e-ISSN: 2549-5070
p-ISSN: 2549-8231

Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang
Volume 7, No. 1, 2023, pp. 69 - 78

https://doi.org/10.31331/medivesveteran.v7i1.2264

Ethnomathematics Form A Wide Range Of Perspective

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Received: *September 2022.* ***Accepted***: *December 2022.* ***Published***: *January 2023.*

ABSTRACT

Mathematics belongs to its thinkers, and every thinker has their own culture. So mathematics has an attachment to culture. Ethnomathematics emerged as a link between mathematics and culture. Ethnomathematics continues to evolve and embrace a broader range of studies with a cultural and social center. So the shift in focus toward the ethnomathematical paradigm is inevitable. This study identifies several philosophers' thoughts about the perspective of research results in ethnomathematics. The debating paradigm in culturally based mathematical research. This study aims to describe ethnomathematics from various perspectives; the research method used is a literature study. The results of this study can be summarized as follows: There are two paradigms related to the study of ethnomathematics, namely ethnomathematics as a cultural practice and ethnomathematics as a theory to analyze something different. There are various perspectives in ethnomathematical research, (1) there are several perspectives on ethnomathematics as a cultural practice, including ethnomathematics as a mathematicizing activity, the NUC system, mathematical analysis activities, mathematics projects, ethics, and ethnomathematics or mathematics. (2) as a theory, ethnomathematics can be looked at from different points of view, such as the QRS system, mathematical analogy activity, location interpretation, emic, and ethnomathematics and mathematics.

Keywords: ***E****thnomathematics, Perspectives, Theory, Practice*

How to Cite: Wahyuni, W., Simorangkir, F., & Dewi, I. (2023). Ethnomathematics Form A Wide Range Of Perspective. *Journal Of Medives : Journal Of Mathematics Education IKIP Veteran Semarang*, *7*(1), 69 - 78.

INTRODUCTION

For more than two hundred decades, mathematics has been considered the most accurate principle of abstraction, while abstraction is a human thought process. So that the claim to mathematics is something abstract, general, formal, objective, rational, and theoretical, giving a beautiful and elegant impression of mathematics. This statement raises the question, are the claims made false? Of course not, not for Pythagoras, who believed that reality was an outlet for the existence of abstractions that existed in the human mind itself. So, mathematics belongs to the thinker.

The argument that mathematics belongs to its thinkers is not new, and each thinker has his own culture. Many researchers (Abdullah, 2017; Albanese et al., 2017; Albanese & Perales, 2015; Fouze & Amit, 2018; Malalina et al., 2020) agree with this. The idea of mathematics being associated with culture was first suggested by Spengler in 1971 (Bengtsson, 2014), but this idea was ignored. Wilder in 1981 gave the idea that mathematics is a cultural system (Osterberg & De Lara, 2019). The thought of mathematics as a culture continues to roll. D'Ambrosio himself has developed a new concept related to mathematics and culture (D'Ambrosio, 1985), as well as the relationship between astronomy and the culture of its user society, which is ethnoastronomy, as well as mathematics and the culture of mathematicians attached to it, later known as ethnomathematics.

Etymologically, we can divide ethnomathematics into three. The ethno prefix leads to social and cultural contests, which include beliefs, myths, language, coding that leads to symbolization, and much more (Rosa & Gavarrete, 2017). The affixation of mathema has the meaning of explaining, studying, understanding, and carrying out activities related to counting, measuring, classifying, sorting, concluding, and modeling (Rosa, 2018). The suffix tics comes from the word tech, which has similarities with technique and art. So if these three words are combined, ethno+mathema+tics is a way for ethnic groups to deal with problems related to counting, measuring, classifying, sorting, concluding, and then solving them in their own way, style, and technique (D'Ambrosio, 2018).

