ISSN 2502-5872 (Print)
ISSN 2622-3627 (Elektronik)

Volume 8 Number 3, August 2023, 1183-1196

ETHNOMATHEMATICS EXPLORATION OF ECENG GONDOK CRAFTS

Zeny Ernaningsih[1*], Ika Murti Kristiyani[2]
[1]Departement of Informatics, Universitas Atma Jaya Yogyakarta, Yogyakarta, Indonesia
[2]Departement of Industrial Engineering, Universitas Atma Jaya Yogyakarta, Yogyakarta, Indonesia

*Correspondence: zeny.ernaningsih@uajy.ac.id

ABSTRACT

Mathematics is a basic science that is always related to other sciences. Many people think of mathematics as a science requiring more effort. Ethnomathematics, as a scientific study, can bridge the gap between mathematics, culture, and life. Through ethnomathematics, it becomes easier for students to learn mathematics. This paper involves a mathematical exploration of eceng gondok crafts. Eceng gondok is one of the main ingredients for handicrafts in great demand by people at home and abroad. The primary objective of this research is to explore the mathematical elements in eceng gondok crafts. Teachers and students can use the results of this study as a learning medium to facilitate understanding in learning some mathematical material. This research follows qualitative descriptive research with an ethnographic focus. This study used observation and interviews with one of the eceng gondok craft industry owners in collecting data. Data analysis from this research was conducted inductively through four activities: collecting, reducing, categorizing, and drawing conclusions. The results found that this eceng gondok craft contained many mathematical elements, including geometric concepts, calculus concepts, and a system of linear equations in three variables.

Keywords: Ethnomathematics, Eceng Gondok, Geometry, Calculus, A System of Linear Equations In Three Variables

How to Cite: Ernaningsih, Z & Kristiyani, I. M. (2023). Ethnomathematics Exploration of Eceng Gondok Crafts. *Mathline: Jurnal Matematika dan Pendidikan Matematika*, *8*(3), 1183-1196. http://doi.org/10.31943/mathline.v8i3.507

PRELIMINARY

Mathematics is sometimes associated with knowledge that is difficult to understand, especially for the younger generation (Rudyanto et al., 2019a). Mathematics is considered a scourge in learning in schools. Most students prefer to avoid math lessons. This can be seen from the results of the Indonesian PISA test, which have stayed the same (Harmini et al., 2020). From the OECD report, it was explained that the score of students' mathematical abilities in Indonesia is still 379 from the world average of 489. From these results, it can be concluded that students are still weak in mathematical abilities (Avvisati et al., 2019). Many people avoid mathematics in every learning process without knowing the importance of mathematics in life (Jamna et al., 2022). Mathematics is a base and universal science that is very useful for all aspects of life and used in almost all sciences (Fauzi & Lu'luilmaknun, 2019). The activities of walking, running, farming, building houses, and other activities in daily life cannot be separated from mathematics (Daswarman & Sutadji, 2022). Of course, most people do not realize that mathematics is so attached to the life they do.

Various steps have been taken to change a person's mindset regarding the complexity of mathematics. Experts reveal that mathematics is not just a science that studies a collection of numbers, symbols, or formulas that are abstract and unrelated of life (Sagala & Hasanah, 2023). This is in line with what educators are trying to do, educators try to make students have a high interest and interest in learning mathematics (Kamil et al., 2021). Educators always try to make learning mathematics fun and easy to understand.

The math problems taught at school sometimes differ from those in daily life (Andriyani & Kuntarto, 2017). It causes students difficulties in learning mathematics. They have difficulty connecting formal mathematical concepts with real-world problems (Putri, 2017). The diversity of cultures in Indonesia also influences the variety of problems found in daily life. Therefore, educators need to integrate culture-based mathematics learning into school learning (Farhan et al., 2021). One effort that can be done is to use an ethnomathematics approach. Ethnomathematics is known as mathematics in a culture (Rahmawati Z. & Muchlian, 2019). Many experts have defined the study of this science. Ethnomathematics is the study of mathematics from cultural forms (ideas, activities, or cultural objects) (Fajriyah, 2018). Another elucidation, ethnomathematics is the study or research program that investigates history, anthropology, pedagogy, language, and the philosophy of mathematics with pedagogical implications that focus on explaining, understanding, and dealing with diverse sociocultural environments (Astriandini & Kristanto, 2021). Ethnomathematics uses mathematical concepts broadly related to various mathematical activities, including grouping activities, counting, measuring, designing buildings or tools, playing, determining locations, and so on (Utami et al., 2021). Through the application of ethnomathematics in education, it is hoped that students will be more interested in learning mathematics because learning is not only based on textual books, but students can explore and build mathematical concepts based on experience and observation (Purnamasari et al., 2022). Through ethnomathematics, students can better understand mathematics as well as be able to understand the culture around them (Rahmadani & Reflina, 2023).

