p-ISSN: 2086-4280
e-ISSN: 2527-8827

Ethno-Mathematics in Minangkabau Indigenous Society

Rozi Fitriza[1*], Hurriyah[2], Dhiya Hadaina[3]

[1*]Tadris Matematika, UIN Imam Bonjol
Balai Gadang, Padang, Sumatera Barat, Indonesia
[1*]rozifitriza@uinib.ac.id

[2]Tadris Fisika, UIN Imam Bonjol
Balai Gadang, Padang, Sumatera Barat, Indonesia
[2]hurriyah@uinib.ac.id

[3]Applied Mathematics and Economics, Universiti Teknologi Brunei
Jalan Tungku Link Gadong BE1410, Brunei Darussalam
[3]dhiyahadaina11@gmail.com

Article received: 25-05-2024, revision: 04-06-2024, published: 30-07-2024

Abstrak

Minangkabau memiliki beberapa daerah desa adat yang dinamakan nagari. Studi etnomatematika pada unsur kebudayaan universal masyarakat adat diperlukan sebagai salah satu usaha pelestarian budaya sekaligus menjebatani budaya lokal dan pembelajaran matematika modern. Penelitian ini bertujuan mengkaji konsep matematis yang ada pada sistem mata pencarian, peralatan hidup dan teknologi serta penggunaannya dalam pembelajaran matematika. Penelitian menggunakan pendekatan kualitatif dengan desain penelitian etnomatematika Alangui. Penelitian dilaksanakan di Nagari Pariangan dan Nagari Sijunjung Provinsi Sumatera Barat. Informan penelitian ini adalah pemuka adat, cadiak pandai dan pelaku budaya. Teknik pengumpulan data yaitu observasi, wawancara, dokumentasi dan catatan lapangan. Analisis data dengan tahapan reduksi data, penyajian data dan membuat kesimpulan. Hasil penelitian menunjukkan pada sistem mata pencarian, peralatan hidup dan teknologi masyarakat adat Minangkabau terdapat konsep perbandingan, pengukuran dengan satuan tradisional, geometri transformasi, bangun ruang dan kalkulus serta optimasi. Aktivitas dan peralatan hidup serta teknologi dalam masyarakat adat di Minangkabau dapat digunakan sebagai konteks dalam pembelajaran matematika.
Kata Kunci: etnomatematika; masyarakat adat; sistem mata pencarian; sistem peralatan hidup; teknologi.

Abstract

Minangkabau has several traditional village areas called Nagari. Ethnomathematics studies on universal cultural elements of indigenous peoples are needed as an effort to preserve culture as well as bridge local culture and modern mathematics learning. This research aims to examine mathematical concepts that exist in livelihood systems, living equipment, and technology and their use in mathematics learning. The research uses a qualitative approach with an Alangui ethnomathematics research design. The research was conducted in Nagari Pariangan and Nagari Sijunjung, West Sumatra Province. The informants for this research are traditional leaders, clever cadiak, and cultural actors. Data collection techniques are observation, interviews, documentation, and field notes. Data analysis with stages of data reduction, data presentation, and conclusion. The results of the research show that in the livelihood system, living equipment, and technology of the Minangkabau indigenous people there are concepts of comparison, measurement with traditional units, transformation geometry, geometric shapes, and calculus and optimization. The activities and equipment of life and technology in indigenous communities in Minangkabau can be used as a context for learning mathematics.
Keywords: ethnomathematics; Indigenous peoples; livelihood systems; living equipment systems; technology.

I. INTRODUCTION

There are many different ethnic groups living in the archipelago of Indonesia. As a result, Indonesia has a rich cultural heritage. Koentjaranigrat defines culture as the whole system of thoughts, emotions, behaviors, and creations made by people in social situations as a result of learning (Syakhrani & Kamil, 2022). According to this viewpoint, culture can be in the form of ideas, activities and artifacts.

According to the conventional wisdom, mathematics is a field that is culture-free and unrelated to culture. Far removed from the events of human existence, mathematics is regarded as an ideal and unchanging science with objective facts (Turmudi, 2009). In fact, mathematics is an object discovered and created by humans, not falling by itself, but arising from activities whose objects are available and for the purposes of science and daily life (Turmudi, 2010).

Mathematical misconceptions have long been rectified. It is not new to view mathematics from a cultural perspective, according to mathematician Raymond L. Wilder's 1950 article, "The Cultural Basis of Mathematics." Similarly, White claimed that human civilization includes mathematics with all its facts and truths. The fact that D'Ambrosio started the ethno-mathematical program in 1985 supports the idea that mathematics is a cultural construct. An ethnomathematical program is a way to look for and examine how mathematical knowledge is produced, transmitted, diffused, and institutionalized in various cultural systems (Gerdes, 1996).

