



THE IMPORTANCE OF ETHNOMATHEMATICS IN EDUCATION: A SYSTEMATIC LITERATURE REVIEW

Muhammad Iqbal Nst^{1*}, Nanda Khairani Batubara²

^{1,2}Medan State University, Medan, Indonesia

*muhammadiqbalnst1299@gmail.com

ABSTRACT

Culture-based mathematics learning is one way to make mathematics learning meaningful and contextual which is closely related to society's culture. Ethnomathematics is his field of study. The goal of this field is to reveal the structure of analysis. Ethnomathematics can also be considered a course that teaches students how to understand, express, think about, and ultimately apply mathematical ideas, concepts, and procedures to situations related to their daily lives. For educators who develop an ethnomathematics-based educational approach, it is important to consider the problem concepts discussed above that can be found and developed in ethnomathematics-based problems. Ethnomathematics is an important approach to apply in learning. In various studies, it was found that ethnomathematics can increase positive feelings and increase students' motivation levels. achievement and retention of students.

Keywords: *Ethnomathematics, Education, Society's Culture, Literature Review.*

1. INTRODUCTION

In the 21st century, society is already using technology based on mathematics. But unfortunately, people only think about mathematics at school when studying mathematics. Even at school, this is a common thing, students feel unable to complete mathematics assignments. Finally, students hate mathematics and get trapped in it. But mathematics education must solve these problems. Mathematics education must increase understanding of the application of mathematics in a world where there has been a lot of technological progress.

Furthermore, the mathematical concepts that exist in human minds sometimes differ from the mathematics that exists in reality. This is in line with Hiebert & Carpenter, who found many differences between mathematics learning at school and mathematics in children's daily lives. Bishop emphasized that mathematics is a form of culture and has been integrated into all aspects of people's lives wherever they are (Zaenuri and Dwidayati, 2018).

Ethnomathematics is an approach where mathematics is explained using the culture that exists in a society. With this approach, mathematics can be understood more easily because mathematics is explained based on what happens in students' daily lives.

2. METHOD

2.1 Research Participants/Sample

This research was focused on providing readers with more knowledge about ethnomathematics in education in Indonesia. This is based on the lack of discussion about ethnomathematics in Indonesia.

2.2 Research Instrument

In this research, the author used several library materials related to the fundamentals of ethnomathematics, including research conducted by Gerdes and Barton.

2.3 Data Collection and Data Analysis



This research uses a systematic literature review method. Systematic literature review is a research method that identifies and evaluates findings on a research topic to answer previously determined questions (Kitchenham & Charters, 2007). The systematic literature review includes 3 stages, namely planning, conducting, and reporting. Planning, including preparing a systematic literature review protocol. At this stage, the researcher determines the research topic, namely ethnomathematics: Introduction to Education. Next, set the article search criteria. The article search criteria are based on sources such as the National Library or *Google Scholar* from the period 2003 to 2023. The keywords used are ethnomathematics and ethnomathematics in education. Conducting is an implementation of a systematic literature review. This stage begins with searching for articles based on the criteria that have been determined in the Planning stage. Article searches are carried out with the help of the application *Publish or Perish*. Next is article selection. The selected articles are articles that match the research topic. Reporting is the final stage of the research. This stage includes writing the results of the systematic literature review in written form according to a predetermined format.

2.4 Ethical Considerations

Ethnomathematics brings out cultural wisdom so that it can motivate students to learn mathematics.

2.5 Study Limitations

Research also has limitations in terms of the author's knowledge and experience in ethnomathematics including concepts, principles, and mathematical skills that exist in groups, nations, tribes, customs, or other groups.

3. RESULTS AND DISCUSSION

One of the worlds of students is culture which is the teacher's territory. One of the mathematics learning lessons that uses a culture-based approach in delivering mathematics learning is ethnomathematics. In ethnomathematics, it discusses how mathematics is taught using a learner-centered cultural perspective. Looking back historically we may see that ethnomathematics has been defined at different levels. Defined as the cultural anthropology of mathematics and mathematics education, it is a relatively new field of interest. Because the view of mathematics as "culture-free", as "a universal, essentially aprioristic form of knowledge" has been dominant, ethnomathematics emerged later than other ethnosciences (Gerdes, 1994). Ethnomathematics is a field of study. The object of this field is to reveal the structure of analysis. Ethnomathematics achieves this by investigating the mathematical activities of particular cultural groups, and hence their mathematical concepts (Barton, 1996). Ethnomathematics can also be considered as a course that teaches students how to understand, express, think about, and ultimately apply mathematical ideas, concepts, and procedures to situations related to their daily lives. Culture-based mathematics learning is one way that is felt to make mathematics learning meaningful and contextual which is closely related to the culture of society, where mathematics is studied and will be applied later.

