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# Conceptual Understanding Through Yogyakarta Keraton Train

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## *Abstract*

Understanding the concept is the foundation for solving problems in everyday life. To help students' understanding of concepts, Ethnomathematics was here to facilitate students in learning. With Ethnomathematics-based mathematics learning, the problems used will be more easily accepted by students and the learning that occurs is more meaningful because of problems in the form of problems in everyday life related to student culture and environment. This study used a qualitative descriptive approach. The purpose of this study is to describe the understanding of the concept of grade VII students of MTS n 8 Sleman after the implementation of Ethnomathematics-based learning of the Kraton Yogyakarta Train. The results of this study found that SR subjects are included in the category of good understanding of concepts. Because it can solve 6 questions that refer to 7 indicators of understanding mathematical concepts. NL subjects are included in the category of good concept understanding because it can solve 5 questions out of 6 questions that refer to 7 indicators of understanding mathematical concepts. The subject of AN is included in the category of good concept understanding because it can solve 5 questions out of 6 questions that refer to 7 indicators of understanding mathematical concepts.

***Keywords:*** *Conceptual Understanding; Ethnomathematics; Yogyakarta Kraton Train*

## *Introduction*

Mathematics is a science that plays an important role in life and socializing in society. One of the objectives of mathematics learning stated by the Ministry of Education and Culture in 2013 is to shape students' ability to solve a problem systematically. Students who are able to solve problems systematically mean that they have a good understanding and know the mathematical ideas that are still related. Understanding in learning mathematics should be instilled by teachers to their students. Without understanding students will not be able to apply processes, concepts and steps (Utami, 2025).

In mathematics learning, the most important understanding is the understanding of concepts. The ability to understand mathematical concepts is very important because besides being one of the goals of learning mathematics, the ability to understand concepts can also help students to not only memorize formulas, but can understand correctly what is meant in mathematics learning (Pitaloka and Mulyono, 2013). Understanding concepts in mathematics learning is an important foundation in solving mathematical problems and everyday problems. This is as stated by (Arnidha, 2017) that understanding mathematical concepts is very necessary in learning mathematics in schools. That is, in learning

mathematics students must understand concepts well in order to solve problems and be able to apply the learning in everyday life (Feny Apriani, 2024).

The abstractness of objects in mathematics requires various things that are close to everyday life and interesting and fun learning to help students' understanding. In the midst of the development of educational technology, the educational curriculum also demands cultural involvement in learning in schools with the aim that students can become a generation with character and are able to maintain and preserve culture as the foundation of the nation's character (Maisaroh & A'yun, 2024). Cultural practice allows the embeddment of mathematical concepts, this is called ethnomathematics which raises cultural wisdom so as to motivate students in learning mathematics (Fajriyah, 2018). Ethnomathematics was first introduced by Brazilian educator and mathematician Ubiratan D'Ambrosio in 1997 in a presentation to the American Association for the Advancement of Science (D'Ambrosio, 1985). Meanwhile, Marsigit argues that Ethnomathematics is a science used to understand how mathematics is adapted from a culture and serves to express the relationship between culture and mathematics. So it can be said that ethnomathematics is a science in studying the culture of society, historical relics related to mathematics and mathematics learning.

Marsigit, Condromukti, Setiana, and Hardiarti (Marsigit et al., 2018) emphasized that mathematics learning should begin by exploring mathematical knowledge obtained by students from the surrounding environment. Concrete things related to student experiences can be used by teachers as interesting learning resources, for example through the culture around students. Therefore, students will more easily observe and imagine what is explained by the teacher, so that it can help students master mathematics better.

Ethnomathematics also aims to study how students understand, manage, and articulate so that they can use mathematical ideas, concepts, and practices that can solve mathematical problems at school and in the environment where they live (Sulaiman, 2019). In ethnomathematics, habits cannot be separated from the application of mathematical concepts. This can be seen from the forms of cultural products, especially in Indonesia, such as art, traditional house forms, carvings, and jewelry. Ethnomathematics uses broad mathematical concepts related to various mathematical activities including grouping activities, counting, measuring, designing buildings or tools, playing, determining locations, and so on (Rachmawati, 2012). The concept is very important, but how can the concept be understood by students. The concept of understanding the learning process influences students' attitudes, decisions, and problem-solving methods (Raharjo &; Sulaiman, 2017). One of the innovations that help improve student understanding is the development of innovative and progressive learning to develop and explore knowledge concretely and independently.