Ethnomathematics, as defined by Barton (1996), is the study of how individuals from different cultures comprehend, express, and apply ideas and customs that are culturally and mathematically generated. According to D'Ambrosio (1985) ethnomathematics aims to acknowledge that there are various approaches to mathematics while accounting for the mathematical knowledge that has been established inside a civilization. In line with this, Marsigit (2016) stated that ethno-mathematics serves to express the relationship between mathematics and culture.

Ethno-mathematics has also been studied in various ethnic and cultural groups in Indonesia. Such as research on ethnomathematics in the Kolaki community (Sirate, 2011), Badui community (Arisetyawan et al., 2014; Turmudi et al., 2016), the Dayak Tribe (Hartoyo, 2013; Hartono & Putra, 2022), Sidoarjo community (Rachmawati, 2012), Balinese community (Puspadewi & Putra, 2014; Darmayasa et al., 2018), Lampung community (Rakhmawati, 2016), Riau Malay community (Hasanuddin, 2017), Tasikmalaya community (Muslim & Prabawati, 2020; Prabawati & Muslim, 2022), Palembang community (Lisnani et al., 2020) Surakarta community (Astriandini & Kristianto, 2021) Malang community (Septia, Nuraini, & Wahyu, 2024), Garut community (Milpa, Puspitasari, & Mardiani, 2024). Research in ethno-mathematics demonstrates how Indonesian civilization has evolved intellectually.

One of the tribes that live on the island of Sumatra is the Minangkabau. There are numerous clans (matriclan), also known as tribes, among the Minangkabau, just like other groups. According to Fatimah (2012), the Minangkabau tribe has grown into 96 distinct tribes dispersed throughout the region. Darek (mainland), Pasisea (coastal), and Rantau are all parts of the Minangkabau area (Soeroto, 2005; Syamsidar, 1991). The province of West Sumatra is synonymous with Minangkabau regarding the current notion of governance. The Indonesian Ocean borders West Sumatra to the west, North Sumatra province to the north, Bengkulu and Jambi provinces to the south, and Riau province to the east.

As a typical Indonesian tribe, the Minangkabau has a lot of traditional values and traditions. There has also been ethno-mathematics research on Minangkabau cultural practices and artifacts. Research on songket (Syahriannur, 2019), rumah gadang (Fauziah & Niniwati, 2017; Fitriza et al., 2017; Fitriza et al., 2019) , and ethno-mathematics in the process of purchasing and selling livestock "marosok" (Mardia & Turmudi, 2019).

In ethnomathematics research, Bishop outlines three primary methods to analyze mathematical knowledge in traditional societies, namely: a) Investigating mathematical knowledge in traditional cultures. This has been done in anthropological approaches that reveal the uniqueness of certain knowledge and practices. Therefore, the language factor is considered very important to be studied in this research, b) Investigating mathematical knowledge in non-Western societies. This approach is more historical in nature, emphasizing the analysis of historical documents, c) Investigating the mathematical knowledge of several different groups in one society. This research emphasizes socio-psychological, focusing on describing how certain mathematical knowledge is related to the practices of several socially formed groups (Gerdes, 1996).

Ethnomathematics teaching approach (ETA) is an approach used to explain the reality of the relationship between cultural environment and mathematics when teaching (Wibawa, Nurhikmayati, & Kania, 2024). For the purpose of the study, ETA is defined as the use of an educator's immediate and close environment in teaching mathematics. ETA is an approach that translates foreign or euro-centric mathematics to fit learners' backgrounds and environments for meaningful teaching and learning (Achor et al., 2009). The integration of mathematics and culture in learning supports education for sustainable development (ESD). According to UNESCO, ESD aims to promote learning while respecting the natural and traditional knowledge of a culture, and even natural views and perspectives should be integrated into educational programs at all relevant levels (Fitriza, 2024).

Based on the explanation above, there is potential to explore the mathematical aspects of the seven universal cultural aspects which include: religious systems and religious ceremonies, community systems and organizations, knowledge systems, languages, arts, livelihood systems, and systems of living equipment and technology in indigenous village communities in West Sumatra, especially the traditional villages of Pariangan and Sijunjung. These traditional villages are hereinafter referred to as nagari as per West Sumatra provincial regulation Number 7 of 2018.

This article discusses ethno-mathematics in the aspects of livelihood systems and living equipment and technology systems. The livelihood system is related to the economy of a community group to meet their needs. While the system of living equipment and technology is seen by anthropologists as a physical culture. In maintaining life, humans will make equipment or objects with simple forms and technology. This system of equipment and technology is closely related to the knowledge system owned by a group of people (Syakhrani & Kamil, 2022).

