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AN IMPLEMENTATION ETHNOMATHEMATICS (BAY TAT CAKES) TO IMPROVE CONCEPTUAL UNDERSTANDING

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Abstrak

Penelitian ini merupakan penelitian kuantitatif dengan tujuan menggunakan etnomatematika kue Bay Tat untuk meningkatkan pemahaman konsep matematika siswa. Subyek dalam penelitian ini adalah 24 siswa pada kelas kontrol dan 24 siswa pada kelas eksperimen. Instrumen yang digunakan dalam penelitian ini adalah tes tertulis untuk melihat sejauh mana peningkatan pemahaman konsep siswa. Teknik analisis yang digunakan adalah analisis statistik deskriptif dan inferensial. Hasil penelitian ini menunjukkan adanya peningkatan yang lebih tinggi pada kelas eksperimen dibandingkan pada kelas kontrol. Hal ini terlihat dari nilai N gain pada kelas kontrol sebesar 0,24, peningkatan pemahaman konsep siswa berada pada kategori lemah. Sedangkan pada kelas eksperimen diperoleh skor N gain sebesar 0,42 yang menunjukkan bahwa pemahaman konsep siswa mengalami peningkatan yang signifikan. Berdasarkan analisis inferensial diperoleh nilai t hitung sebesar 2,23 > t tabel yaitu 2,01 artinya Ho ditolak atau adanya pengaruh dan peningkatan pemahaman konsep siswa setelah penerapan etnomatematika kue Bay Tat pada pembelajaran matematika.
Kata Kunci: etnomatematika, kue bay tat, pemahaman konsep, matematika.

Abstract

This research is a quantitative study with the aim of utilizing the ethnomathematics of Bay Tat cakes to improve students' understanding of mathematical concepts. The subjects in this research were 24 students in the control class and 24 students in the experimental class. The instrument used in this research is a written test to see the extent to which students' understanding of concepts has developed. The analysis technique used is descriptive and inferential statistical analysis. The results of this study showed that there was a higher increase in the experimental class than in the control class. This can be seen from the N gain score in the control class of 0.24, the increase in students' conceptual understanding is in the weak category. Meanwhile, in the experimental class, the N gain score was 0.42, which shows that students' understanding of concepts has increased significantly. Based on inferential analysis, the calculated t value obtained was 2.23 > t table, namely 2.01, meaning that Ho was rejected or met the influence criteria and it was seen that there was an increase in students' conceptual understanding after applying Bay Tat cake ethnomathematics during mathematics learning.
Keywords: *ethnomathematics, bay tat cake, concept understanding, mathematics.*

INTRODUCTION

Education and culture are unavoidable in day-to-day living since they represent a whole and integrated entity that is relevant to a community. Every person in society has a fundamental need, which is education. Ethnomathematics is one that can serve as a link between culture and education.

Ethnomathematics is a form of mathematics that is influenced or culturally based. Ethnomathematics is defined as mathematics used by communities or cultural groups, such as urban and rural communities (Utami et al., 2019). As a result, ethnomathematics sheds light on the social function that mathematics serves in academia. One approach to making mathematics learning meaningful and contextual is through a process known as “culture-based mathematics learning”, which is strongly associated with the cultural communities where mathematics is

studied and applied in daily life (Pathuddin & Nawawi, 2021). Gendes (Nur et al, 2020) defined ethnomathematics as the cultural anthropology of mathematics and mathematics education. It is a relatively young topic of study situated at the intersection of cultural anthropology and mathematics. The science that examines the connection between mathematics and culture is called ethnomathematics (Hariastuti et al., 2019; Sianturi et al., 2022; Sulaiman & Nasir, 2020). The core of the educational process and pedagogy is ethnomathematics, or mathematics that emerges and grows in society and in conformity with the local culture. Ethnomathematics can play a role in connecting the preservation of local culture and wisdom with technological advances through science (Nuryadi et al., 2020; Peni & Baba, 2019; Permata et al., 2021).

Since mathematics mostly develops from abilities or activities in a cultural setting, a person's cultural background has an impact on their mathematical abilities. The culture that exists in history gives birth to the mathematics learning process (Atikah et al, 2020). Ethnomathematics is a complex and dynamic representation. Ethnomathematics has enriched our understanding of mathematics by showing that mathematics is a cultural product that evolved from the specific needs and contexts of society. The field continues to grow and contribute to the development of more inclusive and culturally relevant mathematics education. There is a group of people who use culture for mathematics learning such as activities of grouping objects, sorting objects, counting, playing, making patterns, making geometric shapes, and communicating their mathematical ideas in their own language (Putra & Mahmudah, 2021; Rahmawati, & Muchlian, 2019). The use of culture in mathematics learning can minimize the fading of local culture in the region and make students motivated and learning more enjoyable. By understanding the development of ethnomathematics, we can see how this approach not only broadens our horizons about how mathematics serves as an integral part of human life around the world but also helps to improve understanding of mathematics.

