradition.[20]

In addition to two-dimensional shapes, various three-dimensional geometric forms such as rectangular prism, cylinders, spheres, and pyramids were also identified in the architectural structures of Maulana Ishaq's Tomb and Al-Abror Mosque.

1. The roof structures of both the tomb and mosque feature a three-tiered quadrilateral pyramid configuration, as depicted in Figure 5. Based on interview findings, this three-tiered roof structure symbolizes the concepts of *Iman, Islam,* dan *Ihsan.*

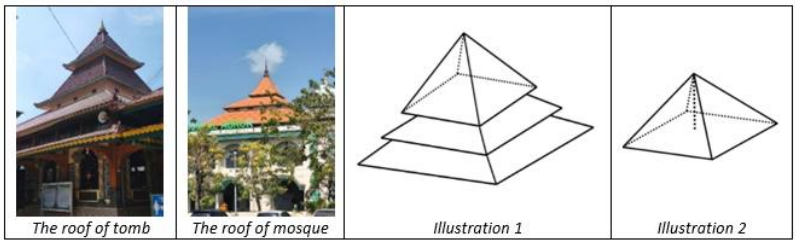

Figure 5. The roof structures of both the tomb and mosque and Its Illustration

2. The domes positioned at the corners of the mosque roof have a hemispherical shape, as illustrated in Figure 6.

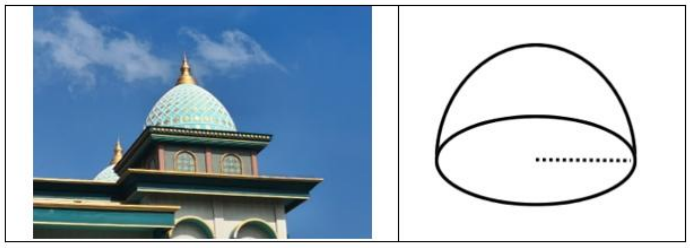

Figure 6. The domes of the mosque and Its Illustration

3. The main pillars of Maulana Ishaq's Tomb consist of four large pillars columns with a rectangular prism, as illustrated in Figure 7.

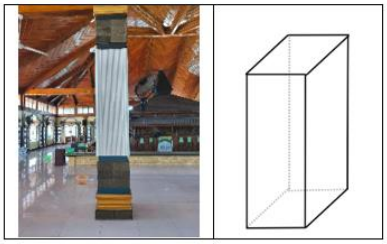

Figure 7. The main pillars of Maulana Ishaq's Tomb and Its Illustration

[19] Tia Purniati et al., "Ethnomathematics Study: Learning Geometry in the Mosque Ornaments," *International Journal on Advanced Science, Engineering and Information Technology* 12, no. 5 (2022): 2096–2104, https://doi.org/10.18517/ijaseit.12.5.17063.

[20] Loai M Dabbour, "Geometric Proportions: The Underlying Structure of Design Process for Islamic Geometric Patterns," *Frontiers of Architectural Research* 1, no. 4 (2012): 380–91.

4. The main pillars of Al-Abror Mosque consist of four large pillars with a cylinder, as illustrated in Figure 8.

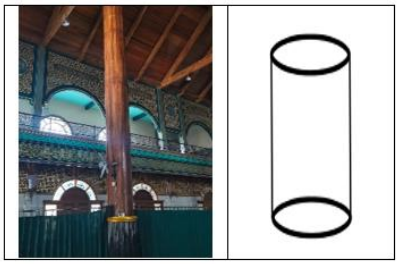

Figure 8. The main pillars of Al-Abror Mosque and Its Illustration

Based on the identification of solid figure concepts in tomb and mosque architecture, several solid figure concepts were identified, such as square pyramids, spheres, rectangular prisms, and cylinders. Three-dimensional architectural elements such as domes, arched portals, and mihrabs function as media for communicating spiritual meaning and religious hierarchy.[21]

The use of pyramids, structures that taper upward, mathematically creates a visual progression that symbolically represents the spiritual journey from *Iman* (faith) to *Ihsan* (excellence). This phenomenon represents "cultural mathematics in action," where abstract theological concepts are transformed into concrete geometric structures.[22]