This research endeavors to facilitate the documentation and preservation of traditional mathematical practices that are part of indigenous cultures. The findings of ethno-mathematics research have the potential to be incorporated into the formal education curriculum, thereby ensuring that the younger generation acquires mathematical knowledge from both a Western and a local cultural perspective. The integration of ethno-mathematics research serves as a conduit between contemporary scientific knowledge and indigenous wisdom, a phenomenon that is advantageous not only for indigenous communities but also for the broader community. It fosters a deeper comprehension of the significance of diversity and cultural values in the construction of a sustainable civilization.

II. METHOD

To uncover ethno-mathematics in the cultural components of the livelihood systems, living equipment, and technological systems of the indigenous village communities of Nagari Pariangan and Sijunjung, a qualitative approach utilizing ethnographic methods was employed in this study. This study's research design is based on Alangui's (2010) ethno-mathematics research framework. The following four key questions (Table 1) served as the foundation for the research:

Table 1.
Research Design

Generic Question	Initial Answer	Critical Construct	Specific Activity
Where to look?	Living systems and technologies of indigenous peoples of Pariang-an and Sijunjung	Universal cultural elements	Interviews with cultural actors Describe evolving and significant tools and technologies
How to look?	Investigate quantitative, relational and spatial (QRS)	Alterity	Determine the idea of QRS in the living tools and technology system.
What it is	Evidence of alternative conception	Philosophical mathematics	Identify mathematical concepts in living systems and technology.
What it means?	Important for culture and	Anthro-pological Methods	Describe the relationship between the two knowledge

Generic Question	Initial Answer	Critical Construct	Specific Activity
	mathematics		systems of mathematics and culture.

Since the social situation is identified as the subject of the study, it is a crucial component in qualitative research. The objects and participants in this study are chosen based on the three elements of the social situation: place, actors, and activities. This study was carried out at Nagari Sijunjuang, a traditional village in the overseas region, and Nagari Pariangan, the ancestral home of the Minangkabau people. Technology, living equipment, and livelihood systems are examples of cultural elements that are observed. Based on the cultural aspects observed, the study's informants are cultural actors in each of the cultural components examined, as well as traditional leaders (ninik mamak) and community leaders (cadiak pandai).

This study employs a number of data collection methods, including field notes, documentation, interviews, and observation. Both organized and unstructured interviews were employed in this study. Guidelines for conducting interviews are used to get information from research informants. Qualitative observation is naturalistic when used in an event's natural setting, where the actors naturally interact and go with the flow of everyday life. In order to observe the cultural elements that are the subject of the study, observation is outfitted with observation guidelines. Written books and documents that offer thorough historical perspectives are also used. Field notes are written records of everything the researcher sees, hears, feels, and considers while gathering and evaluating research data. The initial data recording stage, the record expansion stage, and the development stage over time are the three phases of the field note research process (Denzin & Lincoln, 2005), (Ritchie et al., 2003).

In qualitative research, data analysis is done before going into the field, in the field, and after leaving the field. Analyzing qualitative data involves ongoing tasks until the data is finished or saturated. Three steps comprise data analysis: data reduction/codification, data presentation, and data conclusion/verification.

III. RESULT AND DISCUSSION

A. Ethno-mathematics of livelihood systems and living equipment and technology systems of Nagari Pariangan

Farming is the Pariangan community's primary source of income. The first step in traditional farming is the use to plougplowfield. An instrument known as a palindih is used to level the field after it has been plowed. The bamboo used to make palindih has a 5 to 7 cm diameter and a length of 120 cm (sadapo siku) or sakalawang. The palindih cannot level the land correctly if the bamboo's diameter exceeds 7 cm. Pariangan has closer planting distances for rice than other places. Twenty centimeters is the planting distance. The Pariangan community's choice of this distance demonstrates a localized awareness of spatial efficiency, resulting in a more plentiful harvest.

A kungkuang is a tool used to irrigate rice fields. Kungkuang allocates water based on the quantity of seeds sown or the size of watered rice fields. The niniak mamak (traditional leaders) select the size of the kungkuang based on the soles of the "tuo banda's" feet. As seen in Figure 1, kungkuang is now made of cement instead of wood, as it was in the past.

Figure 1. Kungkuang.

Mairiak is used to separate the stalk and paddy during harvest. The ideas of direct and inverse proportional are applied to the Mairiak tool. The relationship between pressure and force is direct, but the relationship between pressure and surface area is inverse. A large force will be produced when pressure is applied to a thin surface (Figure 2(a)). In contrast, the force generated will be little if the pressure is applied to a large area, as seen in Figure 2(b). Because tool (a) makes separating the rice from the stalk easier, farmers prefer to use it. It is easier to use an object that has a smaller surface area and generates more pressure (Mailili et al., 2023).