In mathematics, several materials could have a higher level of understanding. These materials are considered quite abstract for students because some require good imagination skills to understand them. These materials include the concepts of geometry, calculus, and a system of linear equations in three variables. In the curriculum in Indonesia, problem-solving skills are one of the most essential things in learning mathematics. Students must be able to solve problems to get used to solving problems in daily life (Iksanudin et al., 2022b). Students who explore geometry can develop their problem-solving skills (Budiarto & Artiono, 2019), one of which is when doing room reasoning. Many objects in real life are very attached to geometry, such as tables, books, chairs, tiles, etc (Yanti & Haji, 2019). These are some of the reasons that make geometry one of the most essential materials for students to master.

According to the Kamus Besar Bahasa Indonesia (KBBI), calculus is a part of mathematics that mainly involves understanding and using differential and integral functions and related concepts. Calculus is a branch of mathematics that includes limits, differentials, infinite series, and integrals. Calculus applications can be found in various fields, including science, economics, engineering, etc. The large number of areas covered shows that calculus is very closely related to problems in the real world (Rejeki, 2015).

In daily life, problems are often found which are unknowingly closely related to concepts in mathematics; one of the exciting concepts in mathematics is the system of linear equations in three variables (Kemendikbud, 2019). Problem-solving skills are needed to solve the system of linear equations in three variables questions. The ability to solve these problems includes the ability to translate into a mathematical model in the form of a system of linear equations in three variables, the use of substitution, mixed methods, or the method of multiplying the coefficients (Kemendikbud, 2019).

Eceng gondok craft is a culture that is characteristic of Kulon Progo Regency, Special Province of Yogyakarta (DIY); almost every sub-district in Kulon Progo Regency has eceng gondok craft centers. The eceng gondok can be turned into various forms of crafts that are in great demand by tourists. Processing techniques that still rely heavily on human labor are unique to the quality of the product. Manufacturers still rely on handmade techniques to create each of their products. Researchers are interested in exploring this eceng gondok craft because this craft is so attached to the lives of DIY residents, especially Kulon Progo. In addition, there are many mathematical concepts contained in the processing of eceng gondok, including the products produced. The purpose of this research is so that students can learn more closely about geometry and calculus through various forms of eceng gondok crafts and learn to solve a system of linear equations in three variables through cost and time data in the eceng gondok production process. Likewise, educators can take advantage of this research to add variations to learning media so that there are more real examples that can be used as visual images in the learning process. From several previous ethnomathematics studies, it was explained that ethnomathematics can help students more easily understand a particular material. Several researchers tried to review various cultures in the region to add learning resources for educators and students in learning mathematics, including research conducted by Rudyanto, namely through batik and traditional games, mathematical concepts were obtained, namely flat shapes and spatial shapes (Rudyanto et al., 2019b). Further research conducted by Sarwoedi et al. explained the influence of ethnomathematics on students' mathematical understanding abilities, namely in terms of identifying, translating, and interpreting the meaning of symbols, understanding and applying mathematical ideas, making an exploration (estimate) and increasing the acquisition of student learning outcomes (Sarwoedi et al., 2018). This research was developed from some of these studies by exploring local culture, namely eceng gondok, and connecting it with mathematical concepts. In addition, this research also examines the system of linear equations in three variables in eceng gondok art culture. The system of linear equations in three variables is one of the materials that is difficult to understand because of its complexity. The system of linear equations in three variables has never been discussed in ethnomathematics research. This concept was chosen so students can more easily understand the concept through actual events.

METHODS

This type of research is qualitative description research. This research gathered information for problems and concepts with a case study of several events or incidents during the observation (Soebagyo et al., 2021). This research uses an ethnographic approach, namely an empirical and theoretical approach, to obtain a description and analysis based on observations relating to culture and the mathematical concepts contained in that culture. The results of further observations are described qualitatively. The data collection method carried out in this research was through observation or direct observation in the field and direct interviews with research subjects, namely an owner of the craft industry, literature studies through various media sources, both print and electronic, and documentation.

