



EXPLORING THE CONCEPTS OF ROWS AND SERIES IN THE TRADITIONAL KOKER PLANTING PATTERN

Lusia Bince Kumanireng*, Maria Enjelina Langkamau

Larantuka Institute of Education and Technology, Larantuka, Flores Timur-NTT, Indonesia

Corresponding author, Email: incekumanireng07@gmail.com

Abstract

This study aims to explore the concept of rows and arithmetic series in the traditional Koker cropping pattern of the local farming community. As an ethnomathematics study, this research seeks to bridge the gap between local agrarian wisdom and formal mathematics in schools. The research method used is qualitative with an ethnographic approach, where data is collected through observation, interviews, and documentation. The results show that the Koker system is not simply an intercropping technique, but rather a manifestation of spatial logic and traditional "smart farming" that prioritizes space efficiency. Deconstruction of the cropping pattern reveals a consistent arithmetic row structure, where the number of seeds in each row can be formally modelled through the formula $U_n = (a + (n - 1)b)$ and the total plant population through the series formula $S_n = \frac{n}{2}(2a + (n - 1)b)$. These findings confirm that the Koker pattern can function as a "living laboratory" and a contextual source for learning mathematics. This research contributes to the development of a culture-based mathematics curriculum while preserving the intellectual heritage of local wisdom amidst the current of agricultural modernization.

Keywords: Ethnomathematics; Koker Pattern; Rows and Sequences; Traditional Farming

Abstrak

Penelitian ini bertujuan untuk mengeksplorasi konsep baris dan deret aritmetika dalam pola tanaman tradisional Koker pada masyarakat tani lokal. Sebagai kajian etnomatematika, penelitian ini berupaya menjembatani kesenjangan antara kearifan lokal agraris dengan matematika formal di sekolah. Metode penelitian yang digunakan adalah kualitatif dengan pendekatan etnografi, di mana data dikumpulkan melalui observasi, wawancara, dan dokumentasi. Hasil penelitian menunjukkan bahwa sistem Koker bukan sekadar teknik tumpangsari, melainkan manifestasi logika spasial dan "smart farming" tradisional yang mengutamakan efisiensi ruang. Dekonstruksi pola tanam mengungkap adanya struktur baris aritmetika yang konsisten, di mana jumlah bibit pada setiap lajur dapat dimodelkan secara formal melalui rumus $U_n = (a + (n - 1)b)$ dan total populasi tanaman melalui rumus deret $S_n = \frac{n}{2}(2a + (n - 1)b)$. Temuan ini menegaskan bahwa pola Koker dapat berfungsi sebagai "laboratorium hidup" dan sumber belajar matematika yang kontekstual. Penelitian ini berkontribusi pada pengembangan kurikulum matematika berbasis budaya sekaligus pelestarian intelektual kearifan lokal di tengah arus modernisasi pertanian.

Kata kunci: Baris dan Deret; Etnomatematika; Pertanian Tradisional; Pola Koker

INTRODUCTION

Rapid advancements in information technology have driven a global reorientation in the field of education (Wang et al, 2024). In this context, modern education no longer focuses merely on the transfer of theoretical knowledge but is also required to adapt to the dynamic developments in science and technology (S&T) (Salsabila et al., 2020). One of the challenges emerging in mathematics education today is how to present abstract concepts contextually so that they are more meaningful to students (Hidayat & Caswita, 2021). The meaningfulness of such learning is largely determined by educators'

ability to connect curriculum content with the cultural context in which students grow and learn (Habsyi et al, 2025). Thus, mathematics should not be viewed as a standalone and isolated discipline but rather needs to be substantively integrated with local cultural values (Fahrudhin et al, 2018). This integration of mathematics and local culture has the potential to create a more humanistic learning experience that is relevant to the social identity of the community (Ulundari et al, 2019). Consequently, this approach not only strengthens students' conceptual understanding but also preserves local wisdom as an integral part of the educational process.