Figure 2. Mairiak tool.

There are two methods for exchanging rice field results: manyudui and manyalang. The rice fields are split between the landowners and the rice field cultivators under the manyudui method. Under the manyalang technique, the person who cultivates the rice fields owns the crop. With extra profit-sharing clauses, the landowner receives a fourth of the produce if the individual who *menyudui* possesses capital (fertilizers, seeds). Aleh lapiak, an extra harvest, is given to the individual who cultivates or menyudui (as much as 1 katidiang = 40 sukek = 44 liters). The landowner receives extra katidiang contents (up to one-third of the total katidiang, or as much as the landowner can tip).

Traditional units are used in farming-related activities. Body-based units and the dimensions of the rumah gadang pieces are used in the design of agricultural implements like palindih, kungkuang, and katidiang (Fitriza et al., 2019). According to Kaaronen et al. (2023), body-based units might still be superior to conventional systems in certain areas, such ergonomic technology design.

In addition to farming, Pariangan people also manufacture batik as stamped batik is being made. In creating the batik designs on the fabric, the batik artist applied the concepts of symmetry and mirroring/reflection. The batik maker utilizes thick cardboard sheets as a mirror to ensure that the final design is acceptable and balanced. Whereas 1) if P is not a mirror, the mirror is perpendicular and cuts the line segment PP' (written Mj: P P' with j being the mirror line), 2) if P is a mirror, then P' equals P. This is how reflection maps point P to point P'.

The idea of translation is used in creating stamped batik (Figure 3) in addition to the theory of reflection. Two points P and Q are transformed into P' and Q' by a process called translation, which makes PP' = QQ' and PQ = P'Q'. The distance and direction of each comparable point are identical.

The batik method depicted in Figure 3 employs the symmetry principle of type W1, which excludes rotational and reflectional symmetry and solely employs translational symmetry (Mulyani & Natalliasari, 2020).

Figure 3. The Batik Process.

There are 25 batik motifs that were created from ancient manuscript illuminations, according to the findings of Irwan Malin Basa's research (2019) on the growth of creative industries in Pariangan. The surau Parak Laweh Pariangan contains the ancient manuscripts under study.

Cloth, shawls, shirts, prayer mats, tablecloths, mukena, and other souvenirs embellished with batik, such as wall hangings and key chains, are among the many Pariangan batik products that have been created. Examples of batik designs that have been transformed into different batik goods are shown in Figure 4.

Figure 4. Pariangan Batik Motif.

B. Ethno-mathematics of livelihood systems and living equipment and technology systems of Nagari Sijunjung

Most of the Nagari Sijunjung community's income comes from farming, which aligns with the region's geographic characteristics, scientific proficiency, and social milieu. Of the total population, around 85% are farmers, 10% are civil servants, and 5% are business owners.

Although rice is the primary produce of this region, the outcomes are solely for local consumption. The small area of paddy fields and conventional processing methods are to blame for this. These days, being an Indonesian migrant worker (TKI) is a new trend among young individuals who have completed senior high school. Furthermore, several of them are employed in other areas as local plantation or manufacturing workers.

The Nagari Sijunjung community cultivates agricultural land using the following tools as part of their livelihood as farmers.

Figure 5. Paghau-Paghau.

Paddy fields are flattened with pagau-paghau (figure 5). The Nagari Sijunjung community's local knowledge is reflected in this traditional instrument, which increases farm productivity. This tool's use demonstrates how basic technology has been adapted to meet the demands of Minangkabau's rural communities. According to Tanzei et al. (2012), traditional agricultural technologies are frequently founded on basic ergonomic principles that allow fabor efficiency without relying on pricey contemporary gear.

Figure 6. Tajak/Sudu.

There are intriguing scientific ramifications to the tajak or sudu (Figure 6) with long stalks in rice fields. This tool uses the lever principle, a physics concept in which the length shaft lengthses the force to make the work lighter (Arifi et al., 2021). By reducing the energy needed to cultivate the land, combining a long shaft and a sudu design demonstrates work optimization. This illustrates how local communities have incorporated scientific ideas into the instruments they use daily for farming.

In addition to being functional, the design of the rice-pounding tool Losuang batapak (figure 7) embodies aesthetic and cultural qualities. The community's comprehension of the effectiveness of manual rice milling is demonstrated by the elliptical paraboloid form of its interior. In addition to their economic worth, traditional Minangkabau implements like this losuang also serve as symbols of cultural identity. Lesung is used differently in the Malay area of Riau. Lesung has a concave container in the center and is constructed of huge wood that resembles a boat (Zulfah et al., 2023).