Understanding a concept in mathematics is the basis for students to enjoy mathematics. The importance of understanding concepts in mathematics is because mathematics studies concepts that are interconnected and mutually continuous. Students must therefore be able to comprehend concepts to participate in mathematics sessions. If teachers still use the old paradigm in teaching, such as teachers dominating the learning process where the learning carried out still uses the lecture method with students only coming, sitting, listening, and taking notes on the material after returning home, making students' mathematical skills not develop (Gistituati, & Atikah, 2022; Imswatama, & Lukman, 2018). Therefore, teacher-centered learning has been replaced with student-centered learning with the aim of making students more active in the teaching and learning process and being able to construct an understanding of the concept independently.

Based on surveys that have been conducted during mathematics learning, most students have not been able to apply the concepts they understand solving problems. They have the view that mathematics struggles with many difficult calculations and formulas that require memory and analytical power in their use. In line with Anugraheni et al (2020) that students need to improve their understanding of concepts in order to come up with various ideas when solving problems so that the learning process becomes fun learning. In addition, the researcher also found that students have not been able to redefine mathematics subject in their own language, have not been able to provide concrete examples of the concepts understood. Rosyidah et al (2020) that mathematical concept errors exist in the problem of integer operations which are grouped according to three parts, namely inaccurate errors, conceptual errors, and a combination of inaccurate errors and conceptual errors. This mistake occurs because students do not carefully understand the questions and write down the answers. They make mistakes when interpreting number symbols as intended in issues and mistakenly designate

plus and minus symbols in whole numbers, or mistakenly write number operation symbols. The research of Parhusip & Hardini (2020) emphasizes that the conceptual mistakes made by students on the subject of numbers are misunderstandings about: 1) The concept of understanding of natural numbers, fractional numbers, integers, and rational and irrational numbers; 2) integer operation; 3) negative symbols and the concept of a minus sign for operation and 4) operations using number lines. So it can be concluded that mathematical concepts are not just memorized.

Some studies, say that conventional learning processes such as teacher-centered learning are less effective in achieving optimal concept understanding. Because the role of teachers is a central aspect to achieve the goal of understanding concepts, in the context of contemporary mathematics learning, teachers must take the view that mathematics materials are not memorized materials, but more than that, namely understanding concepts and applying them to solve problems (Jehadus, 2018; Atikah et al, 2022).

Teachers must understand that the Government through the Permendiknas on content standards formulates one of the objectives of learning mathematics in schools, namely mastery of mathematical concepts. Which is detailed as follows: explaining the relationship between concepts and applying concepts, describing step-by-step procedures that can be used to solve computing or other mathematical problems flexibly, accurately, efficiently, and precisely. Siregar (2012) added that understanding mathematical concepts is the root or basis for mastering other higher mathematical concepts and supporting the ability to connect between these concepts. An important foundation used to think in solving mathematical issues and real problems relevant to mathematics is the understanding of mathematical concepts (NCTM, 2000). If students have good conceptualization, it is certain that they will be able to record, understand, and be able to apply and modify a concept in solving various variety of issues and mathematical problems.

To improve students' understanding of mathematical concepts, researchers apply Ethnomathematics as a learning resource. The results of Widada's research (2019) said that learning using ethnomathematics can be used to introduce mathematical concepts through local culture, with learning mathematics in the classroom will be more meaningful because the ethnomathematics used is familiar to students, already known and exists in their own cultural environment. In this regard, the results of the research of Umbara et al (2019) said that ethnomathematics can be used as a concrete source of mathematics learning, and cultural ethnomathematical objects around us can be used to carry out innovative learning. In this case, ethnomathematics that is close to students in the city of Bengkulu is one of them is the Bay Tat cake.

