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ETHNOMATHEMATICAL EXPLORATION IN THE SURAKARTA HADININGRAT PALACE BUILDING

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Abstrak

Penelitian ini bertujuan untuk mengkaji dan menganalisis eksplorasi etnomatematika di Keraton Kasunanan Surakarta Hadiningrat agar diperoleh informasi untuk mengembangkan etnomatematika. Metode penelitian yang digunakan yaitu penelitian deskriptif kualitatif berjeni etnografis. Peneliti berusaha menggali informasi melalui observasi, wawancara, dan dokumentasi. Lokasi penelitian di Keraton Kasunanan Surakarta Hadiningrat, Surakarta, Jawa Tengah. Hasil penelitian menunjukkan bahwa di setiap bentuk bangunan maupun pada benda-benda peninggalan yang berada di Keraton Kasunanan Surakarta Hadiningrat ternyata terdapat unsur matematika yang ditemukan. Pada atap pintu masuk keraton memiliki bentuk trapesium sama kaki. Pintu masuk ndalem keraton memiliki bentuk persegi panjang. Pada ornamen hiasan pada lampu memiliki bentuk lingkaran, dan bentuk guci yang terdapat di museum berbentuk tabung. Unsur-unsur tersebut dapat digunakan oleh para pengajar sebagai bahan pembelajaran pada kegiatan belajar mengajar khususnya pada mata pelajaran matematika. Unsur etnomatematika di Keraton Kasunanan Surakarta Hadiningrat dapat diintegrasikan ke dalam pembelajaran matematika, di antaranya konsep luas bangun datar, keliling bangun datar, luas permukaan bangun ruang, volume bangun ruang, dan transformasi geometri
Kata kunci: etnomatematika; keraton surakarta; matematika

Abstract

This study aims to study and analyze ethnomathematical exploration in the Surakarta Hadiningrat Kasunanan Palace to obtain information to develop ethnomathematics. The research method used is descriptive qualitative research with an ethnographic type. Researchers tried to dig up information through observation, interviews, and documentation. The research location is in the Surakarta Hadiningrat Kasunanan Palace, Surakarta, Central Java. The results showed that in every form of the building as well as on the relics in the Surakarta Hadiningrat Kasunanan Palace, there were mathematical elements found. The roof of the palace entrance has the shape of an isosceles trapezoid. The entrance to the palace ndalem has a rectangular shape. The decorative ornaments on the lamps have the shape of a circle, and the urns in the museum are in the form of a tube. Teachers can use the elements as learning materials in teaching and learning activities, especially in mathematics. Elements of ethnomathematics at the Surakarta Hadiningrat Kasunanan Palace can be integrated into mathematics learning, including the concepts of area, perimeter, surface area, volume, and geometry transformation.
Keywords: ethnomathematics; mathematics; Surakarta palace

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INTRODUCTION

Realistic mathematics is currently very much needed for students so that they can better understand the material being taught because students can see clear examples of the material when this ethnomathematical approach is used in learning (Irawan and Gita Kencanawaty, 2017). There are many elements of mathematics in everyday life, including the culture that develops in society (Hardiarti, 2017). Mathematics grows and develops from a culture. Culture can be used as one of the learning media in mathematics subjects to provide actual examples to assist in inculcating mathematical concepts in students (Susanto, Heryanto, and Aryan, 2022). Culture-based learning is used to improve the quality of education, integrate cultural values into learning, develop educational models with cultural values and transform culture through learning mathematics (Kania, Kartimi, and Mulyani, 2013; Muzakki and Fauziah, 2015; Qolbi, Kartimi, and Roviati, 2016; Rohaeti, 2011; Sariyatun, 2013; Supriadi, Arisetyawan, and Tiurlina, 2016).