This concept deals with students' understanding of aspects of mathematics adapted to cultural activities in their environment. Mathematics is very close to the habits of society, especially Javanese society. Without realizing it, some Javanese people or tribes with certain cultures have used mathematical knowledge in their daily activities. Be it simple or complex, activities such as buying and selling fish caught in coastal fishing complexes or Building traditional houses where every piece of building ornaments is calculated in detail and systematically. Among many fields of mathematics, geometry includes transformation geometry, analytic geometry and space, and Euclidean geometry (Sundawan et al., 2019) Geometry is used by everyone in everyday life and occupies a unique position in the mathematics curriculum because of the many concepts it contains (Maharani et al., 2019).

Several studies have developed ethnomathematics-based learning both in terms of identification to implementation and its benefits in learning. Research (Sulaiman &; Nasir, 2020)) resulted in the conclusion that there is a mathematical concept in Panjalin Traditional House. Another study explores mathematical concepts in Gordang Sambilan musical instruments so that they can be implemented in mathematics learning in the classroom (Lubis et al., 2018). Research that implements ethnomathematics

includes the implementation of ethnomathematics in mathematics learning at the elementary school education level and junior (Siti Fatimah et al., 2024; Widya Sahasika,2025). The research (Setiana, D. S et al., 2021) was based on mathematical concepts identified in cultural elements at the Yogyakarta Kraton Train Museum including the concept of flat building area, the concept of spatial building volume, symmetry, and terselation or binding. Based on each research, researchers want to apply mathematics learning based on the Ethnomathematics of Yogyakarta Kraton Train in the classroom to see students' understanding of concepts.

## *Method*

This research is qualitative research with descriptive methods. The subjects of this study are grade VII students of MTS n 8 SLEMAN for the 2024 academic year. Researchers randomly selected students by considering students' activeness in learning mathematics based on Ethnomathematics Train Keraton Yogyakarta. Consultation with subject matter teachers is also needed to obtain information related to students' concept understanding abilities.

The instrument used is a test of the ability to understand mathematical concepts in the form of an essay with rectangular flat building material (square, rectangular, and parallelogram) to measure the ability to understand students' mathematical concepts and interviews in an unstructured. Data collection techniques carried out in this study are tests, interviews, and documentation to obtain all the important things done during the research so that activities can be recorded properly. Data analysis techniques in this study are data reduction, data display, conclusing drawing.

## *Finding*

Ethnomathematics-based learning can be started by identifying-fication of ethnomathematical objects. One of the learning resources that can be explored from an ethnomathematical point of view that is interesting to learn is the Yogyakarta Kraton Train. Yogyakarta Sultanate has various horse-drawn carriages that reach hundreds of years old such as Kanjeng Nyai Jimat, Kanjeng Kyai Jongwiyat, and Kyai Puspoko Manik Train. Some of these collection trains are still used for the sake of ceremonies of the greatness of the Yogyakarta Palace.

The introduction of the Yogyakarta Palace Train uses a 360video assisted by Lapentor and together students identify mathematical objects on the Yogyakarta Palace Train. Mathematical concepts were obtained including the concept of flat area (square, rectangle, parallelogram, and circle), and the volume of the building space. However, this study only teaches mathematical concepts on the circumference and area of flat squares, rectangles, and parallelograms.

Furthermore, students are asked to do 6 questions that refer to 7 indicators of understanding mathematical concepts. Understanding mathematical concepts includes: restating a concept, classifying objects according to certain properties, giving examples and not examples of a concept, presenting concepts in various forms of representation, developing sufficient conditions or necessary conditions for a concept, utilize, and select specific procedures or operations, and apply problem-solving concepts or algorithms.

## Discussion

The analysis was conducted to see how students' understanding of mathematical concepts after the implementation of Ethnomathematics-based learning of Yogyakarta Kraton Train. The results of the test of understanding mathematical concepts and interviews obtained the following data:

1. SR subject

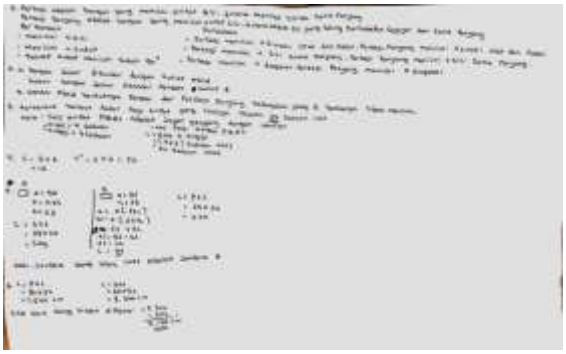

*Figure 1. Results of Subject SR*

Based on the results of data obtained from written tests and interviews on questions number 1 to number 6 by SR subjects obtained for results number 1 subjects can restate concepts correctly. For question number 2a, the subject can classify objects according to certain properties according to their concepts. For question number 2b, the subject can give examples instead of examples of square and rectangular flat shapes. For question no. 3 the subject can present the concept in various mathematical representations precisely. For question number 4, the subject can develop the necessary conditions or sufficient conditions for a concept to be correct but have not concluded the answer to the question. After being confirmed through interviews the subject said that he did not see the questions on the questions well, the subjects assumed that the questions only asked the area of each flat building. For question no 5 the subject can use, utilize and choose the procedure appropriately. This can be seen in the subject's answer that can use the circumference of squares and rectangles to find the area of squares and rectangles. For question number 6, the subject can apply the concept of problem solving appropriately. This is seen in the subject's answers that can solve problems related to the rest of the fabric that is not worn.