The losuang batapak's conical and paraboloid designs help maximize the impact effects by directing the impact energy optimally to the center. This design demonstrates the merging of art and function in traditional Minangkabau instruments and is consistent with the geometric principles of Minangkabau culture.

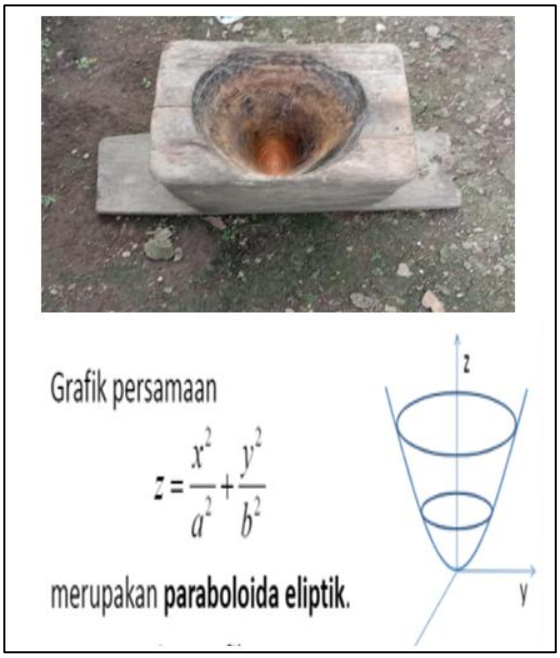

Figure 7. Losuang Batapak.

Made from loso wood, kalintuang is a sound fastened to a cow or buffalo's neck. The kalintuang's skeleton resembles a pyramid's frustum. Three tiny, varying-sized pieces of wood make up the interior. Every cow or cow has a unique kalintuang sound.

The Kalintuang skeleton's pyramid-shaped frustum demonstrates both practicality and attention to detail. This structure reflects the balance between a conventional tool's functionality and appearance by enabling optimal sound dispersal and enhancing the distinctive noises that define each animal (Bitin et al., 2023).

Figure 8. Kalintuang.

Problem-based learning can be applied to concepts like water distribution, planting distance, and conventional measurement. D'Ambrosio (2001) posited that local cultural contexts have the potential to enhance students' comprehension of formal mathematics while fostering respect for their own culture (Fitriza, 2024).

In the classroom, agricultural implements can serve as a backdrop for comparative education. Because measuring, comparison, and geometry are concepts found in traditional agrarian implements, pupils are motivated to learn mathematics because it applies to everyday life (Padang & Lubis, 2023). It has been demonstrated that including ethno-mathematics of agricultural activities in assessment problems enhances students' numeracy abilities (Salsabila et al., 2023). When learning calculus (the volume of a solid) and slicing solids, losuang and kalintuang can be utilized as context.

Culturally contextualized transformation geometry instruction has been shown to enhance geometric thinking abilities (Fitriza et al., 2022), mathematical abilities (concepts, communication, connections) as well as critical thinking skills and mathematical literacy (Nursanti et al., 2024).

IV. Conclusion

The indigenous people of Sijunjuang and Nagari Pariangan primarily depend on farming for their livelihood, for the basic technologies and living equipment to be created as agricultural implements. The concepts of directly and inversely proportional are prevalent in agrarian instruments and activities. The allocation of crops and tools using conventional units. Agricultural tools apply the work optimization idea. The indigenous people of Pariangan also manufacture batik. Other shapes include the frustum of a pyramid and the paraboloid ellipsoid. The concept of transformation geometry is applied in batik projects. Learning proportions, measurement, geometry, calculus, and solids can be framed by the findings of the investigation of ethno-mathematics in the indigenous peoples' technology, livelihood system, and living tools in Minangkabau.

The findings of this research make an important contribution to the preservation of local culture by revealing the mathematical concepts contained in the daily life of the Minangkabau indigenous people. Moreover, this research contributes to the development of mathematics education that is contextual and relevant to students' cultural backgrounds. The findings can serve as a basis for designing more meaningful and inclusive mathematics learning resources, which not only strengthen students' understanding of mathematical concepts but also increase their cultural awareness. Consequently, this study proposes that future scholars develop mathematics learning resources that take into account the universal cultural characteristics of indigenous communities.

Acknowledgement

The funding and successful execution of this research are made possible by LPPM UIN Imam Bonjol Padang. We also thank everyone who participated in this study as an informant.

References

Achor, E. E., Imoko, B. I., & Uloko, E. S. (2009). Effect of Ethnomathematics Teaching Approach on Senior Secondary Students' Achievement and Retention in Locus. *Educational Research and Reviews*, *4*(8), 385–390.