Bengkulu is one of the provinces that has local culture as an important and inseparable part of the life of its people. The people of Bengkulu highly uphold cultural values, so they always try to preserve cultural heritage that has existed since ancient times. One of the famous cultural heritage of Bengkulu is traditional food. Traditional Bengkulu food is always served at every event in the community and is a souvenir as a characteristic of Bengkulu. This makes traditional Bengkulu food very familiar, including among students. This traditional food is called Bay Tat cake. Physically, the surface of the Bay Tat Bengkulu cake has distinctive shapes and has hardly changed since ancient times, namely circles, squares and rectangles. The surface of this Bay Tat cake is formed from several small squares so that when cut it will get the same large part. From its distinctive surface shape, the author feels the need to dig and explore more deeply the concept of numbers contained in the Bay Tat cake so that it can be used as one of the sources of mathematics learning that is very close to students' lives.

Based on the description above, the researcher aims to prove empirically and scientifically the ethnomathematical implementation of Bay Tat cake to improve the understanding of the concept.

METHODS

To answer the formulation of the research problem, we conducted an exploratory field study with a pseudo-experimental design. The research design is "*the matching only pretest-posttest control group design"*. The experiment class, namely 40 students of rombel IV A, and the control class consisted of 35 students from rombel IV B. The instrument used to collect data was a test of understanding the concept of fractions. Statistical inferential and descriptive analysis are the methods of data analysis that are employed. The researcher compared the increase in the Pretest-Posttest score in each group to find out the gain score (g) which indicates an increase in their conceptual understanding. As for the latter, his party examined the research hypothesis by using a t-test with pooled variants for two independent samples. The findings of data analysis based on the value of t table at a significant level of 5% can be used as the criteria for testing the hypothesis, determining whether it is accepted or rejected. If t counts > t table, the H0 is rejected, and if t counts ≤ t table, then H0 is accepted.

RESULTS AND DISCUSSION

The results of this study are presented in the following table 1.

Table 1. Descriptive Statistics Improve Students' Conceptual Understanding

Concept Comprehension Ability	Class Control		Class Experiment	
	For-test	Post-test	Pre-test	Post-test
Maximum Value	60	77	66	88
Minimum Values	25	45	30	40
Total Value	1053	1381	1082	1640
Average	43,87	57,54	45,08	68,33
N Gain Score	0,24		0,42	
Standard Deviation	10,84	10,67	11,99	11,49
Variant	117,57	113,87	143,66	131,95

Based on table 1. Above, in the control class, students get a maximum score of concept comprehension which is 77. With an average score of 43.875 and a standard deviation of 10.843, the pretest score falls into the poor range. However, after learning, the score climbed to 57.542 with a standard deviation of 10.672. In the experimental class, the average pretest score obtained was 45.083 with a standard deviation of 11.986. After the use of ethnomathematics (Bay Tat cake) as a learning resource, the average score of students increased to 68,333 with a standard deviation of 11,487.

Table 2.Normalized Gain Classification on Students' Conceptual Understanding of Mathematics

Coefficient of Normalized-gain	Classification
$g < 0.3$	**Low**
$0,3 \leq g < 0,7$	**Average**
$g \geq 0.7$	**Hight**

Based on tables 1 and 2. The researcher analyzed the N gain score obtained in the experimental class, which was 0.423, interpreted as an increase in the medium category, meaning that there was an increase in concept understanding after the use of ethnomathematics of Bay Tat cake during the implementation of mathematics learning. After analyzing the data using descriptive statistics, an inferential analysis of the

average data was carried out to improve students' conceptual understanding. The test used is a t-test of two independent samples, and the test results are as follows.

Table 3. Hypothesis Test for Improving Students' Conceptual Understanding in Mathematics

Concept Comprehension Ability	Pre-test		Post-test	
	Control Classes	Experimental Classes	Control Classes	Experimental Classes
N	24	24	24	24
Df	23	23	23	23
Average	57,54	66,21	43,87	45,08
Variant	117,57	143,66	113,87	131,95
Chi Square	4,66	6,88	9,79	3,67
F count	1,18		1,72	
F table	1,98			
t count	0,47		2,23	
t table	2,01			

Based on table 3. Both samples are homogeneous and the distribution of data is normally distributed. To test the research hypothesis, the researcher compared the t count with the t table. Before being given special treatment to support students' understanding of concepts, it was found that t calculated < t table or 0.47 < 2.01, meaning that Ho was accepted, meaning that there was no increase in the use of ethnomathematics for students' understanding of concepts. However, after being treated with the use of ethnomathematics of Bay Tat cake as a learning resource, it was found that the t-value was 2.23 > t the table, which was 2.01, meaning that Ho was rejected or met the criteria of influence and there was an increase in students' conceptual understanding after the application of ethnomathematics of Bay Tat cake during mathematics learning.