2. NL subject

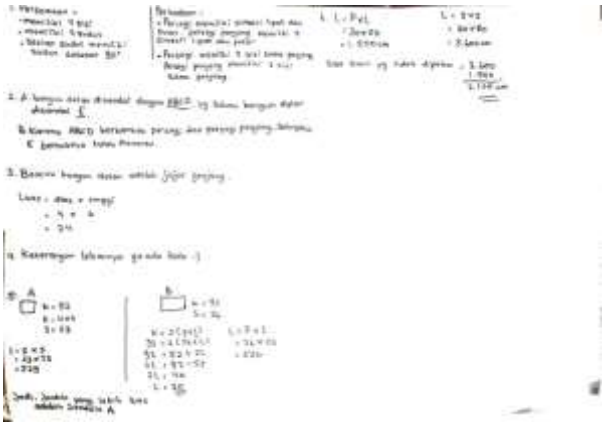

*Figure 2 Result Subject NL*

Based on the results of data obtained from written tests and interviews on questions no. 1 to number 6 by NL subjects, it was found that for question no. 1 subjects were able to restate a concept correctly. For question no. 2a, the subject is able to classify objects according to certain properties according to their concepts. For question no 2b, the subject is able to give examples and not examples by looking at the pictures in the problem. For question number 3, the subject can present concepts in sharing mathematical representations appropriately. For question no. 4 the subject cannot develop sufficient conditions and conditions need a concept. This can be seen from

the subject's answer to write a description of the unknown rectangular width and at the time of the interview the subject said less observing the image on the question. For question number 5 the subject can use, utilize, and choose a particular procedure or operation appropriately. This can be seen in the solution of structured problems even though the unit area is not written. For problem number 6, the data subject applies the concept or algorithm of problem solving correctly.

3. Subject AN

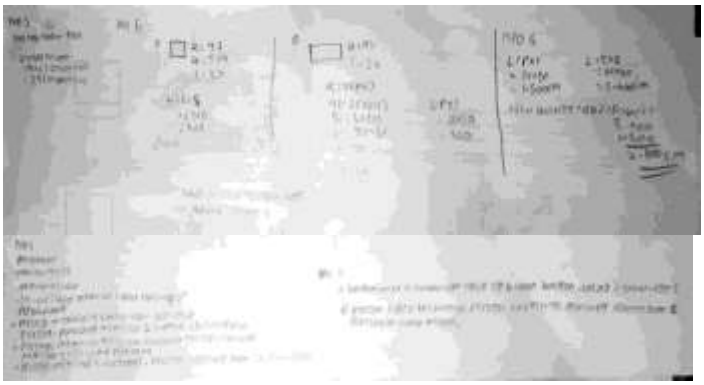

*Figure 3 Result Subject AN*

Based on the results of data obtained from written tests and interviews on questions number 1 to number 6 by AN subject. For question no. 1, the subject can correctly restate a concept of square and rectangular flat shapes. For question number 2a, subjects can classify square and rectangular objects contained in the image according to the nature of each flat shape according to its concept. For question number 2b, the subject can give examples of flat, rectangular and square shapes. For question number 3, the subject can present the concept in various forms of mathematical representation but it is not yet precise. This can be seen in answer number 3 the subject did not mention what quadrilateral was formed in the question. For question number 4 the subject cannot develop sufficient conditions or the conditions need a concept. It can be seen that the subject did not write the answer to question number 4. The subject confirmed during the interview that the subject could not solve the problem because the subject argued that the width of the rectangle was unknown. For question number 5 the subject can use, utilize and choose the procedure or operation appropriately. This can be seen in the answer that subjects can use the circumference of squares and rectangles to find the area. For question number 6, the subject can apply the concept of rectangular area to solve the problem of remaining unused fabric.

## *Conclusion*

SR subjects are included in the category of good understanding of concepts. Because it can solve 6 questions that refer to 7 indicators of understanding mathematical concepts. NL subjects are included in the category of good concept understanding because it can solve 5 questions out of 6 questions that refer to 7 indicators of understanding mathematical concepts. The subject of AN is included in the category of good concept understanding because it can solve 5 questions out of 6 questions that refer to 7 indicators of understanding mathematical concepts. The results of the data obtained from the three subjects also show that mathematics learning based on the Ethnomathematics of the Yogyakarta Kraton Train can be used as an alternative to facilitate students in learning the concepts of building flat squares, rectangles, and parallelograms.