Mathematics and culture are summarized into one in ethnomathematics (Azizah, 2020). Ethnomathematics is a way of understanding mathematics that involves the surrounding culture (Kencanawaty and Irawan, 2017; Marsigit, 2016; Sarwoedi, Marinka, Febriani, and Wirne, 2018; Sulistyani, Windasari, Rodiyah, and Muliawati, 2019). Previous research has shown that the implementation of ethnomathematics in mathematics learning can improve mathematics learning outcomes and improve students' mathematical abilities (Ajmain, Herna, and Masrura, 2020; Soebagyo, Andriono, Razfy, and Arjun, 2021; Zulaekhoh and Hakim, 2021). This shows that ethnomathematics is a good and innovative bridge for teachers to provide comprehensive methods and materials for learning Mathematics.

In ethnomathematics, cultural practices allow the embedding of mathematical concepts (Fajriyah, 2018). Indonesia has abundant culture, especially in Surakarta, Central Java. In Surakarta, there is a palace that is never empty of

visitors, namely the Surakarta Hadiningrat Kasunanan Palace in which there is a museum that stores ancestral relics. The Surakarta Hadiningrat Sunanate Palace is active and is led by King Pakubuwono. The Surakarta Hadiningrat Sunanate Palace is one of the real cultural elements in Indonesia. However, there has never been a previous study that explored the ethnomathematical elements in the Surakarta Hadiningrat Kasunanan Palace. Therefore, the researcher intends to study and analyze ethnomathematical exploration in the Surakarta Palace to obtain information to develop ethnomathematics. The title of this research is the Ethnomathematical Exploration of the Surakarta Palace Building.

METHOD

This research is included in descriptive qualitative ethnographic research. This study explores information to find symptoms or events (concepts or problems) by examining these symptoms using an ethnographic approach. Researchers tried to dig up information through observation, interviews, and documentation. The research location is in the Surakarta Hadiningrat Sunanate Palace, Surakarta, Central Java. Observations were made to obtain information about the Surakarta Palace directly at the research site. Interviews were conducted to obtain information about the history and philosophy of the Surakarta Palace from several community leaders. Documentation is used to take pictures of several buildings owned by the Surakarta Palace.

RESULT AND DISCUSSION

The palace, which has the original name Kasunanan Palace or also known as the Surakarta Hadiningrat Palace, was built by King Paku Buwana II in 1745 at the same time as the discovery of the city of Surakarta. The palace area is decorated with marble stones and various ancient reliefs. Inside the palace, there is also a museum that stores ancestral relics in the form of cutlery, horse-drawn carriages, various weapons, and others. In the courtyard of the palace, there is a tower called the Sanggabuwono Stage which is believed to be the place where the King met Nyi

Roro Kidul. This palace is a place full of dignity with traditions that are still strong today (Hardiyanti, Antariksa, and Hariyani, 2005).

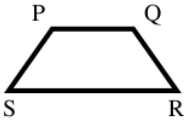
There are mathematical elements such as points, lines, planes, plane figures, solid figures, similarity, congruence, and geometry transformation in the Surakarta Palace. In the following, we will present ethnomathematics at the Surakarta Palace which can be related to mathematics, especially in plane figures and solid figures.

The Roof of the Palace Entrance or Kori Komandungan

Figure 1. Kori Kamandungan

On the roof of the palace entrance above, there is a plane isosceles trapezoid which is a mathematical concept, especially the plane figures. From Figure 1 above, it can be used as teaching material in determining the area and perimeter of an isosceles trapezoid. On the roof of the porch Kori Kamandungan above, there are the plane figures of the isosceles triangles. It can be used as teaching material in determining the area of the triangle, perimeter of an isosceles triangle, congruent triangles, and geometry transformation material (translation, rotation, reflection).