In the architecture of the Al-Abror mosque, domes were also found as shown in Figure 6. Dome-shaped mosque buildings have flourished in the Islamic world and have become a symbolic expression of structure and identity of a mosque, playing an important role as a distinctive attraction.[23] Furthermore, the use of four rectangular prism pillars as the main structure of the tomb and four cylindrical pillars as the main structure of the mosque reflects an implicit understanding of load distribution and structural stability, a manifestation of "measuring" within the framework.[24]

Mathematical Concepts in Determining the Height of Al-Abror Mosque Minaret

The findings of this study indicate that mathematical concepts were also applied in determining the height of the Al-Abror Mosque minaret. The Al-Abror Mosque minaret has a height of 72 meters, as shown in Figure 9.

[21] Hadi Jaya Putra and Linda Octavia, "Exploring the Architectural Elements Meaning of Masjid Agung Kubah Timah in Pangkalpinang City," *RTEKS: Jurnal Teknik Arsitektur* 9, no. 3 (2024): 355–64.
[22] Milton Rosa, "Ethnomodeling: A Pedagogical Action for Uncovering Ethnomathematical Practices," *Journal of Mathematical Modelling and Application*, 2011.
[23] Cecep Supriatna and Sri Handayani, "Ungkapan Bentuk Dan Makna Filosofi Atap Masjid Raya Sumatera Barat, Padang, Indonesia," *Jurnal Arsitektur ZONASI* 4, no. 2 (2021): 307–16.
[24] Bishop, *Mathematical Enculturation, A Cultural Perpective on Mathematics Education*.

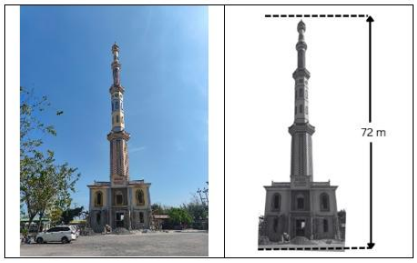

Figure 9. The Al-Abror Mosque minaret and Its Illustration

The 72-meter height of the Al-Abror Mosque minaret was not arbitrarily chosen but holds symbolic significance, representing the original planned height of 99 meters. The number 99 was selected to symbolize Asmaul Husna, the 99 names of Allah. The incorporation of numerically symbolic values has been a longstanding tradition in mosque construction. The primary purpose of employing such symbols, numbers, and geometry is to reflect religious principles through architectural language.[25]

Upon further examination from technical and structural safety perspectives, the 99-meter height was deemed excessively risky. Consequently, the minaret height was reduced to 72 meters, which remains a multiple of 9 (72 = 9 □ 8), thereby preserving its symbolic meaning while adhering to construction safety standards.

In this regard, the management of Al-Abror Mosque has applied mathematical concepts in determining the minaret height, specifically utilizing number patterns and sequences with multiples of 9, namely 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99. The understanding of number sequences and greatest common factors demonstrates mathematical literacy. This reveals that communities possess mathematical knowledge acquired intergenerationally and utilized in everyday life, despite not having received formal mathematical education. This evidences the existence of culturally-based mathematical literacy.[26]

This was confirmed by one of the informants who stated, *"Actually, the planned height of the mosque minaret was 99 meters, but because it was considered too risky, it was reduced to 72 meters... Initially, it was 99 meters, reduced by 9 to become 90. Then it was reduced again by 9, resulting in 72."*

Ethnomathematics in the Heritage Sites of Maulana Ishaq

1. *Bayang Gambang*
   Bayang Gambang is one of the artifacts believed to be a relic of Maulana Ishaq and is currently preserved in the Sunan Drajat Museum. The mathematical element present in *Bayang Gambang* is the concept of a rectangular shape that forms the base of the object, as illustrated in Figure 10.