### *References*


D'Ambrosio, U. (1985). Ethnomathematics And Its Place In The History And Pedagogy Of Mathematics. *For The Learning Of Mathematics*, *5*(February 1985), 44-48 (In 'Classics').

Fajriyah, E. (2018). Peran Etnomatematika Terkait Konsep Matematika Dalam Mendukung Literasi. *PRISMA, Prosiding Seminar Nasional Matematika*, *1*, 114–119. Https://Journal.Unnes.Ac.Id/Sju/Index.Php/Prisma/Article/View/19589

Feny Apriani, S. (2024). *Pentingnya Latihan Terstruktur Bagi Pemahaman Konsep*. *4*(1).

Lubis, S. I., Mujib, A., & Siregar, H. (2018). Eksplorasi Etnomatematika Pada Alat Musik Gordang Sambilan. *Edumatika : Jurnal Riset Pendidikan Matematika*, *1*(2), 1. Https://Doi.Org/10.32939/Ejrpm.V1i2.246

Maharani, A., Sulaiman, H., Saifurrohman, Aminah, N., & Rosita, C. D. (2019). Analyzing The Student's Cognitive Abilities Through The Thinking Levels Of Geometry Van Hiele Reviewed From Gender Perspective. *Journal Of Physics: Conference Series*, *1188*(1). Https://Doi.Org/10.1088/1742-6596/1188/1/012066

Maisaroh, S., & A'yun, D. Q. (2024). *Pendidikan Dalam Perspektif Ki Hajar Dewantara : Antara Kebebasan , Kemandirian , Kebudayaan*. *2*(12).

Marsigit, Rahayu Condromukti, Dkk. (2014). Pengembangan Pembelajaran Matematika Berbasis Etnomatematika. *Prosiding Seminar Nasional Etnomatnesia*, 20–38.

Raharjo, J. F., & Sulaiman, H. (2017). Mengembangkan Kemampuan Pemahaman Konsep Matematika Diskrit Dan Pembentukan Karakter Konstruktivis Mahasiswa Melalui Pengembangan Bahan Ajar Berbantuan Aplikasi Education Edmodo Bermodelkan Progresif Pace (Project, Activity, Cooperative And Exercise). *Teorema*, *2*(1), 49–50. Https://Doi.Org/10.25157/.V2i1.569

Setiana, D. S., Ayuningtyas, A. D., & Wijayanto, Z. (2021). *Eksplorasi Etnomatematika Di Museum Kereta Kraton Yogyakarta Dan Pengintegrasiannya Ke Dalam Pembelajaran Matematika Ethnomathematics Exploration At Museum Of Kereta Kraton Yogyakarta And Its Integration In Mathematics Instruction*. *2*(1), 1–10.

Siti Fatimah, Rania Zulfi Fajriyah, Frika Fatimah Zahra, S. P. P. (2024). Integrasi Etnomatematika Dalam Pembelajaran Matematika *Di Sekolah Dasar Berbasis Kesenian Tari Budaya Lampung 8*(4), 1631–1640. Https://Doi.Org/10.35931/Am.V8i4.3721

Sulaiman, H. (2019). Aktivitas Matematika Berbasis Budaya Pada Masyarakat Pesisir Di Pasar Ikan Gebang Kabupaten Cirebon. *Mapan*, *7*(1), 61–73. Https://Doi.Org/10.24252/Mapan.2019v7n1a5

Sulaiman, H., & Nasir, F. (2020). Ethnomathematics: Mathematical Aspects Of Panjalin Traditional House And Its Relation To Learning In Schools. *Al-Jabar : Jurnal Pendidikan Matematika*, *11*(2), 247–260. Https://Doi.Org/10.24042/Ajpm.V11i2.7081

Sundawan, M. D., Irmawan, W., & Sulaiman, H. (2019). Kemampuan Berpikir Relasional Abstrak Calon Guru Matematika Dalam Menyelesaikan Soal-Soal Non-Rutin Pada Topik Geometri Non-Euclid. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(2), 319–330. Https://Doi.Org/10.31980/Mosharafa.V8i2.438

Utami, Y. (2025). *DIKMAT: Jurnal Pendidikan Matematika*. *06*(01), 17–21.

Widya Sahasika, Feny Rita Fiantika, P. (2025). *Eksplorasi Etnomatematika Dalam Permainan Tradisional Lompat Tali Pada Pembelajaran Berhitung Siswa Kelas II Sekolah Dasar*. *10*.