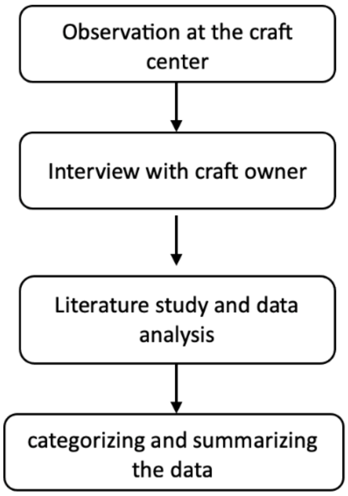

Figure 1. Research Methodology Flow Chart

The following details the stages of the research as described in Figure 1:

1. Directly observe handicraft products at eceng gondok production centers in the Kulon Progo area, Special Region of Yogyakarta.
2. The following research stage involves in-depth interviews with handicraft business producers (craft industry owners) in eceng gondok handicraft production centers. The interviews covered the production and marketing processes and the results of the eceng gondok product.
3. After observations and interviews have been conducted, the data obtained is used to conduct a literature study to find mathematical concepts or elements contained in various forms of crafts.
4. Analyzing the results of data collection, including categorizing data and concluding.

RESULT AND DISCUSSION

In ancient times, eceng gondok was widely known as a weed or nuisance plant in waters. This is because eceng gondok has expeditious growth. Along with the times, many people began to use this plant for various needs, such as biofilters for heavy metal contamination, as a craft material, and as a mixture for animal feed. In its use as a craft material, eceng gondok goes through various processing processes, from drying and coloring to weaving according to the desired model. The results of woven eceng gondok have penetrated the international market. From the results of interviews and exploration directly to the eceng gondok handicraft manufacturing factory, several forms of ready-tosell handicrafts contained many mathematical elements. The following are various forms of ready-made eceng gondok crafts and some geometric and calculus elements that can be used as learning media in the classroom.

Figure 2. Tissue Box

Figure 3. Storage Box

Figures 2 and 3 show that eceng gondok crafts can be formed into tissue boxes and storage boxes in the geometric shape of a cubical geometric shape. The beam has six rectangular sides, 12 edges, and eight vertices, as shown in Figure 4 below.

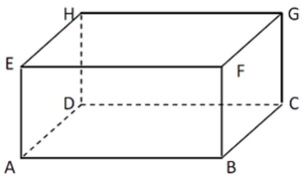

Figure 4. Cuboid

The volume of the tissue box and storage box will be obtained by using the formula for the volume of a block, namely $l \times w \times h$.

For example, a tissue box made of eceng gondok has a length of 20 cm, a width of 10 cm, and a height of 8 cm, then the volume of the tissue box is 1,600 cm^3.

$$
\begin{aligned}
V_{Tissue\ Box} &= l \times w \times h \\
&= 20 \times 10 \times 8 \\
&= 1{,}600\ cm^3
\end{aligned}
$$

Figure 5. Bumbung Bag Craft

Figure 6. Basket Craft

The crafts in Figure 5 and Figure 6 are crafts made from eceng gondok, popular in urban areas and abroad. In general, enthusiasts use this roof bag and basket model to place dirty clothes or household items such as toys, sports equipment, etc. The tube model bag and the basket model resemble the shape of the cylinder chamber, as shown in Figure 7 below. The tube in this bag has a curved side and a circular base. We can use the formula for a cylinder's volume and surface area to determine the volume and surface area of the roof bag craft and basket craft. For a roof bag with a radius of 15 cm and a height of 50 cm, the volume and surface area are as follows.

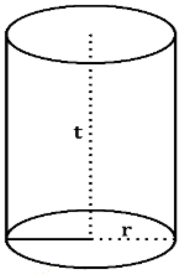

Figure 7. Tube

$$
\begin{aligned}
V_{Bumbung} &= \pi \times r^2 \times t \\
&= \pi \times 15^2 \times 50 \\
&= 11{,}250\pi\ cm^3 \\
A_{Bumbung} &= 2\pi r(r + t) \\
&= 2 \times \pi \times 15 \times (15 + 50) \\
&= 1{,}950\pi\ cm^2
\end{aligned}
$$

Another form of eceng gondok craft with a mathematical element is a jar-shaped craft, as shown in Figure 8. This jar-shaped craft combines raw eceng gondok materials and Agel thread from bang fiber. This jar-shaped craft has many enthusiasts from abroad. This craft is usually used for decoration in the room. In jar crafts, a mathematical element is the volume of a rotating object. To determine the volume of this jar, we can use the formula for the volume of a rotating object.