[25] Bora Bingöl, Namiq Abbasov, and Shahla Abbasova, "'Symbols' as Expression Tools of Islam and Their Usage Methods in Palace Architecture," *Khazar Journal of Humanities and Social Sciences* 27, no. 1 (2024): 8–30, https://doi.org/10.5782/2223-2621.2024.27.1.8.

[26] Dewi Safina and Mega Teguh Budiarto, "Literasi Matematis Berbasis Budaya Sidoarjo Dalam Perspektif Etnomatematika," *MATHEdunesa* 11, no. 1 (2022): 12–25, https://doi.org/10.26740/mathedunesa.v11n1.p12-25.

Figure 10. *Bayang Gambang* and Its Illustration

2. *Sumur Sepaku* (Sepaku Well)
   Sumur Sepaku is a well believed to be a relic of Maulana Ishaq, characterized by a square configuration, as illustrated in Figure 11.

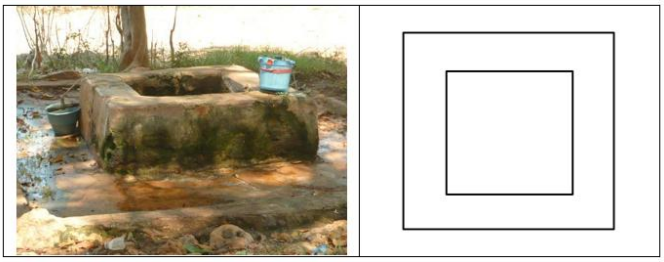

Figure 11. *Sumur Sepaku* and Its Illustration

3. *Sumur Sakencong* (Sakencong Well)
   Sumur Sakencong comprises twin wells situated in the middle of the sea with an approximate distance of 2 meters between them. The mathematical concepts present in *Sumur Sakencong* include plane figure concepts (squares and circles) and three-dimensional figure concepts (rectangular prisms and cylinders), as illustrated in Figure 12.

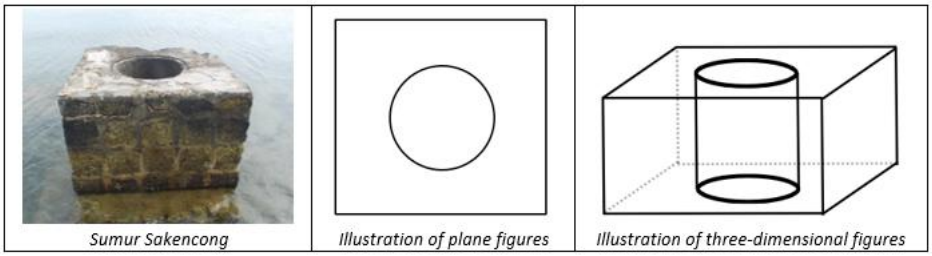

Figure 12. *Sumur Sakencong* and Its Illustration

4. *Jeding Ngaron*
   Jeding Ngaron is situated to the north of Maulana Ishaq's tomb as a replica of *Sumur Sakencong*. The mathematical concepts present in *Jeding Ngaron* include plane figure concepts (rectangles and circles) and three-dimensional figures concepts (rectangular prisms and spheres), as illustrated in Figure 13.

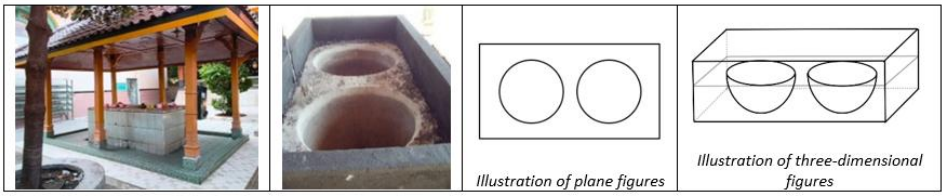

Figure 13. *Jeding Ngaron* and Its Illustration

The heritage sites of Maulana Ishaq as historical legacies possess high educational value in mathematics learning. Based on the identification results of these heritage sites, various concepts of plane figures and solid figures contained in their architectural structures were discovered. These geometric concepts can be utilized as contexts for mathematics learning through an ethnomathematical approach.[27]