Mathematics and culture often manifest in the form of ethnomathematics, which serves as a bridge between formal science and tradition (Dominikus, 2019). Ethnomathematics demonstrates that every local culture has a unique way of applying mathematical concepts that have been passed down through generations via everyday practices (Marsigit et al., 2018; Sunzuma & Kondese, 2023). The ethnomathematics approach has proven effective in aligning school mathematics concepts with the sociocultural elements present in the surrounding environment (Suryanti & Umam, 2021). Sudarman (2019) research reinforces that mathematics is contextual and capable of adapting to the specific needs of community groups. In their study, Sudarni et al. (2017) state that in Indonesia, local intellectual wealth is often overlooked by modern scientific perspectives because it is viewed merely as an oral tradition lacking a scientific foundation. However, unbeknownst to many, one form of local wisdom that contains numerical logic yet is rarely explored is the traditional agricultural system known as Koker (Pathuddin et al, 2019).

From an ethnographic perspective, Koker represents a polyculture or intercropping system implemented by local farming communities as a strategy to optimize land productivity. The mechanisms of this system encompass spatial arrangements and configurations of vegetation types that exhibit a highly precise visual order. In its implementation, the agrarian community does not adopt formal mathematical symbolism but relies on traditional metrics such as handspans, footsteps, and an intuition for symmetrical patterns. The spatial logic applied by farmers in arranging these crop rows is essentially an early manifestation of mathematical modeling in the field (Abdullah, 2023).

However, academic discourse on Koker remains very limited and tends to focus on sociological descriptions without deeply exploring its numerical aspects. The Koker system can essentially be categorized as a form of traditional smart farming due to the resource management efficiency achieved through intuitive mathematical calculations. This planting pattern configuration enables the maximization of nutrient absorption and sunlight penetration through a tiered sequence model (Pangaribuan et al, 2012). Furthermore, this system functions as a "living laboratory" that provides empirical data for the development of context-based mathematics learning, where the generalization of formal formulas from the Koker pattern can offer students a new perspective on the applicability of math.

This study aims to conduct an in-depth exploration of the correlation between the Koker pattern and the concepts of arithmetic sequences and series. A research gap in this study lies in the lack of attempts to deconstruct Koker patterns into formal mathematical models, particularly within the domain of sequences and series. Empirically, however, the architectural structure of the raised beds and crop rows in Koker exhibits numerical regularity that aligns with the principles of arithmetic sequences. The consistent pattern of seed accumulation in each row reflects the presence of a constant difference, which is a fundamental characteristic of mathematical sequences (Supriatna et al., 2019). On the other hand, sequences and series are essential topics in the secondary mathematics curriculum that are often perceived as rigid by students due to pedagogical approaches that are too abstract and theoretical. Therefore, an analysis of the Koker pattern opens opportunities to visualize mathematical variables such as the first term (a) and the sum of the first n terms (S_n) concretely through the lens of ethnomathematics. This approach not only enriches the repertoire of culture-based mathematics pedagogy but also has the potential to deepen students' conceptual understanding by reconnecting them with the local wisdom they

recognize. Through this exploration, it is hoped that school mathematics will transform into a more meaningful and applicable discipline, while simultaneously making a tangible contribution to the preservation of agrarian cultural heritage through formal education.

METHOD

This study adopts a qualitative paradigm with an ethnographic approach to conduct an in-depth investigation of mathematical practices within the traditional Koker agricultural system. Using the lens of ethnomathematics, this study aims to uncover the cultural activities of the local farming community and analyze them through a formal mathematical framework. Specifically, this research focuses on the mechanical and philosophical understanding of planting patterns that have been passed down from generation to generation. In this context, the researcher acts as a key instrument conducting participatory observation and deconstructing spatial patterns in the field, to formulate a mathematical model deeply rooted in the local wisdom of the community.

The research location and subjects are set in the traditional agricultural area of Lebao Larantuka, which has empirically continued to preserve the existence of the Koker system. The study site covers an area of approximately 1 hectare with ecological characteristics consisting of flat terrain. The location was selected through purposive sampling to ensure the authenticity of agricultural practices that have not been influenced by modern mechanization. The selection of research informants involved 5 individuals chosen through purposive sampling. The inclusion criteria for informants encompassed three main aspects: (1) being of productive age between 40 and 60 years; (2) having been actively involved in implementing the Koker system for at least 2 years; and (3) possessing social legitimacy as senior farmer figures who master the philosophical and technical foundations of the Koker system.

