

Teachers' Perception toward Ethnomathematics-based Learning

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ABSTRACT

Ethnomathematics has been globally studied in terms of mathematical concepts, its implementation, and teachers' competence to apply it. However, research on teachers' perceptions of ethnomathematics remains scarce. Therefore, this study aims to investigate teachers' perception of ethnomathematics-based learning, including the challenges encountered during its integration. This study is a qualitative study using a case study design. The participants involved two math teachers from two senior high schools. A semi-structured interview was conducted to collect data. Data were then analyzed qualitatively. The results revealed that teachers have positive responses toward ethnomathematics. They perceived the importance of ethnomathematics in learning. However, they found some challenges during the implementation; the major challenge was a limited understanding of ethnomathematics. Therefore, this study suggests that it is necessary to provide teachers with teacher training on ethnomathematics.

Keywords: teachers' perception; ethnomathematics; mathematics teaching

ABSTRAK

Etnomatematika telah dikaji secara global baik dari segi konsep matematika, implementasinya, maupun kompetensi guru dalam menerapkannya. Namun, penelitian mengenai persepsi guru terhadap etnomatematika masih sedikit. Oleh karena itu, penelitian ini bertujuan untuk mengetahui persepsi guru terhadap pembelajaran berbasis etnomatematika termasuk tantangan yang dihadapi selama implementasinya. Penelitian ini merupakan penelitian kualitatif dengan desain studi kasus. Responden dalam penelitian ini adalah dua orang guru matematika pada tingkat sekolah menengah atas. Wawancara semi terstruktur dilakukan untuk mengumpulkan data. Data kemudian dianalisis secara kualitatif. Hasil penelitian menunjukkan bahwa guru memiliki tanggapan positif terhadap etnomatematika. Mereka menyadari pentingnya etnomatematika dalam pembelajaran. Namun, mereka menemukan beberapa tantangan selama penerapannya; tantangan utamanya adalah terbatasnya pemahaman etnomatematika. Oleh karena itu, penelitian ini menyarankan agar guru dibekali pelatihan terkait etnomatematika.

Kata kunci: persepsi guru; etnomatematika; pengajaran matematika

1. Introduction

Ethnomathematics has been widely discussed and studied among researchers and educators in mathematics education. Research on ethnomathematics has also

been conducted globally, including in Indonesia. Since Indonesia has diverse cultures spread across the country, ethnomathematics thereby suits Indonesian contexts. The researchers have explored

different aspects of cultures in which mathematical concepts are embedded, such as traditional houses (Sari et al., 2022), foods (Busrah & Pathuddin, 2021), clothes (Fouze & Amit, 2019; Hidayat, 2021), games (Zuhri et al., 2023), and so on.

Generally, according to Mania and Alam (2021), studies on ethnomathematics could be classified into three. The first type is studies finding mathematical concepts within culture. The second type is research that assesses the implementation of ethnomathematics in learning. The third one is studies that examine the competence of math teachers to employ ethnomathematics in teaching instruction.

Regarding applying ethnomathematics in teaching, based on our observation, most high school teachers in Pidie Regency have minimal experience teaching math through ethnomathematics. Thus, this study attempts to introduce ethnomathematics to teachers and help them experience teaching math through ethnomathematics. Considering the current demand of the Indonesian national curriculum to internalize culture in learning, through this study, the teachers are expected to develop an understanding of teaching strategies through ethnomathematics.

With the development of ethnomathematics research, many have examined the implementation of ethnomathematics. However, little research discussed teachers' perceptions toward ethnomathematics (Mania & Alam, 2021; Nur et al., 2022). Some previous studies on teachers' perceptions or attitudes toward ethnomathematics include Mania and Alam (2021), Khalil (2023), and Aikpitanyi and Eraikhuemen (2015). Mania and Alam (2021) investigated Indonesian teachers' perception of ethnomathematics in teaching, how to implement ethnomathematics, and how to include ethnomathematics in mathematics

curriculum. However, their study was limited to teachers in Sulawesi only. Meanwhile, Khalil (2023) sought teachers' attitudes on ethnomathematics, which he called ethnic mathematics in Saudi Arabia, including knowledge, its integration, perceptions, and obstacles. Aikpitanyi and Eraikhuemen (2015) studied teachers' awareness of ethnomathematics in teaching mathematics. In respect of studies on teachers' perception toward ethnomathematics, most of them involved elementary teachers, such as Santoso et al. (2022), Maritaria et al. (2022), and Fitria and Mariana (2023). To our knowledge, no studies explored high school teachers' perceptions of ethnomathematics. Therefore, this study intends to explore teachers' perceptions of implementing ethnomathematics in mathematics classrooms at the senior high school level.