Research related to ethnomathematics continues to grow: from language (Regnier et al., 2016), buildings (Hardiarti, 2017; Nursyeli & Puspitasari, 2021), musical instruments ((Lubis et al., 2018), to games (Wahyuni et al., 2021) and much broader research centered on cultural and social contexts. This study identifies several philosophers' thoughts about the perspective of research results in the field of ethnomathematics. The debating paradigm in culturally based mathematical research. Is ethnomathematics a theory or a cultural practice? This study describes ethnomathematics from various perspectives.

METHOD

The research method used in this research is the literature study method. This study was conducted to solve

problems related to the ethnomatematics perspective based on a critical and in-depth review of the relevant literature. The process of collecting library data is done through reading, recording, and processing research materials. The research instrument used was a check-list for clarifying research materials. The data analysis technique used is critical analysis, where the researcher places his views not as an independent subject.

RESULTS AND DISCUSSIONS

Ethnomathematical Perspective in Research

Many gave birth to views related to philosophy, mathematics, and education, and were praised as wise mathematicians. So it is not an exaggeration to say that the science and technology that are developed and enjoyed now exist because of their services. This high rating is because they develop a problem-solving system that is needed according to the times at that time and read and deal with changing times in an appropriate way. Time is moving. If you realize this, change doesn't start at all from the top, but from the bottom. Who? The answer is society. People from the Renaissance to the present are aware that culture has the power to make changes. Because of this awareness, anthropologists in the early twentieth century deepened ethnography by discussing the relationship between indigenous peoples and culture.

So, D'Ambrosio (1985) conceptualized ethnography with mathematics so that the term ethnomathematics emerged. According to some researchers, the area of ethnomathematics serves as a catalyst and stage for those who think that different sociocultural backgrounds influence how mathematics evolves. Ethnomathematics continues to develop and embrace a wider study with a cultural and social center. A shift in focus towards the ethnomathematical paradigm is inevitable. There are at least two paradigms proposed by Veronica Albanese et al. (2017) related to ethnomathematical studies, namely ethnomathematics as a cultural practice and ethnomathematics as a theory to analyze something different.

Researchers who argue that ethnomathematics as a cultural practice have several (Barton, 1996a), namely ethnomathematics as a mathematizing activity, the NUC system, analytical mathematical activity, mathematical projects, ethics, and ethnomathematics or mathematics. Meanwhile, researchers who argue that ethnomathematics as a theory has several perspectives, namely ethnomathematics as an archaeological analysis activity, the NUC system, analogy mathematical activity, location interpretation, emic, and ethnomathematics in mathematics. More details can be seen in the image below.