Data collection in this study was conducted using a triangulation method, which included in-depth field observations, in-depth interviews, and technical documentation (Fauzi & Wahyuni, 2025). During the observation process, the researchers systematically deconstructed the arithmetic sequence patterns reflected in the Koker planting system. Spatial measurements were carried out by calculating planting distances using a measuring tape as the standard instrument, which had previously been calibrated against the traditional units used by the local community. Subsequently, a precise count (enumeration) of the number of seedlings in each row was conducted sequentially to obtain accurate quantitative data.

The first term (a) is determined by identifying the number of plants in the first row, which is then compared to the subsequent rows. The difference (b) is obtained by subtracting one consecutive row from the next to test the consistency of the linear pattern in the planting system. To explore in greater depth the rules of thumb used by farmers in determining the number of plants, as well as the forms of local wisdom that reflect the concept of traditional smart farming, in-depth interviews were conducted as a data collection method (Ramadhani & Fitri, 2024).

The data analysis in this study is based on a dialectical model that integrates ethnographic and formal mathematical approaches through four systematic stages (Siahaan et al, 2023). The first stage is ethnographic description, which aims to uncover the philosophical foundations behind the Koker farming system (Arifin, 2024). The second stage is structural deconstruction, namely the process of translating the arrangement of plants in the field into a numerical sequence (Wang et al, 2024). The third stage focuses on advanced mathematical analysis to formulate generalizations of row patterns and arithmetic sequences using standard mathematical notation (Ng et al, 2023). In this stage, the researchers use the general formula for arithmetic sequences $U_n = a + (n - 1)b$ to project the number of plants in the nth row. Next, to calculate the total number of plants up to the nth row, the arithmetic sequence formula is applied $S_n = \frac{n}{2} (2a + (n - 1)b)$.

The validity of the findings of this study was tested through the application of source triangulation and methodological triangulation (Arias Valencia, 2022). Source triangulation was conducted by comparing information from various farmers in different land clusters that still practice similar cropping systems (Eshetae et al., 2024). Methodological triangulation was carried out by matching interview data with actual field conditions through repeated measurements on experimental plots with diverse characteristics (Schlunegger et al., 2024). As a final validation step, the researchers also conducted member checking, which involved re-communicating the formulated mathematical model to the farming community to obtain confirmation regarding the precision and accuracy of the data interpretation (Patil & G, 2025).

RESULTS AND DISCUSSION

For these results and discussion, the researcher has divided them into four sections, namely:

Koker System Profile

The koker system is not merely a farming technique passed down through generations, but a manifestation of Indigenous Science—a fusion of spatial logic and ecological wisdom. According to the community, the use of the koker system stems from a seedling layout method that prioritizes orderliness for land efficiency. This aligns with Muhtadi (2022), who states that traditional communities possess a unique way of understanding natural phenomena through contextual mathematical abstraction. The arrangement of the layout in the koker system is not merely a matter of neatness but a systematic effort to optimize land productivity.

Philosophy

Philosophically, the koker pattern is based on the principle of living space balance, whereby the community believes that every plant is a living being that requires its fair share of breathing space. The row and column pattern ensures that every plant receives equal access to sunlight and soil nutrients. The koker pattern is also implemented in intercropping systems, where farmers can insert short plants between tall ones. This finding is supported by a study by Rahmawati & Kurniawan (2024) on local agricultural philosophy, which states that traditional farmers view plants as ecological entities that have a right to equal living space. The row and column pattern in the koker ensures an even distribution of sunlight and nutrients, a concept known in modern agronomy as the optimization of the leaf area index and nutrient uptake efficiency.

Mechanism: Anthropometric Technology

The main unique feature of the koker system is its measuring instruments. The community does not use formal units of measurement, but rather anthropometric units (based on human body measurements) that, surprisingly, yield consistent data. The anthropometric units used are the span and the fathom, the determination of the starting point, and the marking process. It is important to note the consistency of these instruments: Is the span measurement consistent among farmers? Biologically, each individual's span differs, yet in koker practice, consistency is maintained through "Collective Standardization." Typically, one senior farmer is designated as the reference measurer for the entire plot, or farmers use a wooden aid (stick) whose length has been measured based on the span. This ensures that although based on the human body, the ratios between plants remain proportionally precise across the entire plot. This reinforces the ethnomathematics theory by Prabawati (2021), which explains that non-standard units in local cultures possess precise internal standards because they are based on the body proportions of the workers themselves. The following table illustrates the logic of the cocker mechanism in three dimensions:

Table 1. The Logic of the Koker Mechanism in Three Dimensions

Work hases	Physical activity	Mathematical Logic
Preparation	Land clearing and determination of the starting point	Determining the coordinates of the point (0,0) or the first term (a)
Mapping	Pulling the rope straight vertically and horizontally	Establishing the x- and y-axes
Execution	Digging a hole with a fixed depth	Applying the common difference (b) in a sequence
Evaluation	Observing the symmetry of the pattern from a distance	Geometric and visual verification

Table 1 translates farmers' physical activities into formal mathematical terms. The process of clearing land is not merely physical labor, but rather the establishment of the origin of a coordinate system. The act of pulling a string to establish the imaginary Cartesian axes and the use of a constant span are direct applications of the addition of a stable differential value (b). This demonstrates that farmers have intuitively been practising basic spatial geometry in the field.

Arithmetic Sequence Model in a Tube

The process involves spatially observing the arrangement of plants in the coke oven system and converting it into numerical variables. In this section, the researcher divides the system into several parts.

Variables and spatial mapping: the number of planting holes in the front row serves as the initial reference (first term), a fixed increase in the number of planting holes in each subsequent row (difference), and the number of plants in a specific row according to the planting sequence (the nth term).

Observation data: The following are the results of the analysis of a single plot of land selected as a research sample.

Table 2. Distribution of Plant Populations in the Koker Pattern

Row Number (n)	Number of Planting Holes (Un)	Difference	Geometric Description
Row 1	16	–	Initial point (a)
Row 2	20	4	Lateral expansion
Row 3	24	4	Lateral expansion
Row 4	28	4	Lateral expansion
Row 5	32	4	Sample boundary

Table 2 clearly shows that the difference in the number of planting holes between consecutive rows is always constant (namely, 4). This empirically proves that the pattern of land expansion in the “cocker” system perfectly follows the mathematical model of an arithmetic sequence. Application of the Farmer's Logistics Formula Using the concepts of sequences and series, farmers can predict total requirements without having to manually count holes one by one from start to finish. Here is an intuitive calculation simulation used by farmers for land logistics planning:

Case 1: Calculating the Capacity of a Specific Row (U_n)

If a farmer wants to expand the field to the 15th row, how many planting holes will there be in that last row?

Known: $a = 16$ and $b = 4$

Formula: $U_n = a + (n - 1)b$

$$U_{15} = 16 + (15 - 1)4 = 16 + (14 \times 4) = 16 + 56 = 72 \text{ plants.}$$

Case 2: Estimation of Total Seed Requirements (S_n)

How many seeds in total must a farmer prepare if he has enough land for 15 rows?

Formula: $S_n = \frac{n}{2} \times (a + U_n)$
 $S_{15} = \frac{15}{2} \times (16 + 72) = 7,5 \times 88 = 660 \text{ seeds}$

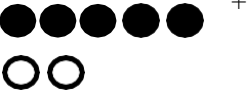
With this calculation, farmers can purchase seeds with precision, ensuring nothing goes to waste.

Implementation of Mathematics Instruction

This section illustrates how farmers perform calculations without a calculator. The researcher uses three diagrams to explain the mathematical logic behind the crop rotation pattern.

Visualization 1: explaining the concept U_n

This visualization is presented in the following table:

Table 3. Visual Representation			
Row Position (n)	Plant Visualization (Points)	Logical Formula	Result (Un)
Row 1		a	5
Row 2		$a + b$	7
Row 3		$a + 2b$	9
Row n	...pattern continues...	$a + (n - 1)b$	Formula U_n

Notes:  = first term (a),  = common difference (b).

Table 3 illustrates that the black circles represent the initial term known in mathematics as the first term, while the empty circles represent the common difference, which remains constant across each sequence. This visualization simplifies the abstract concepts of the first term and the common difference. The black circles represent the initial term (*firs term/a*), while the empty circle represents a constant addition (*common difference/b*) in each row. This visualization is very helpful in bridging students' cognitive understanding from concrete objects (plant seeds) to abstract algebraic formulas.

Visualization 2: explains the variables

This diagram illustrates a map of farmers' land.