Figure 8. Jar Craft

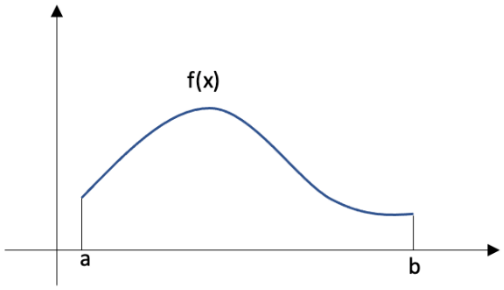

Figure 9. Illustration of The Cut of The Jar

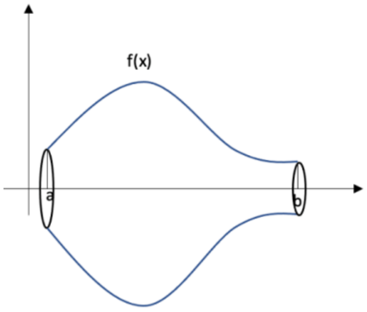

Figure 10. Illustration of The volume of The Jar

Figure 9 and Figure 10 can be used as an illustration to determine the jar's volume using mathematics, namely by using the volume of a rotating object.

$$V_{Jar} = \pi \int_a^b f^2(x)\, dx$$

To determine the volume of a jar using the volume of a rotary object, first, determine the function of the curve that forms the jar and then determine the lower and upper limits of the jar. Furthermore, the jar's volume can be obtained using the integral application.

The results of the exploration of eceng gondok crafts were also seen from calculating capital and profits. These observations' results obtained a mathematical element, namely the system of linear equations in three variables. This material is one of the materials that is quite difficult to understand because it contains many similarities. This is supported by previous research conducted by Iksanudin et al. This research explains that students still make many mistakes when solving problems related to a system of linear equations in three variables, including because they need help understanding the material itself and students have difficulty solving the calculation process in the equation (Iksanudin et al., 2022a).

Further research conducted by Dewi & Kartini analyzed the process of problem-solving by students on a system of linear equations in three variables material. Students make many mistakes in this material because they need help to read the questions, understand the problem and carry out the correct problem-solving procedure (Dewi & Kartini, 2021). From the two studies above, real examples of a system of linear equations in three variables are still needed to facilitate understanding of this material. The more real examples, the students will be more skilled in describing the problem in a mathematical equation model than completing the calculation process. Eceng gondok can be a medium that can be used to illustrate a system of linear equations in three variables using eceng gondok production data.

The following are the results of interviews with the owner of the eceng gondok craft industry.

Researcher (R) and Owner (O).

R: "Permission to ask, sir, from several products in this place, which is the best-selling, sir?"

O: "Oh yes, here are some products in great demand; there are small bags for women, then tissue boxes, and wastebaskets or clothes baskets can also be those small ones."

R: "Of the three products, how many kilos of raw materials do you need, sir?"

O: "For the bag, it's 2 kg, and for the tissue box, 1 kg is enough; for the basket, it's around 2.5 kg."

R: "How much is the purchase price from employees, sir?"

O: "I bought it already woven from the employees. For the small bag, 12,000 rupiah per bag, then for the tissue box, 8,000 per piece. For small baskets, I buy 15,000 per fruit."

R: "Oh yes, how many employees do you have, sir?"

O: "Yes, about 35 people."

R: "Okay, sir, then permission to ask again, sir, how long does it take for this craft, sir?

O: "If the duration depends on the speed of the employee."

R: "Then what is the average production per product, sir, in one day?"

O: "Oh yes, if they work from 8 to 5 a day, they can get around 30 small bags, then about 40 for tissue boxes, and around 30 for small baskets too."

R: "It's quite a lot, sir?"

O: "Yes, they are full of weaving, so that the results can be quite good."

The results of the interviews show that 35 workers can make small bags, tissue boxes, and small tubes from eceng gondok raw materials. Table 1 summarizes the interview results related to the results and production processes of the three crafts most in consumer demand.