The utilization of historical heritage sites as sources for mathematics learning provides several advantages. First, students can learn plane figure concepts contextually and based on local culture, particularly at the elementary school level.[28] This ethnomathematics-based learning facilitates students' understanding of mathematical concepts through concrete and meaningful historical artifacts.[29] Moreover, this approach simultaneously supports efforts to preserve cultural heritage for future generations.[30]

Based on observations, it was found that several heritage sites of Maulana Ishaq are currently difficult for the community to access, particularly *Sumur Sepaku* and *Sumur Sakencong*, which are located within corporate territory. These two wells are typically accessed by the community only during *napak tilas* activities in conjunction with *Maulana Ishaq's haul*.

Consequently, the integration of historical heritage sites into mathematics instruction becomes significant for teachers.[31] Beyond rendering learning more engaging and meaningful, this integration also serves as an effort to introduce and remind students that numerous heritage sites require preservation and should not be forgotten by students as the succeeding generation.[32]

Ethnomathematics in Religious Traditions

1. The Friday *Pon (Jumat Pon)* Night Tradition at Maulana Ishaq's Tomb

The administrators of Maulana Ishaq's tomb organize regular collective prayer *(istigasah)* programs every Friday *Pon (Jumat Pon)* nightThe selection of Friday *Pon* timing not only adheres to tradition but also reflects an understanding of the Javanese calendar system, which possesses unique mathematical characteristics.[33]

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[27] Sylviyani Hardiarti, "Etnomatematika : Aplikasi Bangun Datar Pada Candi Muaro Jambi," *Aksioma* 8, no. 2 (2017): 99–110.
[28] Ikawati Ikawati and Mahardika Darmawan Kusuma Wardana, "Konsep Bangun Datar Sekolah Dasar Pada Struktur Candi Pari Sidoarjo," *Jurnal Basicedu* 6, no. 5 (2022): 8188–98.
[29] Gunawan, "Konsep Geometri Bangun Datar Pada Artefak Dan Relief Candi Plaosan," *Jurnal Derivat: Jurnal Matematika Dan Pendidikan Matematika* 10, no. 3 (2023): 180–88, https://doi.org/10.31316/jderivat.v10i3.5544.
[30] Fitriyani Nursyeli and Nitta Puspitasari, "Studi Etnomatematika Pada Candi Cangkuang Leles Garut Jawa Barat," *Plusminus: Jurnal Pendidikan Matematika* 1, no. 2 (2021): 327–38, https://doi.org/10.31980/plusminus.v1i2.905.
[31] Astri Wahyuni, Ayu Aji Wedaring Tias, and Budiman Sani, "Peran Etnomatematika Dalam Membangun Karakter Bangsa," *Prosiding Seminar Nasional Matematika Dan Pendidikan Matematika FMIPA UNY*, 2013, 15.
[32] torang Siregar, *Integrasi Etnomatematika Dengan Kearifan Budaya Lokal* (Goresan Pena, 2025).
[33] Hauna Aurellia and Pauw Budianto, "Perbandingan Kalender Imlek Dan Kalender Jawa-Islam," *Jurnal Cakrawala Mandarin* 8, no. 2 (2024): 19, https://doi.org/10.36279/apsmi.v8i2.347.

The Javanese calendar system employs two concurrent cycles: a weekly cycle consisting of 7 days, and a market day cycle *(pasaran)* comprising 5 days, namely *Legi, Pahing, Pon, Wage, and Kliwon.*[34] The combination of these two cycles creates a distinctive temporal pattern utilized to determine the timing of activities or rituals.

From a mathematical perspective, the convergence of Friday in the 7-day cycle with Pon in the 5-day cycle generates a recurring pattern. The administrators of Maulana Ishaq's tomb comprehend that to reach the subsequent Friday Pon, a calculation of the Least Common Multiple (LCM) of 7 and 5 is required, yielding 35 days. This indicates that each *istigasah* programs every Friday *Pon* night activity recurs every 35 days, or approximately 5 weeks.