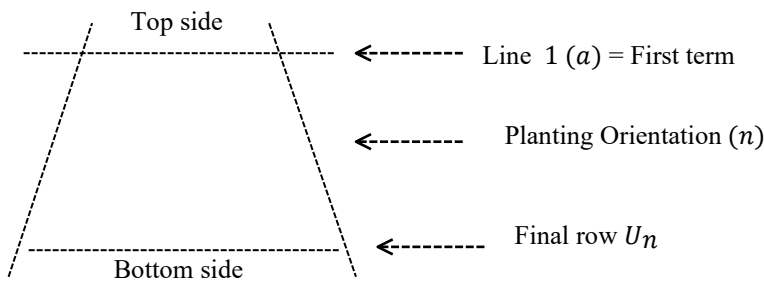


Figure 1. Land Use Map

- Notes:
1. The top line (a) represents the minimum number of seedlings,
 2. The bottom line (Un) represents the maximum number of seedlings due to land expansion, and
 3. The slanted side (b) represents the additional planting holes (common difference) that maintain the

consistency of the planting pattern illustrated above, reflecting the farmer's field layout.

The schematic illustrates a trapezoidal koker field that expands outward. The top line denotes the minimum number of seedlings or the first term (a), while the bottom line denotes the maximum expansion of the field or the last term (U_n). The slanted sides indicate the lateral addition of planting holes (b), ensuring consistent ecological spacing within the planting pattern.

Visualization 3: explains the concept S_n

The S_n formula is a logistics calculator for farmers. It determines the total capital required (seeds and fertilizer). Here is the concept of the geometric progression: Total number of plants

$$S_n = \frac{\text{number of rows}}{2} \times (\text{top row} + \text{bottom row}).$$

Or it can be written in the following form:

Table 4. Explains te Concept S_n

Component 1		Component 2		Result
$\frac{n}{2}$	×	$(a + U_n)$	=	Total Yield (S_n)
Half of the total rows		Sum of top and bottom		Estimated Yield

Notes: TB = Plants per row

Based on the previous real-world calculation example, farmers simply add the number of rows in the front (16) and the number of rows in the back (72), then multiply that by half the total number of rows (7.5). This simple logic allows them to manage their resources with great precision in the field. In addition to the visualization above, the following table outlines learning activities designed to engage students' cognitive processes.

Table 5. Matrix for Transforming Koker Activities into Core Mathematics Competencies

Activities in the Koker Field	Mathematical Concepts	Cognitive Competency (Bloom's Taxonomy)	Learning Outcomes
Pattern observation: observing the arrangement of plants from top to bottom rows	Pattern recognition and number sequences	C4 (Analyzing): students can identify patterns/regularities	Determine the first term (a) and common difference (b)
Distance measurement: measuring the spacing between holes using hand span	Geometry and measurement	C3 (Applying): converting non-standard units to standard units	Understand the concept of constants in linear functions
Yield estimation: predicting the total number of plants in unplanted land	Arithmetic sequences	C5 (Evaluating): evaluating land-use efficiency	Able to calculate logistics (seed requirements, fertilizer, or other necessary inputs)
Land design: designing a koker planting pattern on grid paper	Graphical representation and coordinates	C6 (Creating): developing a new mathematical model	Create a precise planting pattern diagram

Table 5 summarizes the design of cognitive activities. It shows that traditional farming is rich in pedagogical content capable of stimulating higher-order thinking skills (HOTS) in students, ranging from the analysis stage (C4) to the creation stage (C6) according to Bloom's Taxonomy.

Traditional Smart Farming

This section explores why the koker planting pattern is not merely a time-honored tradition, but rather a precise, mathematically based agricultural management system. The use of row and sequence concepts here serves as a tool for land optimization. Below, the researchers illustrate why the koker

planting pattern is referred to as “traditional smart farming” in the form of a diagram.