Table 1. Mathematical Concepts from Kori Kamandungan

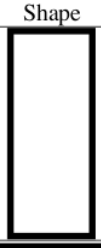
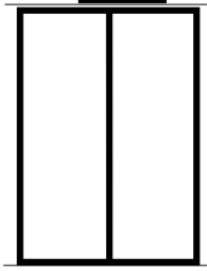
Shape	Math Concept
	Trapezoid has 4 sides where 2 sides are parallel (PQ and SR) while the other 2 sides are not parallel. • Area of Trapezoid $A = \frac{1}{2} \times$ sum of the lengths of parallel sides $\times$ height • The Perimeter of the Trapezoid P = PQ + QR + RS + PS
	An isosceles triangle has 2 equal sides and 2 equal angles. The sum of the three angles of a triangle is 180°. • Area of triangle A = ½ base side × height • Perimeter of triangle P = the sum of the lengths of the three sides
	• Two congruent triangles • The concept of symmetry • Reflection concept • Rotation concept • Translation concept

Entrance to Ndalem Keraton

Figure 2. Entrance to Ndalem Keraton

At the entrance to the palace, there is a mathematical concept, namely the plane figures in the form of a rectangle. Figure 2 above, can be used as teaching material in determining the area of a rectangle, the perimeter of rectangle, congruent rectangles, and geometry transformation material (translation, rotation, reflection).

Table 2. Mathematical Concepts from The Entrance to Ndalem Keraton

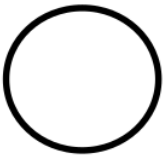
Shape	Math Concept
	A rectangle has 4 sides where the parallel and opposite sides are the same lengths and all angles are right angles. • The Area of Rectangle L = Length × Width • The perimeter of the Rectangle P = 2 (Length + width)
	• Two congruent rectangles • The concept of symmetry of a rectangle • Reflection concept • Rotation concept • Translation concept

The Decorative Ornaments on Lamps

Figure 3. The Decorative Ornaments on Lamps

In the lamp decoration above, there is a mathematical concept in the form of a plane figure (circle) that can be implemented in mathematics learning to determine the area and circumference of a circle.

Table 3. Mathematical Concepts from The Lamps

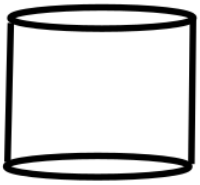
Shape	Math Concept
	A circle has only 1 side and has no angles and has infinitely folded symmetry. • Area of Circle $L = \pi r^2 = \frac{1}{4} \times \pi d^2$ • Circumference of Circle $K = 2\pi r = \pi d$

The Urn at the Palace Museum

Figure 4. The Urn

In the urn, there is a mathematical concept, namely the solid figures in the form of a cylinder, and can be implemented to determine the volume and surface area of the cylinder.

Table 4. Mathematical Concepts from The Urn

Shape	Math Concept
	The cylinder has 3 side planes and 2 ribs. A cylinder is made up of 2 parallel circles and a rectangle that surrounds the two circles. • Surface Area $SA = 2\pi r (r + t)$ • Volume $V = \pi r^2 t$

These results indicate that in every form of the building as well as on relics in the Surakarta Hadiningrat Kasunanan Palace, there are mathematical elements found. The roof of the palace entrance has the shape of an isosceles trapezoid. The entrance to the palace ndalem has a rectangular shape. The decorative ornaments on the

lamps have the shape of a circle, and the urns in the museum are in the form of a cylinder. Teachers can use the elements as learning materials in teaching and learning activities, especially in mathematics. Elements of ethnomathematics at the Surakarta Hadiningrat Sunanate Palace can be integrated into mathematics learning, including the concepts of plane figures, solid figures, volume, and geometry transformation. These concepts can be applied in learning mathematics as a contextual problem as well as a way to introduce cultural elements to students to develop student character education (Richardo, 2016; Setiana, Ayuningtyas, Wijayanto, and Kusumaningrum, 2021).

Ethnomathematics can be used by teachers in conducting effective and fun learning (Soebagyo et al., 2021). The application of ethnomathematics as a means to motivate, and stimulate students, can overcome boredom and give new nuances to learning mathematics (Richardo, 2016; S. Sirate, 2012). This can make it easier for students to absorb learning material because students have a clear picture of the plane figures and solid figures being studied. The results of previous studies stated that through ethnomathematical studies, they could make a pedagogical contribution to mathematics learning (Astriandini and Kristanto, 2021; Sudianto and Santoso, 2022; Sulistyani et al., 2019; Susanto et al., 2022). This is partly because people know and apply culture that has to do with mathematics (Azizah, 2020). So that it shows the relationship between ethnomathematics and mathematical concepts and its role in supporting mathematical literacy (Fajriyah, 2018).