2. Method

This study is a qualitative study employing a case study design. This study sought teachers' perceptions toward implementing ethnomathematics in mathematics classrooms. In this study, teachers used the ethnomathematics approach in teaching mathematics at the senior high school level. The lesson plan was designed by researchers after thoroughly discussing the students' backgrounds and the topics students would learn at school with the teachers. All teaching instruments, including the lesson plan and the student worksheet, were validated by experts. Before using the designed lesson plan, the teachers had a briefing on how the lesson would be run through the ethnomathematics approach.

The participants involved two math teachers from two public senior high schools in Pidie Regency, Aceh, Indonesia. The teachers were chosen by the criteria: the availability and the willingness to apply ethnomathematics in their mathematics classroom. One of the

teachers has a background of a master's degree in mathematics education, while the other received a bachelor's degree in mathematics education. Both teachers are females aged 35 and 36. One has 13 years of teaching experience, and the other has ten years.

The data were gathered through semi-structured interviews conducted after implementing ethnomathematics-based learning. The interview was guided by the following questions:

1. What is your perception of ethnomathematics?
2. What are your views on teaching through ethnomathematics?
3. What challenges or problems did you face during your teaching through ethnomathematics?
4. After this, will you apply ethnomathematics in your classroom?

Data were analyzed qualitatively by identifying themes in teachers' responses. The results were further described and discussed in this paper.

3. Result and Discussion

The finding showed teachers' positive responses toward ethnomathematics. Based on the interview, teachers agreed that ethnomathematics is a valuable approach to mathematics. Through ethnomathematics, students can see the value of mathematics in their lives. Previously, students deemed that doing mathematics meant doing a calculation, which always relates to numbers. Using this approach, students can connect mathematics and culture to make learning interesting. This notion can be seen in the interview excerpts.

"...we include the value of culture in mathematics learning. So, mathematics is

not only about calculation but also relates to culture." (Teacher #1)

"As a math teacher, I personally think that math and culture have a connection, like in some topics in math, geometry and arithmetic sequence. Ethnomathematics expose students to culture... many cultures we need to expose to our students, especially culture in our community." (Teacher #2)

"Ethnomathematics is interesting as it is contextual." (Teacher #2)

This positive response is also confirmed by some previous studies (Khalil, 2023; Mania & Alam, 2021). Khalil (2023) reported that teachers showed a positive attitude toward ethnomathematics and noticed the importance of connecting math to students' culture. Mania and Alam (2021, p.293) believe that by "contextualizing mathematics with students' culture, students will preserve their culture"; therefore, ethnomathematics needs to be included in the mathematics curriculum.

Regarding using ethnomathematics in teaching, teachers contended that ethnomathematics-based learning encourages students' participation in learning. Students were interested in learning and actively solving math problems through discussion, helping them learn mathematics concepts. This is explained by teachers in the following excerpts.

"Students get motivated and are not getting bored during learning. It is important to implement an ethnomathematics approach to motivate students and make them interested in learning mathematics. Students also actively solved problems and discussed in their group." (Teacher #1)

"...it [ethnomathematics] helps students understand the math content" (Teacher #2)

This result is aligned with the study of Mania and Alam (2021), finding that teachers suggest ethnomathematics is interesting and prevents students from boredom. Further, the other teacher stated that the mathematics curriculum requires the use of a scientific approach in which teachers can insert cultural content, such as observing a cultural object.

"I think it [ethnomathematics-based learning] is very good. ...very suitable to the scientific approach, where we can insert cultural content. Like in observation, ...students can observe a picture or video [related to ethnomathematics]. ...then students can analyze the problems." (Teacher #2)

In another response, the teacher stated that ethnomathematics aligns with the current curriculum demand, which requires reasoning skills, as described below.

"[ethnomathematics] is aligned with the demand of independent curriculum as it emphasizes reasoning." (Teacher #2)

Moreover, concerning the challenges during the implementation of ethnomathematics, teachers mentioned that limited lesson time deters them from implementing activities in ethnomathematics-based learning.