This mathematical understanding is essential for the administrators of Maulana Ishaq's in scheduling activities and ensuring the consistency of tradition implementation that has been transmitted across generations at Maulana Ishaq's tomb. Knowledge of such temporal cycles demonstrates how communities integrate mathematical logic into daily life.[35]

2. The *Nyunggi Talam* Tradition in Kemantren Village

The *"Nyunggi Talam"* tradition, also known as *"Malam Songolikuran"* constitutes a hereditary religious practice of the Kemantren Village community, conducted regularly on the 28th day of Ramadan after Asr prayer preceding the 29th night of Ramadan. Substantively, this activity represents a celebration of *khatmil Qur'an*, or the completion of reciting the entire Qur'an during the month of Ramadan. The term *"Nyunggi Talam"* derives from the Javanese language, referring to the practice of carrying trays containing food as an expression of gratitude and sharing with fellow congregants.

From a temporal system perspective, the implementation of this tradition adheres to the lunar calendar pattern, which is fixed and predictable. The community and organizing committee comprehend that this event will occur on the 28th of Ramadan annually, enabling the community to perform calculations and preparations well in advance.

Integration into mathematics learning can be implemented in measurement topics. For instance, "If Ramadan fasting in 2026 falls on February 18th, on what date will the *Nyunggi Talam* tradition in Kemantren Village be conducted?". The problem with using familiar cultural contexts to teach mathematical concepts. Culturally responsive mathematics instruction not only enhances mathematical understanding but also validates students' cultural knowledge, which is often marginalized.[36]

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[34] Khairul Fahmi Harahap, Amar Adly, and Watni Marpaung, "Perhitungan Weton Sebagai Penentu Hari Pernikahan Dalam Tradisi Masyarakat Jawa Kabupaten Deli Serdang (Ditinjau Dalam Persfektif 'Urf Dan Sosiologi Hukum)," *Al-Mashlahah: Jurnal Hukum Islam Dan Pranata Sosial Islam* 9, no. 02 (2021): 293–318, https://doi.org/10.30868/am.v9i0.

[35] H. Kurniawan et al., *Literasi Matematika Dalam Kehidupan Sehari-Hari* (PT. Green Pustaka Indonesia, 2025).

[36] Julia M. Aguirre and Maria del Rosario Zavala, "Making Culturally Responsive Mathematics Teaching Explicit: A Lesson Analysis Tool," *Pedagogies: An International Journal* 8, no. 2 (2013): 163–90.

In this context, students will learn mathematics while simultaneously becoming acquainted with the traditions and culture in their surroundings. This approach can enhance students' awareness to appreciate and value culture,[37] thereby cultivating positive attitudes toward mathematics.[38]

3. Mathematical Application in the Organization of *Maulana Ishaq's Haul*

The commemoration of *Maulana Ishaq's haul* constitutes a large-scale religious event involving lunar calendar calculations and complex organizational management. *Maulana Ishaq's haul* is conducted during the first ten days of *Muharram*, with the culminating event occurring on the 10th of *Muharram*, or the day of *Ashura*.

The planning process necessitates date conversion from the lunar calendar to the solar calendar to determine the precise timing of implementation within the context of the national calendar. This calendar conversion involves understanding the differences between lunar and solar calendar systems, wherein the Hijri year, based on the lunar cycle (354-355 days), is shorter compared to the solar-based year (365-366 days), resulting in Islamic celebration dates shifting approximately 10-11 days earlier each year in the solar calendar.[39] Although the national calendar currently incorporates significant Islamic dates, the capability to perform calendar conversion remains essential for long-term planning and coordination with various stakeholders.