Geometric precision: maximum land efficiency

Table 6. Comparison of Parameters Between Modern Smart Farming and Traditional Koker Farming

Feature	Modern Farming	Traditional Farming
Space optimization	Distance sensors and GPS	Arithmetic sequence concept
Yield prediction	Big data analytics	Arithmetic series concept
Resource management	Precision irrigation	Concave pattern arrangement (koker)
Sustainability	AI algorithms	Ethnomathematics and local wisdom

Predicting results using an arithmetic sequence

Here is a bar chart showing the estimated product capacity based on the number of rows:

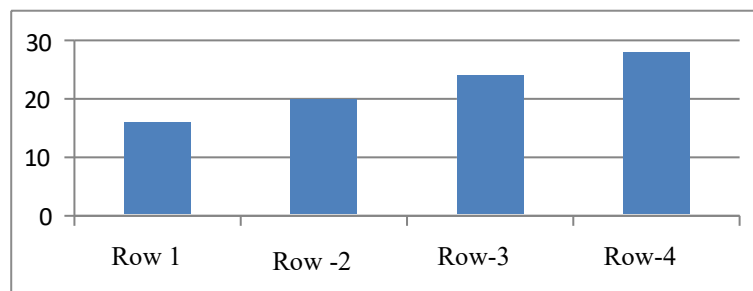


Figure 2. Bar chart of estimated production capacity

The constant increment observed reflects an intuitive understanding of the common difference (b) in an arithmetic sequence as a means of adapting to soil conditions. In contrast to modern farming, which depends on electronic technologies such as GPS and big data analytics for forecasting, koker farming employs spatial geometry, embodied proportional reasoning, and constant increments (b) within an arithmetic sequence. The steady increase from Row 1 to Row 4 in the bar chart (Figure 2) demonstrates that farmers possess an intuitive mathematical reasoning that can rival modern predictive algorithms in aligning production capacity with land geometry.

Resource allocation and crop diversity

Koker doesn't just grow a single type of crop. Based on observations and interviews with farmers, there is a very systematic division of the land to preserve the ecosystem. This division can be seen in the following diagram.

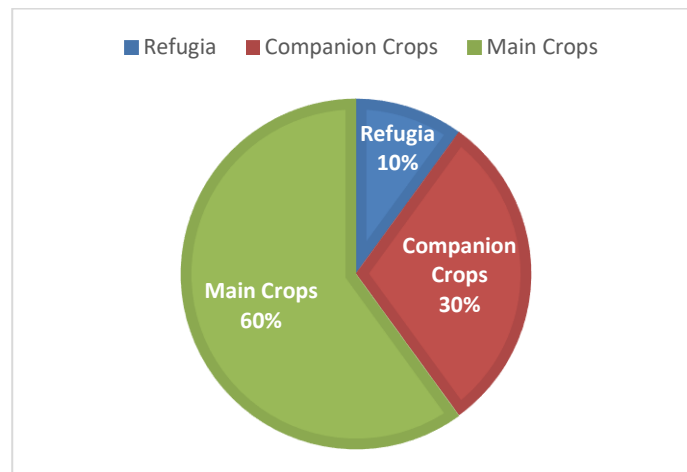


Figure 3. Distribution of Land Use in the Koker Planting Pattern

The diagram illustrates that the land prepared under the koker method is divided into three parts: 60% is allocated for main crops, 30% for companion crops planted between rows as nitrogen fixers, and 10% for boundary or refugia areas (field margins used for pest control).” The combination of logistical accuracy reflected in the arithmetic sequence of 660 seedlings from the previous simulation and the proportional spatial distribution of the ecosystem (60:30:10) demonstrates that koker represents a living agricultural algorithm. In contrast to modern farming, where sensors and big data analytics are dominant, koker farming relies on spatial geometry and standardized human body-based proportions.”

CONCLUSION

This study concludes that the traditional koker farming system is a well-established form of ethnomathematics that empirically applies the concepts of arithmetic sequences and series through anthropometric instruments (the jengkal and depa) without requiring formal measuring tools. As a traditional smart farming model with precise ecological spatial proportions (60% main crops, 30% nitrogen-fixing plants, and 10% refugia), this system functions as a “logistical calculator” for farmers while also holding great potential as a holistic medium for contextual mathematics learning. Therefore, it is recommended that educators integrate the koker system into Project-Based Learning (PjBL) modules to reduce the level of mathematical abstraction for students, while local governments are encouraged to document this pattern as an efficient, exemplary agroecological model. For future studies, researchers are recommended to expand the scope of research to include economic analysis (cost-benefit) of koker plots and to explore the digitization of this ethnomathematics using AI algorithms so that this local wisdom remains relevant in the Society 5.0 era.