Table 1. Data on Production Results from Eceng Gondok

Name of goods	Material (kg per unit)	Processing time (minutes per unit)	Price (Rupiah per unit)	Number of goods produced (units per day)
Small bag	2	160	12,000	30
Tissue box	1	120	8,000	40
Small Tube	2.5	240	15,000	30

From the data above, it can be developed into a system of linear equations in three variables problem. The following is a numerical example of a system of linear equations in three variables:

35 workers can make small bags, tissue boxes, and small tubes from eceng gondok. Look at Table 2 below:

Table 2. Illustration of Produced from Eceng Gondok

Name of goods	Material (kg per unit)	Processing time (minutes per unit)	Price (rupiah per unit)
Small bag	2	160	12,000
Tissue box	1	120	8,000
Small Tube	2.5	240	15,000

Given that the amount of eceng gondok that can be processed by 35 workers per day is 175 kg, and the total time needed by the 35 workers is 16,800 minutes (480 hours). Determine the amount of each item that can be produced per day if it is known that the income per day is IDR 1,130,000.00.

Solution:

Let x = number of small bags, y = number of tissue boxes, and z = number of small tubes, the following mathematical model is obtained:

$2x + y + 2{,}5z = 175$……………. (1)

$160x + 120y + 240z = 16{,}800$ ……………. (2)

$12{,}000x + 8{,}000y + 15{,}000z = 1{,}130{,}000$……………. (3)

By using the elimination method in equations (1) and (2) obtained:

$$\begin{array}{l|l} 2x + y + 2{,}5z = 175 & \times 2 \\ 160x + 120y + 240z = 16{,}800 & \times \frac{1}{40} \end{array}$$

$$\begin{array}{r} 4x + 2y + 5z = 350 \\ \underline{4x + 3y + 6z = 420} \; - \\ -y - z = -70 \end{array}$$ ……………. (4)

By using the elimination method in equations (1) and (3) obtained:

$$\begin{array}{l|l} 2x + y + 2{,}5z = 175 & \times 6 \\ 12{,}000x + 8{,}000y + 15{,}000z = 1{,}130{,}000 & \times \frac{1}{1{,}000} \end{array}$$

$$\begin{array}{r} 12x + 6y + 15z = 1{,}050 \\ \underline{12x + 8y + 15z = 1{,}130} \; - \\ -2y = -80 \\ y = 40 \end{array}$$

Obtained y = 40, then substituted into equation (4)

$$-40 - z = -70$$
$$-z = -30$$
$$z = 30$$

Obtained z = 30, then substituted into equation (1)

$$2x + 40 + 2{,}5(30) = 175$$
$$2x + 40 + 75 = 175$$
$$2x + 115 = 175$$
$$2x = 60$$
$$x = 30$$

Therefore, the number of small bags that 35 workers can produce is 30 units, 40 units of tissue boxes, and 30 units of small tubes.

Some researchers (e.g., Azkia et al., 2022) found that some students had difficulties learning a system of linear equations in three variables. They needed to be more careful when solving a system of linear equations in three variables and had a fixation on examples of problems. To help students get habituated to autonomous learning and understand Banjar culture, they developed a module in the form of an ethnomathematics-based booklet. Other researchers (e.g., Silvia, 2022) examined ethnomathematics-based student worksheets on typical Dayak bead bracelets for a system of linear equations in three variables. It contains two indicators: Students can construct a system of linear equations in three variables and solve problems contextualizing a system of linear equations in three variables by elimination and substitution methods. According to earlier research, if the material relates to real-world issues or the area's culture, students will find it simpler to learn mathematics, such as a system of linear equations in three variables. Learning mathematics becomes more meaningful using an ethnomathematics approach (Silvia, 2022). This paper shows that the eceng gondok craft could be one of the objects used to make a system of linear equations in three variables with an ethnomathematics approach.

CONCLUSION

From the results of ethnomathematics exploration on eceng gondok crafts, it was found that there are several mathematical elements in it, namely geometric concepts such as the shape of blocks and tubes from tissue box crafts and roof bag crafts. The second mathematical element is the concept of calculus. This concept is contained in the eceng gondok jar craft. We can use the volume of rotating objects to find out the volume of the woven jar. Furthermore, the concept of the system of linear equations in three variables is also a mathematical element in the eceng gondok production process. Production data can be used as a real example in learning the system of linear equations in three variables material. This research needs to be further developed for other mathematical elements contained in various local crafts so that more sources and learning media can be used to facilitate students' understanding of mathematics material so that the assumption that mathematics is a complicated science to learn can be minimized.