The understanding of mathematical concepts of grade IV students in fractional material was initially in the low category. They do not get learning resources that are close to their daily environment, so they are less enthusiastic about learning. After that, researchers used the ethnomathematics of Bay Tat cake to improve students' understanding of concepts. The average score of students' conceptual understanding after utilizing the ethnomathematics of the Bay Tat cake increased significantly. Several studies have also reported that by applying ethnomathematics in learning, students' understanding of concepts can develop (Ilyas & Ikram, 2021). Similarly, the use of mathematical concepts contained in Cilacap traditional food helps students construct students' thoughts or understanding through the identification and exploration of Cilacap traditional food objects because they utilize concrete objects (Laelinatul, 2020). Lepet Ketan traditional food culinary products with local culture can be used as a learning medium so that they do not have problems when understanding the concept of geometry (Werdiningsih, 2022).

Based on the results of research by Pathuddin, H., & Raehana, S. (2019) almost all students have eaten and even made traditional Bugis food, Students can be asked to observe the traditional food, then asked to identify the geometric concepts in which mathematics learning becomes more meaningful because the learning resources come from the environment around the students. Andriono (2021) lists several benefits of implementing ethnomathematics-based learning, such as: (1) Making mathematics learning enjoyable and contextual; (2) Reducing the perception that mathematics is hard and abstract, and replacing it with the perception that mathematics is fun, and real in every day activities; (3) Learning about one's own and other cultures; (4) Being aware of the value and appreciation of one's pwn and other cultures; and (5) Being a part of efforts to

systematically preserve culture through education in general and mathematics education in particultural. So it can be concluded that learning in the classroom is more meaningful because ethnomathematics is known and exists in their own environment, mathematics learning has followed pedagogic rules in general, namely with learning that starts from concrete to abstract, simple to complex so that students' understanding of concepts increases.

CONCLUSION

Based on hypothesis calculations and discussions, it can be concluded that the use of ethnomathematics of Bay Tat cake can improve the understanding of mathematical concepts. This can be seen from the calculated t value obtained of 2.23 > the table t, which is 2.01, meaning that Ho was rejected or met the influence criteria and there was an increase in students' conceptual understanding after the application of the ethnomathematics of the Bay Tat cake during mathematics learning. Before to apllying the ethnomathematics of Bay Tat cake, students' conceptual knowledge of mathematics was in the low range; however, following the application of the ethnomathematics of Bay Tat cake, students' conceptual understanding improved. There are several suggestions for further researchers as follows: (1) researchers can utilize ethnomathematics in Bengkulu Province for research and support the existence of Bengkulu culture; (2) teachers can use ethnomathematics as a source of mathematics learning because it is close to students' daily lives; (3) It is intended that by using ethnomathematics as a teaching tool, students will be able to grasp and appreciate the culture in their community while also improving their mathematical skills in line with the Minister of National educations aims for mathematics education.

REFERENCE

Andriono, R. (2021). Analisis peran etnomatematika dalam pembelajaran matematika. ANARGYA: Jurnal Ilmiah Pendidikan Matematika, 4(2).

Anugraheni, I., Kristen, U., & Wacana, S. (2020). Analisis Kesulitan Mahasiswa dalam Menumbuhkan Kemampuan Berpikir Kritis melalui Pemecahan Masalah. 04(01), 261–267.

Atikah, N., Gistituati, N., Syarifuddin, H., & Fitria, Y. (2022, December). E-module mathematics by using Kvisoft flipbook in elementary school. In *AIP Conference Proceedings* (Vol. 2468, No. 1). AIP Publishing.

Atikah, N., Karjiyati, V., & Noperman, F. (2020). Pengaruh Model Realistic Mathematics Education Berbasis Etnomatematika Tabut terhadap Kemampuan Komunikasi Matematika Siswa Kelas IV SDN di Kota Bengkulu. *JURIDIKDAS: Jurnal Riset Pendidikan Dasar*, *3*(1), 25-32.

Gistituati, N., & Atikah, N. (2022). E-module based on RME approach in improving the mathematical communication skills of elementary students. *Jurnal Ilmiah Sekolah Dasar*, *6*(1), 106-115.

Hariastuti, R. M., Budiarto, M. T., & Manuharawati, M. (2019). From Culture to Classroom: Study Ethnomathematics in House of Using Banyuwangi. International Journal of Trends in Mathematics Education Research, 2(2), 76–80.

Ilyas, M., & Ikram, M. (2021). An implementation of ethnomathematics-science, technology, engineering, mathematics (ethno-STEM) to enhance conceptual understanding. *Al-Jabar: Jurnal Pendidikan Matematika*, *12*(1), 35-44.