"Time is one of my obstacles. Students need more time to read the cultural part of the task. Like Rumoh Aceh, students need to read the story about Rumoh Aceh first before answering the problems. So, they need to know the context of the problem first." (Teacher #1)

If we explore further about timing issues, students may not have good basic

mathematical concepts, slowing down their work. This assumption is confirmed by another teacher, who stated that students faced difficulty translating the problems into mathematics or mathematical modelling. In his study, Khalil (2023) pointed out that, according to the teachers, less motivation to learn mathematics is a significant obstacle to integrating ethnomathematics. She also mentioned that students' lack of knowledge about the culture is another constraint. This response is consistent with the study of Sunzuma and Maharaj (2022), revealing that students' limited knowledge of cultural content and diversity prevents teachers from applying ethnomathematics.

The other challenge revealed in this study is teachers' difficulty connecting some math topics and cultures. According to the teachers, not all math topics are found in cultural objects. Some math topics, such as logarithms, cannot be connected with culture, as the excerpt below:

"Not all math topics can employ ethnomathematics... Math topics that are not suitable for ethnomathematics are exponent, logarithm, matrix, and limit." (Teacher #2)

"Some topics may be difficult to use ethnomathematics since we do not know which cultural part we can connect to. I mean, there is a topic that is not embedded in the culture, for example, logarithm..." (Teacher #1)

We assume the teacher made this argument due to a lack of understanding of ethnomathematics and strategies to apply it in the classroom. According to Khalil (2023, p.1064), to integrate ethnomathematics into mathematics, teachers need "specialized knowledge, historical knowledge of math concepts, educational knowledge, and knowledge of

students' community culture." He also conducted an exploratory study reporting that 85% of teachers have medium to zero previous knowledge of ethnomathematics, and 50% of teachers rarely integrate ethnomathematics in teaching. Teachers also found it challenging to apply ethnomathematics, although they knew it was essential. The teachers' reluctance of ethnomathematics integration is also caused by their insufficient knowledge of ethnomathematics (Khalil, 2023; Sunzuma & Maharaj, 2019). Therefore, a teacher development program on ethnomathematics is vital at this time. As pointed out by several researchers (Mania & Alam, 2021; Nur et al., 2022; Register et al., 2022; Sunzuma & Maharaj, 2019), it is crucial to conduct teacher training on how to design learning using an ethnomathematics approach.

In addition, learning resources for teachers related to ethnomathematics are necessary for ethnomathematics integration. Limited related resources impede them from applying ethnomathematics, as mentioned in the following excerpt.

"...if there are no ethnomathematics resources related to the topic, it would be hard to implement." (Teacher #2)

"...it seems like ethnomathematics-based learning resources are limited. I mean, there are no ethnomathematics problems or ethnomathematics-based manual in all math topics and all cultural aspects." (Teacher #1)

Based on the teachers' responses, we may suggest that teachers should be provided with ethnomathematics-based learning resources to help them apply ethnomathematics in their classrooms. Furthermore, teacher manuals using ethnomathematics should be developed. Indeed, there is much developmental

research producing ethnomathematics-based tasks and lesson plans. However, most of them are not accessible, and teachers have very little information about good learning resources.

Concerning the intention to apply ethnomathematics in the classroom, teachers share similar responses. Both intend to include ethnomathematics if they teach math topics that can be linked to ethnomathematics, such as geometry. If the topic cannot be connected to ethnomathematics, they will not apply it unless ethnomathematics-related learning resources are available and suits to the topic being taught.

"Yes. If there are suitable topics to use ethnomathematics, I will apply it...like geometry." (Teacher #1)

"I will implement it only for some topics that relate to ethnomathematics." (Teacher #2)

4. Conclusion and Recommendation

The results of this study conclude that teachers have a positive response to ethnomathematics. They admit that ethnomathematics is prominent in mathematics classrooms to create exciting and meaningful learning. However, some challenges impede them from applying ethnomathematics, such as limited time, insufficient knowledge of ethnomathematics and strategies to apply it, unavailability of learning resources related to ethnomathematics, irrelevant topics with ethnomathematics, and students' insufficient math knowledge. Among all challenges, teachers' limited understanding of ethnomathematics is the most prominent. Therefore, based on this issue, we recommend that stakeholders hold a teacher training or workshop related to the ethnomathematics approach to help teachers develop their understanding of ethnomathematics. Through this program,

teachers may get information about ethnomathematics learning resources that will assist them in integrating ethnomathematics in the classroom. Moreover, this study suggests that further research explores more about teachers' obstacles in applying ethnomathematics and provides solutions to the problems.

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