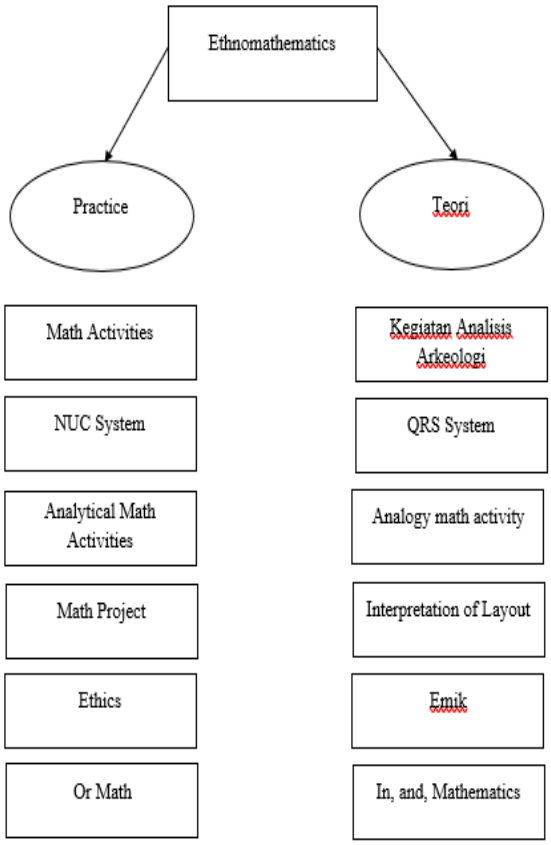

Figure 1. Research paradigms for ethnomathematics

Ethnomathematics as a mathematizing activity is the perspective of researchers who try to describe and translate cultural material found into formal language from the cultural perspective and cultural perspective of the researcher, and then develop new mathematical knowledge or a better understanding of cultural groups from the perspective of the academic community (Albanese et al., 2017). While ethnomathematics is an archaeological-analytical activity, this research involves reconstructing the history of practice to find reasons and principles for the mathematical implications of practice, highlighting aspects of mathematics from the practitioner's point of view.

The argument between mathematics as a system or as a user activity becomes a gap for Barton, who argues that mathematics has two understandings. First, mathematics is understood as a cultural activity that includes counting, measuring, playing, discovering, designing, and explaining. Barton understands this as a science that invites us to understand mathematics based on the language terms used by cultural owners. The NUC system encompasses both mathematics and statistics (Greer & Mukhopadhyay, 2010). NUC stands for Near Universal Conventional, which is a conventional mathematical calculation system that is almost universal. On the other hand, Barton argues, mathematics is relative, which means that mathematics changes and will continue to change so that new mathematical concepts will emerge that will radically change mathematics. On the other hand, mathematics is relative based on its inevitable development. Barton hopes that NUC can develop into a QRS (Quantitative Relational Spatial) system. This system emphasizes his interest in finding ways to know and think about the real world that develops in each culture (Barton, 1996a), because the development of NUC is inevitable.

Despite Barton's expectations of the NUC system development system, the ethnomathematical perspective as an analytical mathematical activity continues to grow and is in demand. For example, in research on bagas godang, analyzing an activity of observing a culture, describing it, and carrying out a coding transformation for further research, for example in research on

bagas bodang (Dewita et al., 2019). The ethnomathematical perspective as an analogical mathematical activity is a mathematical activity that is used to explain a culture that is difficult to understand by using other terms or other symbols to make it easy to understand. Even though these two points of view seem to be at odds with each other, they actually help each other grow because there are analogical mathematical activities to go along with analytical mathematical activities.

The next perspective is ethnomathematics as a mathematical projection of a study that describes what researchers can see about mathematics when craftsmen produce work. In this case, we are talking about the process of the work produced. For example, research conducted on the manufacture of ecoprint fabrics at the El Hijaaz Gallery, including counting, measuring, designing, locating, playing, and explaining (Puspasari et al., 2021), the process of making tempeh (Harahap & Rakhmawati, 2022), and the process of implementing the game of gulingkue teupe pou (Wahyuni, 2018), While ethnomathematics as a layout interpretation is a study that describes what researchers can see about mathematics when a project or craftsman's work has been completed, For example, in ethnomathematical exploration research on the gordang nine musical instruments, which discusses the concept of arithmetic sequences and geometric concepts (Lubis et al., 2018), but this study has shortcomings, where the researchers did not confirm the findings they got with the owner of the work. These two ethnomathematical perspectives are the development of analogical mathematical activities, where the researcher constructs what he sees as mathematics, then confirms the opinion of the craftsman (the view of the cultural group) with reasonable justification.

Talking about the ethical perspective that exists in ethnomathematical studies gives us a view of cultural conceptualization so that the description process follows a pattern that is meaningful in academic culture but is not addressed to cultural owners specifically (Albanese et al., 2017). Furthermore, the perspective of emic researchers sees culture as something that cannot be separated from the individual, such as an inherent quality (Geertz, 1973). Ethnomathematical research with an emic approach is carried out on the dynamics and relationships of the cultural groups studied so that the description and analysis are carried out with conceptual schemas and categories of cultural groups, with respect to their perceptions of reality (Albanese et al., 2017). The emic method focuses on the application of values ingrained in people's cultures and the meaning of objects such as mathematical artifacts that are present in people's lives. By ignoring the researcher's point of view, the emic approach seeks to accept the cultural variations between one group and other cultures.