Imswatama, A., & Lukman, H. S. (2018). The Effectiveness of Mathematics Teaching Material Based on Ethnomathematics. International Journal of Trends in Mathematics Education Research, 1(1), 35–38.

Jehadus, E. (2018). Model Quantum Untuk Mengatasi Kecemasan. Jurnal

Pendidikan Dan Kebudayaan Missio, 10(2), 137–142.

Laelinatul, C. (2020). Studi Etnomatematika Pada Makanan Tradisional Cilacap. *Aksioma: Jurnal Matematika dan Pendidikan Matematika Upgris Semarang*, 210-214.

National Council of Teachers of Mathematics (2000). Principles and Standars for School Mathematics. Reston, VA: NCTM.

Nur, A. S., Waluya, S. B., Rochmad, R., & Wardono, W. (2020). Contextual learning with Ethnomathematics in enhancing the problem solving based on thinking levels. JRAMathEdu (Journal of Research and Advances in Mathematics Education), 5(3), 331–344.

Nuryadi, N., Kurniawan, L., & Kholifa, I. (2020). Developing mobile learning based on ethnomathematics viewed from adaptive e-learning: Study of two dimensions geometry on Yogyakarta palace's chariot. International Journal of Education and Learning, 2(1), 32–41.

Pathuddin, H., & Nawawi, M. I. (2021). Buginese Ethnomathematics: Barongko Cake. Journal on Mathematics Education, 12(2), 295–312.

Pathuddin, H., & Raehana, S. (2019). Etnomatematika: makanan tradisional Bugis sebagai sumber belajar matematika. *MaPan: Jurnal Matematika dan Pembelajaran*, *7*(2), 307-327.

Parhusip, Y. P., & Hardini, A. T. A. (2020). Meta Analisis Efektivitas Pembelajaran Kontekstual Terhadap Kemampuan Pemahaman Matematika Bagi Mahasiswa Sekolah Dasar. *Mimbar Ilmu*, *25*(3), 319-326.

Peni, N. R. N., & Baba, T. (2019). Consideration of curriculum approaches of employing ethnomathematics in mathematics classroom. Journal of Physics: Conference Series, 1321(3), 1–5.

Permata, J. I., Budiarto, M. T., & Ekawati, R. (2021). Ethnomathematics: Geometry and Values from Architecture of the Radakng House in Sahapm Village. Advances in Social Science, Education and Humanities Research, 611(1), 495–499

Putra, E. C. S., & Mahmudah, F. N. (2021). The Implementation of Ethnomathematics Based-Learning for Students. SJME (Supremum Journal of Mathematics Education), 5(2), 162–169.

Rahmawati, Y., & Muchlian, M. (2019). Eksplorasi etnomatematika rumah gadang Minangkabau Sumatera Barat. Jurnal Analisa, 5(2), 123–136.

Rosyidah, A. N. K., Maulyda, M. A., & Oktaviyanti, I. (2020). Miskonsepsi Matematika Mahasiswa PGSD Pada Penyelesaian Operasi Hitung Bilangan Bulat. Jurnal Ilmiah KONTEKSTUAL, 2(01), 15–21. https://doi.org/10.46772/kontekstual.v2i01.244

Sianturi, C. E., Kiawati, E. S., Ningsih, E. C., Fitria, N. R., & Kusuma, J. W. (2022). Ethnomathematics: Exploration of Mathematics Through a Variety of Banten Batik Motifs. International Journal of Economy, Education and Entrepreneuship, 2(1), 149–156.

Siregar, N. F. (2021). Pemahaman Konsep Matematika Siswa SMP Melalui Pendekatan Realistic Mathematics Education. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *5*(2), 1919-1927.

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.

Utami, N. W., Sayuti, S. A., & Jailani. (2019). Math and mate in javanese primbon: Ethnomathematics study. Journal on Mathematics Education, 10(3), 341–356.

Umbara, U., Wahyudin, & Prabawanto, S. (2019). Ethnomatematics: how does cigugur traditional community use palintangan on farming. Journal of Physics: Conference Series, 1265(1), 12025. https://doi.org/10.1088/1742-6596/1265/1/012025

Werdiningsih, C. E. (2022). Kajian Etnomatematika Pada Makanan Tradisional (Studi Kasus Pada Lepet Ketan). *Jurnal PEKA (Pendidikan Matematika)*, *5*(2), 112-121.

Widada, W. (2019). Characteristics of students thinking in understanding geometry in learning ethnomathematics. International Journal of Scientific and Technology Research, 8(11), 3496–3503.