3.1 Ethnomathematics and Philosophy

Ethnomathematicians must be able to discuss the possibility of the simultaneous existence of culturally different mathematics. The challenge for anyone attempting a philosophical basis for ethnomathematics is to ensure that there is an account of the way mathematics is structured, understood and communicated that is consistent with sociological and anthropological descriptions of how mathematics is deployed and used. Moreover, any explanation must explain how one mathematical culture became dominant and became highly developed compared to other mathematical cultures.

So, mathematics had to be explained in a new way: alternative philosophical positions had to be established – positions that had to be argued in conventional terms. Moreover, part of the task is to show why



previous philosophical positions are reasonable and firmly held. It is not enough to simply say that mathematics is culturally determined and continue to act as if this is the case simply because we believe so. We have to convince other people, especially mathematicians.

An important feature of realism that makes it unsuitable as a philosophical basis for understanding mathematical culture is the requirement of a universal, a priori basis for truth, namely a pre-existing mathematical world. It could be argued that it is not necessary for a cultural conception of mathematics that realism be rejected. It could be that mathematical objects are absolute, but can only be known through human abilities which depend on various factors, including culture. Therefore, the cultural view of mathematics is an expression of the inadequacy of human understanding of this ideal world.

However, the idea that cultural relativity in mathematics results from imperfections in culture does not help explain the problem that gave rise to ethnomathematics: namely, the failure of culture-based mathematics. That would allow us to say that some cultures "see" mathematics as more correct than others, and hegemony would continue.

It is suggested that a philosophy based on Wittgenstein can provide ethnomathematics with the position needed to describe mathematical objects correctly. The idea referred to here is the Wittgensteinian idea that we speak mathematics into existence (Barton, 1999).

For example, consider a circle. No one has ever seen or touched a circle; it is an ideal object. This prompted Plato to hypothesize about a world inhabited by such ideal objects, thus, there are circles. Wittgenstein argued that this is just a "way of talking": circles exist because – and only because – we talk about them. When we talk about them as if they were real objects then it makes sense to talk as if they had properties, but we must realize that this is just a convenient figure of speech - literally. When we don't talk about them, they don't exist. In languages where roundness is realized as an action, not as an object, circles do not exist.

Building a solid foundation for a conception of ethnomathematics gives us an exciting new direction to follow. This also encourages us to deepen our ethnomathematics concepts. This can be thought of in several ways. One way is to look at ethnomathematics investigations going on beneath the surface. The language examples above encourage us to look, not at different number words, but at the way they function in the language.

Similarly, with weaving patterns, it is interesting to analyze patterns attested in the arts and crafts of different cultures (and this may have some educational use although the author considers that to be an open question), but it is also important to examine the concept of symmetry used by the weavers – a concept that may be different from those we are familiar with.

Whether "below the surface" or "what if", I am sure of one thing: 'ethnomathematics research will continue to surprise us, and at the least expected times, of course. If we understand mathematics in a consistent relativist way, then we may be better able to "see" the hidden valleys between our mathematics'.

3.2 Ethnomathematics, Education, and Ideology

For educators to develop an ethnomathematics-based educational approach, it is important to consider the problem concepts discussed above so that ethnomathematics-based problems can be found and developed, thereby avoiding the use of pseudo-problems. their pedagogical program, as proposed by Freire: "The educational content for critical consciousness must be developed by seeking experiences with students that give meaning to their lives."

Learner ethnicity is a resource for mathematics teachers at all levels. This approach includes not only the cultural background of learners but also their cultural foreground as their life experiences and future hopes are taken into account (Presmeg, 1998).