Rosa and Orey (2011) contend that ethnomathematics attempts to connect mathematical concepts and methods ingrained in local practice (emic) and academic conceptual

frameworks in this context (ethics). The acquisition of emic and ethical approaches is one of the objectives of ethnomathematical research because emic approaches are crucial for intuitive and empathic understanding of culture and are necessary for carrying out successful ethnographic fieldwork, while ethical approaches are crucial for cross-cultural comparisons and shaping a crucial aspect of ethnology because such comparisons demand the use of standard units and categories. The ethical and emic methods examine related ideas from between-culture versus within-culture perspectives (Rosa & Orey, 2011).

Furthermore, Miarka and Viggiani (2012) argue that there are three perspectives in ethnomathematical research, namely (1) mathematics in ethnomathematics: A study to develop knowledge That each culture has knowledge of mathematics in different ways (Barton, 1996b; D'Ambrosio, 1985, 2018); (2) mathematics or ethnomathematics: Mathematics is unique in that it has only one symbol or pattern, which is then manifested in various forms depending on the culture of its users (Gerdes, 1988; Sebastiani, 1991); (3) The difference between mathematics and ethnomathematics is that the two cannot be contrasted. From an epistemological standpoint, they are on par (Miarka & Bicudo, 2016).

Whatever paradigm argues ethnomathematics as a theory or practice, a question for all of us arises: Is there any practice without a theory to back it up? Is it reasonable to have a theory but no practice? Ethnomathematics is a knowledge system that promotes the prospect of harmonious human-human and human-nature relationships. Art may improve creativity, strengthen culture, self-esteem, and respect for others, and provide people with a comprehensive view of humanity, in addition to helping to restore cultural dignity and providing people with the intellectual tools they need to live as individual citizens.

Perennialism: Perspective in Ethnomathematics

Learning surely offers a fresh environment that can broaden students' knowledge and learning opportunities. This is so that activities connected to understanding mathematics and the impact on behavior can be carried out through ethnomathematics by visiting, observing, and personally engaging in both (Richardo, 2016). It is nevertheless frequently observed in practice that traditional mathematics instruction affects the learning activities of students. Students didn't learn anything substantive from the content being studied, and it was discovered that they were bored. Therefore, we require theories that may be developed to support ethnomathematics and the teaching of mathematics. Perennialism is one of the under discussion philosophies. Pratiwi (2019) argues that learning mathematics from a perennialist perspective is rational and liberating because one is free to do so on different objects. Ethnomathematics viewed from the perspective of perennialism refers to things (Sulaiman, 2013), namely (1) mental discipline, (2) rationality and

independence, (3) learning to think, (4) learning as preparation for life, and (5) learning even though teaching (learning through teaching). In this case, students gain the principle of independence in learning and become more connected to their culture and surroundings through ethnomathematics. Furthermore, students can select and employ methods and methods of learning that are more comfortable and enjoyable for them. The teacher's position as a learning facilitator invites pupils to contribute what they observe about mathematical culture in their surroundings. Teachers can also foster a positive classroom environment and stimulate dialogues among students.

CONCLUSION

There are two paradigms related to the study of ethnomathematics, namely ethnomathematics as a cultural practice and ethnomathematics as a theory to analyze something different. Ethnomathematics as a cultural practice has several perspectives, namely ethnomathematics as a mathematizing activity, the NUC system, mathematical analysis activities, mathematics projects, ethics in ethnomathematics or mathematics. Meanwhile, researchers who argue that ethnomathematics as a theory has several perspectives, namely ethnomathematics as an archaeological analysis activity, the QRS system, analogy mathematical activity, location interpretation, emic, and ethnomathematics and in mathematics. Regardless of the paradigm that debates ethnomathematics as a theory or practice. Ethnomathematics is a body of knowledge that shows how people can live in harmony with each other and with nature.

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