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Abstract

This research aims to determine and describe mathematical abilities in ethnomathematics-based learning. The method used in the research is a systematic literature review. The results of article selection from 53 articles published from 2019-2023 based on the ERIC and Scopus databases found 5 articles that met the research objectives. The results of the identification and analysis of articles found that ethnomathematics-based learning can improve mathematical understanding abilities, problem-solving abilities, creative thinking abilities, higher-order thinking abilities, and mathematical connection abilities. Ethnomathematics-based learning can improve students' mathematical abilities. However, existing research has yet to reveal the full range of students' mathematical abilities in learning mathematics. This can be used as a reference for further research.

Keywords: Mathematical abilities, Ethnomathematics, Ethnomathematics-based learning.

1. Introduction

Education is an effort to prepare and provide for all the needs of human life, both in social life and cultural life in the broadest sense. Ki Hajar Dewantara emphasized that children's education requires children to achieve their natural strengths by the nature of nature and the times. If we look at the nature of the times, current education emphasizes children's ability to have 21st-century skills while interpreting the nature of nature in the students' local socio-cultural context. Education cannot be separated from learning activities. One of the subjects that plays an important role in being taught at every level of formal education is mathematics. Siagian (2016) states that mathematics is a branch of science that has an important role in the development of science and technology, both as a tool in applications in other fields of science and in the development of mathematics itself.

Mathematics is part of sociocultural practices (Boylan, 2016). Mathematics originates from the ways, styles, and techniques humans develop to respond to the environment, such as seeking explanations, understanding, experiences, and solutions to phenomena around them (Prahmana et al., 2021). The diversity of the human environment, which includes language, religion, customs, economic, social, and political activities, influences a person's mathematical thinking. Thus, mathematics, in its development, is closely related to cultural thinking produced by humans, so it has relevance to be developed in the learning process (Sudirman et al., 2018).

Mathematics learning in schools aims to make students realize that mathematical thinking exists in their culture and needs to be respected and preserved (Ergene et al., 2020). Culture-based learning aims to produce students who are not only successful academically but also explore critical thinking in cultural activities in the surrounding environment (Anderson-Pence). The relationship between mathematics and culture is explicitly presented through a study called ethnomathematics.

The term ethnomathematics was originally defined by D'Ambrosio (1985), who revealed that ethnomathematics is a form of mathematics practiced by cultural ethnic groups,

work groups, groups of children of a certain age, and professional classes. Ethnomathematics is an approach that involves local culture with mathematical concepts that can be incorporated into the learning process at school (Muhammad, 2023). Ethnomathematics-based learning is an important part of developing science, especially for students (Putra & Mahmudah, 2021). Applying ethnomathematics as a learning approach will enable the material studied to be related to students' culture so that students' understanding of the material becomes easier because the material is directly related to students' culture which is an activity in everyday life (Suhartini & Martyanti, 2017) and creating meaningful learning (Sharma & Orey, 2017).

Ethnomathematics learning in schools integrates culture in learning mathematics. NCTM (2020) sets five standard abilities that must be possessed in learning mathematics, namely problem solving, reasoning and evidence, communication, connection and representation. Mathematical abilities are abilities related to numbers and calculations (number sense and numeration), geometry (geometry), measurement (measuring) which includes comparing (comparing), ordering (ordering) and series (seriation) as well as opportunities and graphs (probability and graphics). Researchers believe that paying attention to students' shared experiences can help create meaningful learning, although mathematics can be taught effectively and meaningfully without relating it to culture or individual students. Because if mathematics is considered meaningless, cannot be understood, and is not a popular subject for most students, then the fault may lie with the educators (Hendriyanto et al., 2023).

This systematic literature review (SLR) study analyzes mathematical abilities in ethnomathematics-based learning. SLR studies on ethnomathematics have been widely carried out, but are only limited to exploring ethnomathematics in certain cultures and cultural contexts as mathematics learning content (Hendriyanto et al., 2023). Therefore, by taking advantage of this opportunity, this SLR study is to identify what mathematical abilities are studied in ethnomathematics-based learning. This research has the potential to add to the conversation by offering an overview of ethnomathematics in mathematics learning.