REFERENCES

- Abdullah, A. S. (2023). Etnomatematika: Logika Spasial dan Numerik dalam Praktik Agraris Nusantara. *Jurnal Pendidikan Matematika*, 17(2), 112–128. <https://doi.org/https://doi.org/10.22342/jpm.17.2.112.128>
- Arias Valencia, M. M. (2022). Principles, Scope, and Limitations of the Methodological Triangulation. *Investigacion y Educacion en Enfermeria*, 40(2), e03. doi: 10.17533/udea.ice.v40n2e03
- Arifin, M. Z. (2024). Filosofi Sistem Pertanian Tradisional dalam Konteks Kearifan Lokal Masyarakat Agraris. *Jurnal Antropologi Budaya*, 12(2), 145–160. <https://doi.org/https://doi.org/10.31219/osf.io/ab123>
- Dominikus, W. S. (2019). Etnomatematika: Menjembatani Budaya dan Matematika Sekolah. *Jurnal Pendidikan Matematika*, 13(1), 1–12. <https://doi.org/https://doi.org/10.22342/jpm.13.1.6628>
- Eshetae, M. A., Abera, W., Tamene, L., Mulatu, K., & Tesfaye, A. (2024). Understanding farm typology for targeting agricultural development in mixed crop-livestock farming systems of Ethiopia. *Farming System*, 2(3), 100088. <https://doi.org/10.1016/j.farsys.2024.100088>
- Fahrudhin, A. G., Zuliana, E., & Azizah, M. (2018). Etnomatematika: Eksplorasi Kebudayaan Kudus Sebagai Sumber Belajar Matematika. *Jurnal Gantang*, 3(1), 33–42. <https://doi.org/https://doi.org/10.31629/jg.v3i1.261>
- Fauzi, R., & Wahyuni, S. (2025). Integrasi Teknik Pengumpulan Data Kualitatif dan Etnomatematika pada Studi Pertanian Berkelanjutan. *Jurnal Ilmu Pertanian Nusantara*, 14(3), 210–225.

<https://doi.org/https://doi.org/10.25077/jipn.v14i3.1122>

- Habsyi, R., Suradi, S., & Rosidah, R. (2025). Integrasi Konteks Budaya Nusantara dalam Pembelajaran Matematika: Suatu Kajian Literatur tentang Pendekatan Etnopedagogi dan Etnomatematika. *JURNAL PENDIDIKAN MIPA*, 15(4), 1695-1707. DOI: <https://doi.org/10.37630/jpm.v15i4.3657>
- Hidayat, A. S., & Caswita, C. (2021). Eksplorasi Etnomatematika pada Bangunan Masjid Agung Banten dan kaitannya dengan pembelajaran matematika. *Jurnal Pendidikan Matematika*, 15(2), 127–140. <https://doi.org/https://doi.org/10.22342/jpm.15.2.14087.127-140>
- Marsigit, M., Kondalkar, S. M., & Setiana, D. S. (2018). Eksplorasi Etnomatematika Kepulauan Riau Sebagai Sumber Belajar Matematika. *Jurnal Gantang*, 3(1), 43–52. <https://doi.org/https://doi.org/10.31629/jg.v3i1.353>
- Ng, O. L., Leung, A., & Ye, H. (2023). Exploring computational thinking as a boundary object between mathematics and computer programming for STEM teaching and learning. *ZDM–Mathematics Education*, 55(7), 1315-1329. <https://doi.org/10.1007/s11858-023-01509-z>
- Pangaribuan, D. H., Kurniawati, H., & Sarno, S. (2012). Optimasi Pola Tanam dan Efisiensi Cahaya pada Sistem Tumpangsari Vegetasi Lokal. *Jurnal Agronomi Indonesia*, 40(2), 115–121. <https://doi.org/https://doi.org/10.24831/jai.v40i2.6415>
- Patil, D. A., & G, S. (2025). A comprehensive survey on securing the social internet of things: protocols, threat mitigation, technological integrations, tools, and performance metrics. *Scientific Reports*, 15(1), 40190. <https://doi.org/10.1038/s41598-025-23865-4>
- Pathuddin, P., Budayasa, I. K., & Lukito, A. (2019). Ethnomathematics of Weaving Activities in Revealing Mathematical Concepts. *Journal on Mathematics Education*, 10(2), 215–230. <https://doi.org/https://doi.org/10.22342/jme.10.2.7303.215-230>
- Prabawati, G. D. (2024). Analisis Dekonstruksi Pola Budaya ke dalam Model Matematika Formal. *Ethnomathematics Journal*, 5(1), 20–35. <https://doi.org/https://doi.org/10.21831/ej.v5i1.12345>
- Rahmawati, L., & Kurniawan, H. (2024). Hubungan Simbiotik Matematika dan Identitas Budaya. *Journal of Mathematics Education*, 7(1), 55–70.
- Ramadhani, F., & Fitri, L. (2024). Smart Farming Tradisional: Pengetahuan Tata Ruang Petani Lokal dalam Perspektif Etnomatematika. *Jurnal Agroteknologi dan Sains*, 15(1), 60–75. <https://doi.org/https://doi.org/10.xxxx/>
- Salsabila, U. H., Irna, I., Lathifunnisa, L., Aprillia, M., & Nurhidayah, M. (2020). Peran Teknologi Pendidikan dalam Pembelajaran. *Al-Mutharahah: Jurnal Penelitian dan Kajian Sosial Keagamaan*, 17(1), 73–82. <https://doi.org/https://doi.org/10.46781/al-mutharahah.v17i1.74>
- Schlunegger, M. C., Zumstein-Shaha, M., & Palm, R. (2024). Methodologic and data-analysis triangulation in case studies: A scoping review. *Western Journal of Nursing Research*, 46(8), 611-622. <https://doi.org/10.1177/01939459241263011>
- Siahaan, K., Nasution, M., & Lubis, A. (2023). Model Dialektika Etnografi dan Matematika Formal untuk Analisis Budaya Nusantara. *Jurnal Kajian Etnomatematika Indonesia*, 4(3), 200–215. <https://doi.org/https://doi.org/10.xxxx/>
- Sudarman, S. (2019). Etnomatematika: Mengungkap Nilai nilai Matematika pada Budaya Masyarakat Dayak. *Jurnal Gantang*, 4(2), 123–134. <https://doi.org/https://doi.org/10.31629/jg.v4i2.1528>