Alangui, W. V. (2010). *Stone Walls and Water Flows: Interrogating Cultural Practice and Mathematics. Doctoral Disertation.* Auckland, New Zealand: University of Auckland.

Arifi, M. F., Lesmono, A. D., & Handayani, R. D. (2021). Analisis Konsep Fisika pada Penggunaan Alat Pertanian Cangkul oleh Petani sebagai Bahan Pembelajaran Fisika. *Jurnal Pembelajaran Fisika*, *10*(3), 121–129. https://doi.org/10.19184/jpf.v10i3.25563

Arisetyawan, A., Suryadi, D., Herman, T., & Rahmat, C. (2014). Study of Ethnomathematics: A lesson from the Baduy Culture. *International Journal of Education and Research*, *2*(10), 681–688.

Astriandini, M. G., & Kristanto, Y. D. (2021). Kajian etnomatematika pola Batik Keraton Surakarta melalui analisis simetri. *Mosharafa: Jurnal Pendidikan Matematika*, *10*(1), 13-24. https://doi.org/10.31980/mosharafa.v10i1.637

Barton, W. D. (1996). *Ethnomathematics: Exploring Cultural Diversity in Mathematics*. Thesis for Doctor of Philosophy in Mathematics Education. University of Auckland: Unpublished.

Basa, I. M. (2019). Pengembangan Industri Kreatif dari Iluminasi Naskah Kuno Pariangan: Studi Motif Batik Pariangan Sumatera Barat. *Jurnal Manassa*, *9*(2), 1–10.

Bitin, M. B., Amsikan, S., & Ahzan, Z. N. (2023). Eksplorasi Etnomatematika pada Alat Musik Tihar dan Permainan Tradisional Biu di Desa Lakanmau Kabupaten Belu. *MATH-EDU: Jurnal Ilmu Pendidikan Matematika*, *8*(2), 148–155. https://doi.org/10.32938/jipm.8.2.2023.148-155

D'Ambrosio, U. (1985). Ethnomathematics and Its Place in the History and Pedagogy of Mathematics. *International Journal of Mathematics Education*, *5*(1), 44–48.

Darmayasa, J. B., Wahyudin, W., & Mulyana, T. (2018). Ethnomathematics: The use of multiple linear regression Y =b1 X +b2 X + e in traditional house construction Saka Roras in Songan Village. *Journal of Pysics: Conf. Series*, *948*, 1–5. https://doi.org/10.1088/1742-6596/948/1/012076

Denzin, N. K., & Lincoln, Y. S. (Eds). (2005). *The SAGE Handbook of Qualitative Research. Third Edition*. Thousand Oaks California: SAGE Publications.

Fatimah, S. (2012). Gender dalam Komunitas Masyarakat Minangkabau: Teori, Praktek dan Ruang Lingkup Kajian. *Jurnal Ilmiah Kajian Gender*, *2*(1), 10–24. https://doi.org/10.15548/jk.v2i1.37

Fauziah, N., & Niniwati, N. (2017). Ethno-mathematics Exploration on the Carvings of Rumah Gadang in South Solok Regency of West Sumatera. *Jurnal IJRDO-Journal of Educational*, *2*(11), 134–148.

Fitriza, R. (2024). Ethnomathematics di Minangkabau (Eksplorasi & Penerapan dalam Pembelajaran). *Jakarta: Yayasan Berkah Literasi Jaya*, *1*, 164.

Fitriza, R., Afriyani, D., Turmudi, M., & Juandi, D. (2017). The Exploration of Ethno-Mathematics Embedded on Traditional Architecture of Rumah Gadang Minangkabau. *Advances in Social Science, Education and Humanities Research (ASSEHR)*, *160*.

Fitriza, R., Desmaniati, E., & Kudus, H. F. (2022). Kemampuan Berfikir Geometri Peserta Didik Kelas IX dalam Pembelajaran dengan Pendekatan Etnomatematika. *Axiom: Jurnal Pendidikan Dan Matematika*, *11*(2), 107–115. https://doi.org/http://dx.doi.org/10.30821/axiom.v11i2.11422

Fitriza, R., Turmudi, M., Juandi, D., & Harisman, Y. (2019). Traditional measurement units: a study on the construction of rumah gadang of Minangkabau. *Journal of Physics. Conf. Series*, *1157*(4), 1–7.

https://doi.org/10.1088/1742-6596/1157/4/042123

Gerdes. (1996). *Ethnomathematics and Mathematics Education.* International Handbook of Mathematics Education. Dordecht: Kluwer Academic Publisher.