CONCLUSION

Keraton Surakarta Hadiningrat which was built by King Paku Buwana II has some buildings and relics that have mathematical elements when viewed in terms of shape. Elements of ethnomathematics at the Surakarta Hadiningrat Sunanate Palace can be integrated into mathematics learning, including the concepts of plane figures, solid figures, volume, and geometry transformation. Teachers can use the elements as learning materials in teaching and learning activities, especially in mathematics.

This research can then be carried out on other cultures that have never been explored before. In addition, further research can be conducted on the effect of ethnomathematics at the Surakarta Hadiningrat Palace on students' mathematical abilities.

REFERENCES

Ajmain, Herna, and Masrura, S. I. (2020). Implementasi Pendekatan Etnomatematika Dalam Pembelajaran Matematika. *SIGMA (Suara Intelektual Gaya Matematika)*, *12*(1), 45–54. https://doi.org/https://doi.org/10.26618/sigma.v12i1.3910

Astriandini, M. G., and 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.v10i1.831

Azizah, N. H. (2020). Keterkaitan Matematika dan Budaya Jawa dalam Bingkai Etnomatematika. *Prosiding Pendidikan Matematika Dan Matematika*, *2*(1). https://doi.org/https://doi.org/10.21831/pspmm.v2i0.92

Fajriyah, E. (2018). Peran Etnomatematika Terkait Konsep Matematika dalam Mendukung Literasi. *Prisma, Prosiding Seminar Nasional Matematika*, *1*, 114–119. https://doi.org/2613-9189

Hardiarti, S. (2017). Etnomatematika: Aplikasi Bangun Datar Segiempat pada Candi Muaro Jambi. *Aksioma*, *8*(2), 99. https://doi.org/10.26877/aks.v8i2.1707

Hardiyanti, N. S., Antariksa, and Hariyani, S. (2005). Studi Perkembangan dan Pelestarian Kawasan Keraton Kasunanan Surakarta. *Dimensi Teknik Arsitektur*, *33*(1), 112–124. https://doi.org/https://doi.org/10.9744/dimensi.33.2.%25p

Irawan, A., and Gita Kencanawaty. (2017). Implementasi Pembelajaran Matematika Realistik Berbasis Etnomatematika. *Journal of Medives*, *1*(2), 74–81. https://doi.org/prefix 10.31331

Kania, N., Kartimi, and Mulyani, A. (2013). *Penerapan Pembelajaran Biologi Berbasis Sains Lokal Melalui Budaya Paraji Terhadap Hasil Belajar Siswa Pada Pokok Bahasan Sistem Reproduksi Kelas XI di SMA Negeri Jatiwangi*. *2*(2), 1–18. https://doi.org/http://dx.doi.org/10.24235/sc.educatia.v2i2

Kencanawaty, G., and Irawan, A. (2017). Penerapan Etnomatematika Dalam Pembelajaran Matematika di Sekolah Berbasis Budaya. *Ekuivalen Pendidikan Matematika*, *27*(2), 169–175. https://doi.org/10.37729

Marsigit. (2016). Pengembangan Pembelajaran Matematika Berbasis Etnomatematika. *Prosiding Seminar Nasional Matematika-Pendidikan Matematika STKIP PGRI Sumatera Barat*, *2*(1), 1–38. Retrieved from https://www.cairn.info/revue-etudes-

2003-11-page-475.htm

Muzakki, and Fauziah, P. Y. (2015). Implementasi Pembelajaran Anak Usia Dini Berbasis Budaya Lokal di PAUD Full Day School. *Jurnal Pendidikan Dan Pemberdayaan Masyarakat*, *2*(1), 39–54. https://doi.org/10.21831/jppm.v2i1.4842