The organization of the *Maulana Ishaq's haul* also involves mathematical applications for event success. One such application is the estimation of pilgrim numbers utilizing statistical data from previous years. This estimation method is crucial for anticipating facility requirements, spatial capacity, and necessary logistics.[40]

Based on these findings, it is demonstrated that the Muslim community in Kemantren Village has transmitted and maintained complex mathematical concepts through their religious traditions and local cultural practices. This preservation of mathematical knowledge is evident within the context of Islamic rituals and local religious practices that have been perpetuated across generations.[41] The integration of mathematical knowledge through cultural practices indicates that mathematics learning occurs not only in formal settings but is also embedded within the socio-religious life of the community.[42] This phenomenon corroborates that each community possesses unique approaches to developing and applying mathematical concepts in accordance with their cultural context.[43]

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[37] Rohim Andriono, "Analisis Peran Etnomatematika Dalam Pembelajaran Matematika," *ANARGYA: Jurnal Ilmiah Pendidikan Matematika* 4, no. 2 (2021), https://doi.org/10.24176/anargya.v4i2.6370.
[38] Aleksius Madu, "Merangkul Diversitas Budaya Melalui Matematika: Pendekatan Ethnomatematika Dalam Pembelajaran Matematika Di Sekolah," *Jurnal Riset Pembelajaran Matematika* 6, no. 1 (2024): 39–48, https://doi.org/10.55719/jrpm.v6i1.1097.
[39] Muhajir, "Sejarah Kalender Hijriyah," *Jurnal Cendekia Ilmiah* Vol.3, No., no. 5 (2024): 4598–4609.
[40] I Wayan Sudiarsa, "Literasi Meraih Sukses Dengan Pembelajaran Statsitika Di Era Industri 4.0," *Prosiding SENAMA PGRI* 1 (2019): 20–33.
[41] Rosa and Orey, "State of the Art in Ethnomathematics."
[42] Rachmawati, "Eksplorasi Etnomatematika Masyarakat Sidoarjo."
[43] Ubiratan D'Ambrosio, "An Overview of the History of Ethnomathematics," *In Current and Future Perspectives of Ethnomathematics as a Program*, 2016, 5–10.

Integration of Ethnomathematics in Mathematics Learning

1. Ethnomathematics Potential as a Context for Learning

Field observation results indicate that the integration of local wisdom surrounding Maulana Ishaq's tomb in mathematics learning is still rarely implemented by mathematics teachers. This condition contrasts with the substantial potential of ethnomathematical findings in Islamic local wisdom around Maulana Ishaq's tomb that can be utilized as mathematics learning resources in schools. The utilization of local cultural contexts in mathematics learning has been proven to enhance student motivation and conceptual understanding as the material becomes more relevant to students' lives.[44] Historical architectural contexts such as tombs and historic mosques can serve as bridges between formal mathematics and the living cultural reality in the community.[45]

The use of cultural artifacts as learning media enables students to observe direct applications of abstract mathematical concepts. For instance, the pyramid shape of building roofs can be utilized to introduce three-dimensional figure concepts, volume, and surface area in a more concrete and meaningful manner. Culture-based contextual learning aligns with constructivist principles that emphasize knowledge construction through authentic experiences.[46] The integration of local contexts in mathematics learning can also enhance students' mathematical literacy competencies as students learn to identify, comprehend, and apply mathematics in daily life.[47]

2. Development of Ethnomathematics-Based Learning Materials

The ethnomathematical identification findings in this research can be developed into various forms of learning materials, such as learning modules, student worksheets, or learning media. Ethnomathematics-based learning materials must be designed with careful attention to the alignment between cultural content and curriculum-based core competencies, ensuring that learning objectives are achieved while preserving local wisdom values.[48]

For instance, geometric concepts can be taught through observation and analysis of architectural structures in Maulana Ishaq's tomb and Al-Abror Mosque. Students can be tasked with identifying plane and three-dimensional figures, calculating area and volume, and comprehending existing geometric patterns.

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[44] Rosa and Orey, "State of the Art in Ethnomathematics."

[45] R. F. Rahmawati et al., "PENERAPAN PEMBELAJARAN ETNOMATEMATIKA MASJID AGUNG TUBAN UNTUK MENINGKATKAN KEMAMPUAN BELAJAR SISWA KELAS V MATERI VOLUME BALOK MELALUI KUBUS SATUAN.," *Pendas: Jurnal Ilmiah Pendidikan Dasar* 9, no. 04 (2024): 777–88.