Hartono, & Putra, M. I. R. (2022). Desain LKM elektronik bermuatan etnomatematika pada pakaian adat Dayak Iban dan bahasa Inggris. *Mosharafa: Jurnal Pendidikan Matematika*, *11*(2), 293-304. https://doi.org/10.31980/mosharafa.v11i2.721

Hartoyo, A. (2013). Etnomatematika pada Budaya Masyarakat Dayak Perbatasan Indonesia-Malaysia. *Jurnal Pendidikan Matematika Dan IPA*, *2*(1), 29–39.

Hasanuddin. (2017). Etnomatematika Melayu: Pertautan antara Matematika dan Budaya pada Masyarakat Melayu Riau. *Sosial Budaya*, *14*(2), 136–149. http://dx.doi.org/10.24014/sb.v14i2.4429

Kaaronen, R. O., Manninen, M. A., & Eronen, J. T. (2023). Body-based Units of Measure in Cultural Evolution. *Science*, *380*(6648), 948–954. https://doi.org/10.1126/science.adf1936

Lisnani, Zulkardi, Putri, R. I. I., & Somakim. (2020). Etnomatematika: pengenalan bangun datar melalui konteks museum negeri Sumatera Selatan Balaputera Dewa. *Mosharafa: Jurnal Pendidikan Matematika*, *9*(3), 359-370. https://doi.org/10.31980/mosharafa.v9i3.618

Mailili, W. H., Gustina, Nurmayanti, Y., & Irmawati. (2023). Ethnomathscience Identification of Traditional Weapons of Sigi Biromaru. *Journal 12 Waiheru*, *9*(2), 180–188. https://doi.org/10.47655/12waiheru.v9i2.175

Mardia, I., & Turmudi, N. (2019). Ethnomathematics Study: Mathematical Practices Through Symbols and Gesture of Marosok Tradition in Minangkabau. *International Conference On Special Education In Southeast Asia Region*, *9*, 69–74.

Marsigit. (2016). Pengembangan Pembelajaran Matematika Berbasis Etnomatematika. *Seminar Nasional Matematika Dan Pendidikan Matematika*, 1–32.

Mulyani, E., & Natalliasari, I. (2020). Eksplorasi Etnomatematik Batik Sukapura. *Mosharafa: Jurnal Pendidikan Matematika*, *9*(1), 131–142. https://doi.org/10.31980/mosharafa.v9i1.598

Muslim, S. R., & Prabawati, M. N. (2020). Studi Etnomatematika terhadap Para Pengrajin Payung Geulis Tasikmalaya Jawa Barat. *Mosharafa: Jurnal Pendidikan Matematika*, *9*(1), 59-70. https://doi.org/10.31980/mosharafa.v9i1.592

Nursanti, Y. B., Saputra, B. A., & Gibra, G. K. (2024). Systematic Literature Review: Efektivitas Penerapan Pendekatan Etnomatematika dalam pembelajaran Matematika. *Jurnal Education and Development*, *12*(3), 107–113.

Nursyamsiah, M., Pusitasari, N., & Mardiani, D. (2024). Eksplorasi Etnomatematika pada Motif Batik Pasiran Garut ditinjau dari Aspek

Matematis. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *3*(1), 91-100. https://doi.org/10.31980/pme.v3i1.1562

Padang, D. S., & Lubis, M. S. (2023). Ethnomathematical Exploration of Traditional Agricultural Tools in Hutamanik Village, Sumbul Regency. *Indonesian Journal of Science and Mathematics Education*, *6*(2), 137–151. https://doi.org/10.24042/ijsme.v5i1.17003

Prabawati, M. N., & Muslim, S. R. (2022). Etnomatematika:Filosofi dan Konsep Matematis Kalender Sunda . *Mosharafa: Jurnal Pendidikan Matematika*, *11*(3), 369–378. https://doi.org/10.31980/mosharafa.v11i3.728

Puspadewi, K. R., & Putra, I. G. N. N. (2014). Etnomatematika di Balik Kerajinan Anyaman Bali. *Jurnal Matematika*, *4*(2), 80–89.

Rachmawati, I. (2012). *Eksplorasi Etnomatematika Masyarakat Sidoarjo*. Universitas Negeri Surabaya: Skripsi.

Rakhmawati, R. (2016). Aktivitas Matematika Berbasis Budaya pada Masyarakat Lampung. *Al-Jabar: Jurnal Pendidikan Matematika*, *2*(2), 221–230. http://dx.doi.org/10.24042/ajpm.v7i2.37

Ritchie, J., Lewis, J., Nicholls, C. M., & Ormston, R. (Eds). (2003). *Qualitative Research Practice: A Guide for Socisl Science Students and Researchers*. London: SAGE Publications.