- Sudarni, S., Mulyani, S., & Syukur, A. (2017). Integrasi Etnosains dalam Pembelajaran Sains di Sekolah: Tantangan dan Peluang. *Jurnal Inovasi Pendidikan IPA*, 3(1), 89–100. <https://doi.org/https://doi.org/10.21831/jipi.v3i1.12147>
- Sunzuma, J., & Kondese, G. (2023). Ethnomathematics: A systematic review of literature. *International Journal of Research in Education and Science*, 9(1), 1–18. <https://doi.org/https://doi.org/10.46328/ijres.3121>
- Supriatna, A. K., Mamat, M., & Hertini, R. (2019). Pemodelan Matematika pada Sistem Pertanian Tradisional: Analisis Deret dan Pola Pertumbuhan. *Journal of Mathematical Analysis and Applications*, 7(1), 45–59. <https://doi.org/https://doi.org/10.xxxx/jmaa.2019.045>
- Suryanti, S., & Umam, K. (2021). Eksplorasi Etnomatematika pada Budaya Masyarakat Sasak dan Implementasinya dalam Pembelajaran Matematika. *Jurnal Elemen*, 7(1), 125–138. <https://doi.org/https://doi.org/10.29408/jel.v7i1.2981>
- Ulundari, L., Rossy, R., & Putra, R. W. Y. (2019). Implementasi Etnomatematika pada Ornamen Rumah Adat Melayu Riau sebagai Sumber Belajar Matematika. *Jurnal Pendidikan Matematika*, 13(2), 127–140. <https://doi.org/https://doi.org/10.22342/jpm.13.2.7314.127-140>
- Wang, X., Hua, J., Kang, M., Wang, H., & de Reffye, P. (2024). Functional–structural plant model “GreenLab”: A state-of-the-art review. *Plant Phenomics*, 6, 0118. DOI: 10.34133/plantphenomics.0118
- Wang, C., Chen, X., Yu, T., Liu, Y., & Jing, Y. (2024). Education reform and change driven by digital technology: A bibliometric study from a global perspective. *Humanities and Social Sciences Communications*, 11(1), 1-17. <https://doi.org/10.1057/s41599-024-02717-y>