REFERENCES

Andriyani, & Kuntarto, E. (2017). Etnomatematika: Model baru dalam pembelajaran. *Jurnal Gantang*, *II*(2), 133–144. http://ojs.umrah.ac.id/index.php/gantang/index

Astriandini, M. G., & Kristanto, Y. D. (2021). Kajian etnomatematika pola batik keraton Surakarta melalui analisis simetri. *Mosharafa: Jurnal Pendidikan Matematika*, *10*(1), 13–24. http://journal.institutpendidikan.ac.id/index.php/mosharafa

Avvisati, F., Echazarra, P., & Markus, S. (2019). *The Programme for International Student*. Directorate for Education and Skills. Organisation for Economic Co-operation and Development.

Azkia, K., Fajriah, N., & Suryaningsih, Y. (2022). Pengembangan modul berbentuk buklet berbasis etnomatematika kerajinan sasirangan materi sistem persamaan linear tiga variabel. *Jurnal Mahasiswa Pendidikan Matematika*, *2*(1), 12–22. http://jtam.ulm.ac.id/index.php/jurmadikta

Budiarto, M. T., & Artiono, R. (2019). Geometri dan permasalahan dalam pembelajarannya (suatu penelitian meta analisis). *Jurnal Magister Pendidikan Matematika (Jumadika)*, *1*(1), 9–18. https://doi.org/10.30598/jumadikavol1iss1year2019page9-18.

Daswarman, & Sutadji, E. (2022). Etnomatematika minangkabau pada pembelajaran matematika sekolah dasar. *JIPD (Jurnal Inovasi Pendidikan Dasar)*, *6*(1), 16–20. https://doi.org/10.36928/jipd.v6i1.862

Dewi, S. P., & Kartini, K. (2021). Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Sistem Persamaan Linear Tiga Variabel Berdasarkan Prosedur Kesalahan Newman. *Junrnal Cendikia : Jurnal Pendidikan Matematika*, *5*(1), 632–642. https://doi.org/10.31004/cendekia.v5i1.508

Fajriyah, E. (2018). Peran etnomatematika terkait konsep matematika dalam mendukung literasi. *Prisma, Prosiding Seminar Nasional Matematika*, 114–119. https://journal.unnes.ac.id/sju/index.php/prisma/

Farhan, M., Apriyanto, M. T., & Hakim, A. R. (2021). Etnomatematika: Eksplorasi uma lengge untuk pembelajaran matematika di sekolah. *Jurnal Derivat*, *8*(2), 98–106. https://doi.org/10.31316/j.derivat.v8i2.1965

Fauzi, A., & Lu'luilmaknun, U. (2019). Etnomatematika pada permainan dengklaq sebagai media pembelajaran matematika. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *8*(3), 408–419. https://doi.org/10.24127/ajpm.v8i3.2303

Harmini, T., Annurwanda, P., & Suprihatiningsih, S. (2020). Computational thinking ability students based on gender in calculus learning. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *9*(4), 977–986. https://doi.org/10.24127/ajpm.v9i4.3160

Iksanudin, Saputro, M., & Firdaus, M. (2022a). Analisis Kemampuan Pemecahan Masalah Pada Materi Sistem Persamaan Linier Tiga Variabel. *Jurnal Prodi Pendidikan Matematika (JPMM)*, *4*(1), 377–387.
https://jurnal.mipatek.ikippgriptk.ac.id/index.php/JPPM/article/view/410

Iksanudin, Saputro, M., & Firdaus, M. (2022b). Analisis kemampuan pemecahan masalah pada materi sistem persamaan linier tiga variabel di SMAN 1 Bunut Hulu. *Jurnal Prodi Pendidikan Matematika (JPMM)*, *4*(1), 377–387. https://jurnal.mipatek.ikippgriptk.ac.id/index.php/JPPM/article/view/410

Jamna, N. D., Hamid, H., & Bakar, M. T. (2022). Analisis kemampuan berpikir komputasi matematis siswa SMP pada materi persamaan kuadrat. *Jurnal Pendidikan Guru Matematika*, *2*(3), 278–288. https://doi.org/10.33387/jpgm.v2i3.5149

Kamil, M. R., Imami, A. I., & Abadi, A. P. (2021). Analisis kemampuan berpikir komputasional matematis siswa kelas IX SMP negeri 1 Cikampek pada materi pola bilangan. *Aksioma: Jurnal Matematika Dan Pendidikan Matematika*, *12*(2), 259–270. https://doi.org/10.26877/aks.v12i2.8447

Kemendikbud. (2019). *Sistem persamaan linear tiga variabel*. Kementrian Pendidikan dan Kebudayaan.