Salsabila, A., Johar, R., Yuhasriati, Y., Yanti, S., & Suryawati, S. (2023). The Development of Problems for Minimum Competency Assessment Based on Ethnomathematics about Farmer Activities in Aceh Besar Regency. *Kreano: Jurnal Matematika Kreatif-Inovatif*, *14*(1), 28–41. https://doi.org/10.15294/kreano.v14i1.39101

Septia, T., Nuraini, A., & Wahyu, R. (2024). Eksplorasi etnomatematika pada aktivitas masyarakat petani di kecamatan gondanglegi kabupaten malang. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *3*(2), 253-262. https://doi.org/10.31980/pme.v3i2.1702

Sirate, S. F. S. (2011). Studi Kualitatif tentang Aktivitas Etnomatematika dalam Kehidupan Masyarakat Tolaki. *Lentera Pendidikan: Jurnal Ilmu Tarbiyah Dan Keguruan*, *14*(2), 123–136. https://doi.org/https://doi.org/10.24252/lp.2011v14n2a1

Soeroto, M. (2005). *Pustaka Budaya dan Arsitektur: Minangkabau*. Jakarta: Myrtle Publishing.

Syahriannur. (2019). Eksplorasi Etnomatematika Kain Songket Minang Kabau Untuk Mengungkap Nilai Filosofi Konsep Matematika. *Jurnal MathEducation Nusantara*, *2*(1), 58–63. https://doi.org/10.54314/jmn.v2i1.69

Syakhrani, A. W., & Kamil, M. L. (2022). Budaya dan Kebudayaan: Tinjauan dari Berbagai Pakar, Wujud-Wujud

Kebudayaan, 7 Unsur Kebudayaan yang Bersifat Universal. *Cross-Border*, *5*(1), 782–791.

Syamsidar, B. A. (1991). *Arsitektur Tradisional Daerah Sumatera Barat*. Jakarta: Depdikbud, Direktorat Jendral Kebudayaan Direktorat Sejarah dan Nilai Tradisional Proyek Inventarisasi dan Pembinaan Nilai-nilai Budaya.

Tallei, T. E., David, W., & Basith, A. (2012). Indigenous Knowledge of Minangkabau Community in the Conservation of Local Plant and Genetic Diversity. *Pasific Journal*, *3*(7), 1–5.

Turmudi. (2009). *Landasan Filsafat dan Teori Pembelajaran Matematika Berparadigma Eksploratif dan Investigatif*. Jakarta: Leuser Cita Pustaka.

Turmudi. (2010). Mengurangi Rasa Cemas Belajar Matematika dengan Menampilkan Matematika Eksploratif untuk Siswa Belajar. *Seminar Nassional Sehari. Bandung*.

Turmudi, Juandi, D., Hidayat, A. S., Puspita, E., & Ulum, A. S. (2016). Exploring Ethno-mathematics: How the Baduy of Indonesia Use Traditional Mathematics Skills in Weaving. *International Journal of Control Theory and Applications*, *9*(23), 325–341.

Wibawa, F. S., Nurhikmayati, I., & Kania, N. (2024). Cultural Perspectives in Geometry: Designing Ethnomathematics-Inspired Educational Tools for Geometric Thinking. *Plusminus: Jurnal Pendidikan Matematika*, *4*(3), 453-470. https://doi.org/10.31980/plusminus.v4i3.2276

Zulfah, Astuti, Juliana, I., Herlinda, N., & Febriani, S. (2023). Eksplorasi Etnomatematika pada Alat Pertanian Tradisional Kabupaten Kampar. *Journal of Education Research*, *4*(1), 161–170. https://doi.org/10.37985/jer.v4i1.137

AUTHOR'S BIOGRAPHY

Dr. Rozi Fitriza, M.Pd.

Born in Payakumbuh, 28 July 1981. Bachelor of Mathematics Education (2005) and Master of Mathematics Education (2007), Universitas Negeri Padang. Mathematics Education Doctoral Program, Universitas Pendidikan Indonesia (2018).

Hurriyah, S.Si. M.T.

Born on 13 November 1979 in Padang. Since 2009, I have been a lecturer in Universitas Islam Negeri Imam Bonjol Padang's Physics Tadris program. Bachelor of Physics from Universitas Negeri Padang in 2003, Master of Geophysical Engineering from Institut Teknologi Bandung in 2007. Presently enrolled at Universitas Negeri Padang as a PhD student in Science Education.

Dhiya Hadaina, S.Pd., M.Sc.

Was born in Payakumbuh, Indonesia, on September 11, 1997. She earned a bachelor's degree in mathematics education from the Islamic State University of Imam Bonjol, Padang, West Sumatra, in 2020. In 2022, she commenced a Master's program in Applied Mathematics and Economics at Universiti Teknologi Brunei under the Brunei Darussalam Government Scholarship.