[46] W. Widada et al., "Ethnomathematics and Outdoor Learning to Improve Problem Solving Ability," in *In International Conference on Educational Sciences and Teacher Profession (ICETeP 2018)* (Atlantis Press, 2019), 13–16.

[47] Uba Umbara and Didi Suryadi, "Re-Interpretation of Mathematical Literacy Based on the Teacher's Perspective," *International Journal of Instruction* 12, no. 4 (2019): 789–806.

[48] Dyara Atmy Febriyanti and Siti Quratul Ain, "Pengembangan Modul Matematika Berbasis Etnomatematika Pada Materi Bangun Datar Di Sekolah Dasar," *Jurnal Basicedu* 5, no. 3 (2020): 1409–16.

For number and arithmetic operations topics, the concept of multiples can be taught through the case of determining mosque minaret height that employs multiples of 9. The utilization of historic mosque contexts in geometry instruction can significantly enhance students' conceptual understanding.[49]

The development of contextual word problems can also be accomplished by leveraging religious traditions such as Friday *Pon* night tradition and *Nyunggi Talam*. Problems integrating cultural contexts not only train computational skills but also conceptual understanding and mathematics application in real life.[50]

3. Learning Strategies with an Ethnomathematical Approach

The implementation of ethnomathematics in learning requires specific strategies to be effective. One applicable approach is Problem-Based Learning (PBL), wherein students are confronted with problems related to local cultural contexts.[51] For example, students can be tasked with designing miniature mosque structures while considering geometric proportions and symbolic meanings as present in Al-Abror Mosque. Such approaches have proven effective in enhancing learning outcomes.[52]

Learning strategy can also be conducted through field visits to Maulana Ishaq's tomb and Al-Abror Mosque sites. Direct observational activities enable students to explore mathematical concepts contextually while becoming acquainted with the cultural heritage and Islamic history in their region. Such outdoor classroom learning can provide more enjoyable and meaningful learning experiences.[53] Outdoor learning models with ethnomathematical approaches can also enhance conceptual understanding.[54]

4. Implications for Students' Attitudes and Cultural Identity

The integration of ethnomathematics in instruction yields positive impacts not only on students' cognitive aspects but also on their affective aspects. Mathematics learning with local culture can provide the students' perception that mathematics is a

[49] Rachmawati, "Eksplorasi Etnomatematika Masyarakat Sidoarjo."
[50] J. A Bishop, "Mathematics Education in Its Cultural Context," *Educational Studies in Mathematics* 19 (1988): 179–91.
[51] Andika Arisetyawan et al., "Study of Ethnomathematics: A Lesson from the Baduy Culture," *International Journal of Education and Research* 2, no. 10 (2014): 681–88.
[52] Neza Agusdianita, Irfan Supriatna, and Yusnia Yusnia, "Model Pembelajaran Problem Based-Learning (PBL) Berbasis Etnomatematika Dalam Meningkatkan Hasil Belajar Mahasiswa," *Social, Humanities, and Educational Studies (SHES): Conference Series* 6, no. 3 (2023): 145–54, https://doi.org/10.20961/shes.v6i3.82317.
[53] Rony Zulfriman, Martin Kustanti, and Rezki Amelia, "Implementasi Metode Outdoor Learning Dalam Membentuk Lingkungan Pembelajaran Yang Efektif Dan Menyenangkan," *Jurnal Pendidikan Dan Riset* 2, no. 2 (2024): 70–76.
[54] Shadaqnas Dewarif Tri Anggoro, Rahmat Jumri, and Masri, "Lintasan Belajar Tentang Sistem Persamaan Linier Dengan Pendekatan Etnomatematika Menggunakan Outdoor Balinese Desa Panglipuran," *Seminar Nasional Silamparilis* 1 (2025): 24–38.

science that is relevant to student's lives.[55] Students who recognize that mathematics is embedded within their culture and traditions will develop more positive attitudes toward mathematics. A study has proven that Mathematics learning with local culture can reduce students' mathematics anxiety.[56]