2. Method

The method used in the research is a systematic literature review (Systematic Literature Review). Systematic literature review is a literature review method that identifies, assesses, and interprets findings on a research topic to answer research questions (Brereton et al., 2007). The stages applied to conduct a systematic literature review (Putra & Andriani, 2021; Siregar et al., 2020) including: 1) developing research questions; 2) identify research articles; 3) evaluate the feasibility of the research article; 4) summarize research articles; and 5) implement the findings in research articles. Data collection in this study was obtained from the ERIC and SCOPUS databases totaling 53 articles consisting of 7 SCOPUS articles and 46 articles from ERIC with the keyword "ethnomathematics" in the 2019-2023 period. Then articles are selected based on suitability and suitability of content. As a result, this research used 5 articles about mathematical abilities in ethnomathematics-based learning. These articles are then summarized and presented in table form containing the name of the researcher, year of publication, journal and research results.

3. Results and Discussion

Articles in this research that were relevant to the problem to be studied, namely mathematical abilities in ethnomathematics-based learning.

Table 1
Mathematics abilities in ethnomathematics-based learning

No.	Author, Year	Journal, Publication Category	Research result
1.	(Nugraha et al., 2020)	Pulpit Elementary School, Sinta 2	Mathematics learning through the Sundanese Ethnomathematics-based Contextual Learning (CTL) model can significantly improve mathematical understanding abilities.
2.	(Nur et al., 2020)	JRAMathEdu (Journal of Research and Advances in Mathematics Education), Sinta 2	Contextual learning with ethnomathematics influences problem solving abilities based on the level of thinking. Students with a formal level of thinking have better problem-solving abilities than students with a transitional and concrete thinking level. Contextual learning with ethnomathematics fosters problem solving abilities based on levels of thinking.
3.	(Richardo et al., 2023)	International Journal of Information and Education Technology, Q2	<i>Augmented Reality (AR)</i> technology- based learning with ethnomathematics for junior high school students is effective in improving students' creative thinking abilities.
4.	(Gembong et al., 2022)	Pegem Journal of Education and Instruction, Q4	Mathematics learning based on the context of Javanese vegetable salad (ethnomathematics) is effective in improving students' high-level thinking abilities.
5.	(Kusuma & Dwipriyoko, 2021)	Infinity: Journal of Mathematical Education, Sprout 2	Learning by applying ethnomathematics and the Mozart effect can improve students' mathematical connection abilities and students have a positive attitude and are motivated in learning mathematics.

Based on the identification and analysis of articles that have been studied, the use of an ethnomathematics-based learning approach can improve students' mathematical abilities. The results of the analysis show that ethnomathematics-based learning can improve mathematical understanding abilities (Nugraha et al., 2020), problem solving abilities (Nur et al., 2020), creative thinking abilities (Richardo et al., 2023), high-level thinking abilities (Gembong et al., 2022), and mathematical connection abilities (Kusuma & Dwipriyoko, 2021).

To encourage the creation of new mathematical knowledge, D'Ambrosio (1985) initiated ethnomathematics, which returns mathematical knowledge to be discovered from the cultural roots of different societies. It values dialogue and differences of opinion to revive critical and democratic reasoning in everyone who studies it, appreciates differences and is tolerant of various variations in knowledge (D'Ambrosio, 2007). Ethnomathematics examines the