Purnamasari, R., Agustiningsih, & Alfarisi, R. (2022). Ethnomathematical exploration of cetho temple on the topic of plane figures for elementary school. *Ethnomathematics Journal*, *3*(2), 86–99. https://doi.org/10.21831/ej.v3i2.51657

Putri, L. I. (2017). Eksplorasi etnomatematika kesenian rebana sebagai sumber belajar matematika pada jenjang MI. *Jurnal Ilmiah Pendidikan Dasar*, *4*(1), 21–31. https://jurnal.unissula.ac.id/index.php/pendas/article/view/1018

Rahmadani, T., & Reflina. (2023). Ethnomathematics exploration of the taganing musical instrument. *Mathline: Jurnal Matematika Dan Pendidikan Matematika*, *8*(2), 589–602. https://doi.org/10.31943/mathline.v8i2.425

Rahmawati Z., Y., & Muchlian, M. (2019). Eksplorasi etnomatematika rumah gadang Minangkabau Sumatera Barat. *Jurnal Analisa*, *5*(2), 124–136. http://journal.uinsgd.ac.id/index.php/analisa/index

Rejeki, S. (2015). Kontribusi kemampuan kalkulus I dan kalkulus II terhadap hasil belajar mata kuliah analisis vektor. *Jurnal Pendidikan Matematika IAIN Antasari*, *3*(1), 1–14. http://jurnal.uin-antasari.ac.id/index.php/jpm/article/view/1178

Rudyanto, H. E., Kartikasari Hs, A., & Pratiwi, D. (2019a). Etnomatematika budaya Jawa: Inovasi pembelajaran matematika di sekolah dasar. *Jurnal Bidang Pendidikan Dasar (JBPD)JBPD*, *3*(2), 25–32. http://ejournal.unikama.ac.id/index.php/

Rudyanto, H. E., Kartikasari Hs, A., & Pratiwi, D. (2019b). Etnomatematika Budaya Jawa : Inovasi Pembelajaran Matematika Di Sekolah Dasar. *Jurnal Bidang Pendidikan Dasar (JBPD)JBPD*, *3*(2), 25–32. http://ejournal.unikama.ac.id/index.php/

Sagala, S. A., & Hasanah, R. U. (2023). Ethnomathematics exploration at the state museum of North Sumatra. *Mathline: Jurnal Matematika Dan Pendidikan Matematika*, *8*(1), 123–136. https://doi.org/10.31943/mathline.v8i1.364

Sarwoedi, Okta Marinka, D., Febriani, P., & nyoman Wirne, I. (2018). Efektifitas Etnomatematika dalam Meningkatkan Kemampuan Pemahaman Matematika Siswa. *Jurnal Pendidikan Matematika Raflesia*, *3*(2), 171–176. https://ejournal.unib.ac.id/index.php/jpmr

Silvia. (2022). Eksplorasi etnomatematika pada gelang manik-manik khas Dayak Kalimantan sebagai sumber penyusunan LKPD. *Pattimura Proceeding: Conference of Science and Technology*, 195–206. https://doi.org/10.30598/PattimuraSci.2021.KNMXX

Soebagyo, J., Andriono, R., Razfy, M., & Arjun, M. (2021). Analisis peran etnomatematika dalam pembelajaran matematika. *ANARGYA: Jurnal Ilmiah Pendidikan Matematika*, *4*(2), 184–190. https://doi.org/10.24176/anargya.v4i2.6370

Utami, R. N. F., Hermanto, R., & Muhtadi, D. (2021). Etnomatematika: Eksplorasi seni ukir Jepara. *JP3M (Jurnal Penelitian Pendidikan Dan Pengajaran Matematika)*, *7*(1), 23–38. https://doi.org/10.37058/jp3m.v7i1.2551

Yanti, D., & Haji, S. (2019). Studi tentang konsep-konsep transformasi geometri pada kain besurek Bengkulu. *JNPM (Jurnal Nasional Pendidikan Matematika)*, *3*(2), 265–280. https://doi.org/10.33603/jnpm.v3i2.1744