A mechanical view of the dialogic educational process should be avoided; one should not expect an eleven-year-old boy or girl to develop a sophisticated understanding of the contradictions of political-economic systems. Children do develop an awareness of relationships in their world from their reflections on the way they play. Pedagogy with students as partners with the teacher does not mean that the educational process is value-free. The incorporation of socio-cultural aspects in mathematics education and the dialogical way of doing it each have a role to play. Dialogue in which the teacher speaks through his ethnomathematics (usually developed in universities) and the participants learn to talk to them.

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3.3 The Importance of Ethnomathematics

Ethnomathematics is a form of approach that has many positive impacts on students. This can be seen in several studies. The following research shows the importance of ethnomathematics in learning.

In research conducted by Amit, Fried, & Abu-Naja (in Fouze, 2023), the findings show that participants consider this type of learning as a meaningful experience that is different from other learning methods, increasing their positive feelings towards other students and teachers and contributing to on the lively discourse between them and increase their motivation level. Studies show that knowledge based on belief and affiliation to a group leads to cultural coexistence and inner peace.

Other research reveals the impact of applying ethnomathematics in increasing understanding of arithmetic material. Students taught using an ethnomathematics approach have very good performance compared to students taught using a traditional approach. Analysis of existing teacher practices shows that the use of traditional lecture approaches is dominant in the teaching and learning of consumer arithmetic, which contributes to poor performance and leads to learner boredom. However, teachers appreciate the use of an ethnomathematics approach in teaching not only consumer arithmetic but also other mathematical topics because the approach keeps students motivated, actively involved, and interested in learning mathematical concepts. Teachers also reported that the ethnomathematics approach improved students' understanding and retention of arithmetic concepts. Therefore, it is recommended that mathematics teaching and learning be linked to the cultural background and experiences of learners through workshops for in-service teachers and mathematics methods training courses at teacher training institutions for pre-service teachers (Sunzuma, 2021).

Furthermore, in a study conducted in the Maldives, it was found that there were indications of success that could be associated with the ethnomathematics curriculum model, although whether this success could be achieved by all teachers and students was still an open question. Two contributing factors may be that the unit is new and thus interesting and stimulating, or that teachers and learners report what they consider to be appropriate responses to the research. However, the details of the responses show that an understanding of ethnomathematics and socio-cultural aspects of mathematics is beginning to emerge (Adam, 2004).

In (Achor, 2009), it was also found that students were affected. *Ethnomathematics Teaching Approach* (ETA) is superior in achievement and retention to those exposed to conventional teaching methods. Overall, ETA has proven to be the right choice in promoting meaningful learning at Locus. Therefore, it is recommended that mathematics teachers be trained in the use of ethnomathematics teaching approaches in their teaching.

In short, it is time for ethnomathematics to be integrated into every mathematics class. Ethnomathematics fits with constructivist theory which asks students to build understanding and knowledge through what they have



learned and experienced previously. Ethnomathematics has the potential to help students feel accepted, become more accepting of others, and even help in the fight against racism. While there are several issues that need to be addressed (namely, concerns about promoting primitivism or romanticizing foreign cultures), these can easily be overcome by educators who think critically and creatively about the material they share with students and how it is delivered. Bringing ethnomathematics into the classroom in the future has the potential to change the way students view themselves, each other, and their place in the world and students may even enjoy it (Brandt, 2014).

4. CONCLUSION

In understanding the culture of mathematics, it is necessary to apply alternative philosophical positions, which must be discussed consistently with sociological and anthropological descriptions of how mathematics is used in various cultures. The Wittgensteinian approach, which emphasizes that mathematical objects exist because of talk about them, can be used as a relevant philosophical basis for ethnomathematics. Ethnomathematics allows for deeper research and understanding of mathematical concepts and different cultures' understanding of mathematics. In an educational context, ethnomathematics can be used to develop a culture-based educational approach, taking into account the cultural background of students, and avoiding the use of pseudo-problems in educational programs. An effective mathematics education approach requires dialogue between teachers and students by incorporating socio-cultural aspects, without expecting students to develop sophisticated understanding mechanically. A mathematics education approach that involves dialogue between teachers and students can enable students to develop their understanding of mathematics through reflection on their life experiences and participation in meaningful learning. Ethnomathematics offers a different theoretical and practical basis for understanding mathematics in a cultural context, as well as for enriching mathematics education approaches by integrating social and cultural aspects, making students partners in the learning process, and avoiding mechanical approaches. This approach helps us understand how mathematics is accessed and used by various cultures and communities around the world.

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