The Ethnomathematics-based learning plays a crucial role in strengthening students' cultural identity. In the globalization era, younger generations often become alienated from their cultural roots. Through instruction that explores local wisdom, students not only learn mathematics but also recognize, appreciate, and preserve their cultural heritage.[57] This process enables students to develop and reinforce their cultural identity.[58] A robust cultural identity constitutes an essential foundation for students' personal and social development.[59] Furthermore, ethnomathematics learning can also cultivate multicultural awareness and attitudes of respect toward cultural diversity.[60]

CONCLUSION

This research identifies various ethnomathematical elements within Islamic local wisdom surrounding Maulana Ishaq's tomb in Kemantren Village, Lamongan Regency. The findings reveal that the Muslim community in Kemantren has preserved advanced mathematical understanding through religious and cultural traditions, integrated within historical architecture, heritage sites, and local Islamic ritual practices.

The architecture of Maulana Ishaq's tomb and Al-Abror Mosque exhibits concepts of plane and three-dimensional geometry, with minaret height determination employing the principle of multiples of 9. Sites such as *Bayang Gambang, Sumur Sepaku, Sumur Sakencong*, and *Jeding Ngaron* contain systematic geometric concepts. Within religious traditions, applications of Least Common Multiple (LCM) are found in *Friday Pon (Jumat Pon) Night Tradition*, calendar conversion in *Nyunggi Talam* and *Maulana Ishaq's Haul* traditions, and statistical methods in pilgrim estimation.

This research contributes to mathematics learning by demonstrating how Islamic local wisdom can function as a contextual bridge in mathematics learning while preserving cultural heritage. Furthermore, this study strengthens the relationship between Islamic cultural identity and STEM learning by demonstrating that mathematical knowledge is not

[55] Rosa and Orey, "State of the Art in Ethnomathematics."
[56] Sri Supiyati, Farida Hanum, and Jailani, "Ethnomathematics in Sasaknese Architecture," *Journal on Mathematics Education* 10, no. 1 (2019): 47–58, https://doi.org/10.22342/jme.10.1.5383.47-58.
[57] Niken Wahyu Utami, Suminto A. Sayuti, and Jailani, "Math and Mate in Javanese Primbon: Ethnomathematics Study," *Journal on Mathematics Education* 10, no. 3 (2019): 341–56, https://doi.org/10.22342/jme.10.3.7611.341-356.
[58] Khaerani Khaerani, Arismunandar Arismunandar, and Ismail Tolla, "PERAN ETNOMATEMATIKA DALAM MENINGKATKAN MUTU PEMBELAJARAN MATEMATIKA : TINJAUAN LITERATUR," *Ndonesian Journal of Intellectual Publication* 5, no. 1 (2024): 20–26.
[59] Musyarrafah Sulaiman Kurdi, "Urgensitas Pendidikan Islam Bagi Identitas Budaya (Analisis Kritis Posisi Efektif Pendidikan Sebagai Pilar Evolusi Nilai, Norma, Dan Kesadaran Beragama Bagi Generasi Muda Muslim)," *Indonesian Journal of Religion Center* 1, no. 3 (2023): 169–89.
[60] Yenny Puspita, "Pentingnya Pendidikan Multikultural," *In Prosiding Seminar Nasional Program Pascasarjana*, 2018, 285–91.

solely a Western construct but is deeply embedded within Islamic civilization and local Muslim traditions. By recognizing mathematical concepts within religious rituals, sacred architecture, and cultural practices, Muslim students can develop a sense of mathematical ownership and cultural pride, viewing mathematics as a discipline inherently connected to their religious and cultural heritage. This integration addresses the critical need for culturally responsive mathematics education that validates students' cultural identities while fostering mathematical literacy, potentially increasing Muslim students' engagement and persistence in mathematics learning by presenting mathematics as a discipline that resonates with their lived experiences and spiritual values.

Future research is recommended to develop ethnomathematics-based learning materials and explore other Islamic religious sites throughout the Indonesian archipelago.

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