Qolbi, F., Kartimi, and Roviati, E. (2016). Penerapan Pembelajaran Berbasis Sains Budaya Lokal Ngarot Untuk Meningkatkan Keterampilan Berpikir Kritis Siswa Pada Konsep Plantae (Studi Eksperimen Kelas X Di Sma N 1 Lohbener). *Scientiae Educatia: Jurnal Sains Dan Pendidikan Sains*, *5*(2), 105–121. https://doi.org/http://dx.doi.org/10.24235/sc.educatia.v5i2

Richardo, R. (2016). Peran Ethnomatematika dalam Penerapan Pembelajaran Matematika pada Kurikulum 2013. *LITERASI*, *7*(2), 118–125. https://doi.org/http://dx.doi.org/10.21927/literasi.2016.7(2).118-125

Rohaeti, E. E. (2011). Transformasi Budaya Melalui Pembelajaran Matematika Bermakna Di Sekolah. *Jurnal Pengajaran MIPA*, *16*(1), 139–147. https://doi.org/https://doi.org/10.18269/jpmipa.v16i1.36004.g15380

S. Sirate, F. (2012). Implementasi Etnomatematika dalam Pembelajaran Matematika pada Jenjang Pendidikan Sekolah Dasar. *Lentera Pendidikan*, *15*(1), 41–54. https://doi.org/10.24252/lp.2012v15n1a4

Sariyatun. (2013). Pengembangan Model Pendidikan Nilai-Nilai Budaya Di SMP Berbasis Tradisi Seni Batik Klasik Surakarta. *Paramita: Historical Studies Journal*, *23*(2), 230–241. https://doi.org/https://doi.org/10.15294/paramita.v23i2.2672

Sarwoedi, Marinka, D. O., Febriani, P., and Wirne, I. N. (2018). Efektifitas Etnomatematika dalam Meningkatkan Kemampuan Pemahaman Matematika Siswa. *Jurnal Pendidikan Matematika Raflesia*, *03*(02), 171–176. https://doi.org/10.33369/jpmr.v3i2.7521

Setiana, D. S., Ayuningtyas, A. D., Wijayanto, Z., and Kusumaningrum, B. (2021). Eksplorasi Etnomatematika di Museum Kereta Kraton Yogyakarta dan Pengintegrasiannya ke dalam Pembelajaran Matematika. *Ethnomathematics Journal*, *2*(1), 1–10. https://doi.org/10.21831/ej.v2i1.36210

Soebagyo, J., Andriono, R., Razfy, M., and 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

Sudianto, and Santoso, E. (2022). Eksplorasi Etnomatematika pada Area Siti Inggil Keraton Kasepuhan Cirebon. *Jurnal Didactical Mathematics*, *4*(1), 273–282. https://doi.org/https://doi.org/10.31949/dm.v4i1.2501

Sulistyani, A. P., Windasari, V., Rodiyah, I. W., and Muliawati, N. E. (2019). Eksplorasi Etnomatematika Rumah Adat Joglo Tulungagung. *Media Pendidikan Matematika*, *7*(1), 22–28. https://doi.org/10.33394/mpm.v7i1.1537

Supriadi, Arisetyawan, A., and Tiurlina. (2016). Mengintegrasikan Pembelajaran

Matematika Berbasis Budaya Banten pada Pendirian SD Laboratorium UPI Kampus Serang. *Mimbar Sekolah Dasar*, *3*(1), 1–18. https://doi.org/10.17509/mimbar-sd.v3i1.2510

Susanto, P. K., Heryanto, D. R., and Aryan, D. (2022). Eksplorasi Etnomatematika Pada Rumah Adat Joglo Sinom Limas. *Prisma, Prosiding Seminar Nasional Matematika*, *5*, 483–491. Retrieved from https://journal.unnes.ac.id/sju/index.php/prisma/article/view/54568

Zulaekhoh, D., and Hakim, A. R. (2021). Analisis Kajian Etnomatematika pada Pembelajaran Matematika Merujuk Budaya Jawa. *JPT: Jurnal Pendidikan Tematik*, *2*(2), 216–226. https://doi.org/2745-5645

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