relationship between mathematics and socio-cultural backgrounds which shows how mathematics is produced, transferred, distributed and specialized in various cultural systems (Anderson-pence, 2015; Ergene et al., 2020; Gerdes, 1994). Many researchers confirm that cultural content can be implemented as mathematics learning content (Busrah & Pathuddin, 2021; Chahine, 2020; Fauzi et al., 2020; Gök, 2020; Hariastuti & Budiarto, 2020; Johnson et al., 2022; Hariastuti et al., 2022; Nugraha et al., 2020; Nur et al., 2020; Nursyahidah & Albab, 2021; Pathuddin et al., 2021; Payadnya et al., 2021; Prahmana et al., 2021; Prahmana & D' Ambrosio, 2020; Prahmana & Istiandaru, 2021; Sari et al., 2022; Sunzuma et al., 2021; Supriadi, 2022; Umbara et al., 2021; Richardo et al., 2023). This shows that ethnomathematics can facilitate students in learning mathematics. Incorporating ethnomathematics into the school curriculum will provide a new nuance in mathematics learning, considering that each region consists of various ethnicities and cultures which have their own characteristics in problem solving (Nkopodi & Mosimege, 2009). Prahmana (2022) argues that ethnomathematics can help teachers and students understand mathematics in the context of ideas, methods and practices used in everyday life, thereby ultimately encouraging understanding of school mathematics and improving students' mathematical abilities (Hartinah et al., 2019).

Describing ethnomathematics as a concept or practice can be done in various ways, namely (Barton, 1996) : (1) descriptive activities, (2) archaeological activities, (3) mathematization activities, and (4) analytical activities. The first stage is to describe cultural practices as much as possible in various contexts. Some may be related to the substance of school subject matter, while others are not. Finding mathematics in cultural practices cannot be separated from six activities (Bishop, 1988), namely (1) Counting, which is a basic activity that is easily found in every culture in the form of the use of numbers, calculation patterns, number systems, and algebraic representations. (2) Determining the location is an activity to explore the spatial environment and create concepts through models, diagrams and drawings. (3) Measuring is the activity of comparing objects and identifying them by comparing, determining length, area, volume, time, weight and measurement system. (4) Playing, is an activity that appears as a form of entertainment but involves certain rules, procedures, strategies, predictions, puzzles, reasoning and models. (5) Designing is defined as the activity of forming objects or parts in a spatial environment and can be found in various craft ornaments, traditional houses, monuments and geometric artifacts. (6) Explaining, is the activity of classifying, generalizing and convening in various forms of algorithms, diagrams, structures and mathematical models.

Ethnomathematics learning involves various activities by analyzing socio-cultural factors on the development of mathematics, and connecting it as a cultural product, as well as contributing to building traditional mathematical knowledge as an asset that needs to be preserved (Gerdes, 1994). Meanwhile, culture-based mathematics learning can be developed in three ways, namely (Lipka, 1994): (1) Showing students that mathematics is socially constructed; (2) Involving students in the process of building mathematical systems based on their cultural knowledge; and (3) Connecting students' knowledge to bridge the mathematics found in their culture with academic mathematics. The subject of mathematical knowledge related to culture is considered to have an influence on the sense of identity and as a means to enrich ethnomathematics learning (Gavarrete, 2015).

Ethnomathematics-based learning can be used by teachers as an approach in learning mathematics to improve students' mathematical abilities. School teachers should use cultural references to explain mathematical concepts that relate to students' cultural knowledge and experiences. Teachers must have local knowledge for effective engagement of students in various actions and learning processes. We can refer to D'Ambrosio's (2018) explanation of the concept of ethnomathematics as a conceptual approach to learning mathematics, "Ethnomathematics is an approach to teaching and learning mathematics that is built on

students' previous knowledge, background, and the role of their environment. play in terms of content and methods, and past, and present experiences of one's immediate environment and approach can in a practical way” emphasize that the 'culture' whose users should be close to and known to students.

4. Conclusion

Based on the results and discussion, this research concludes that ethnomathematics learning can improve students' mathematical abilities. The use of an ethnomathematics approach to studying mathematics has a positive trend in creating meaningful learning for students. By integrating cultural perspectives and practices into mathematical education, students are not only exposed to diverse mathematical concepts but also develop a deeper understanding of the subject matter. Ethnomathematics fosters an appreciation for the cultural richness inherent in mathematics, making the learning experience more engaging and relevant. As such, incorporating ethnomathematics into educational curricula holds promise for enhancing students' mathematical proficiency and cultivating their appreciation for mathematics in various cultural contexts.

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