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MATHEMATIC DISPOSITION OF STUDENTS ON THE APLICATION OF ETHNOMATHEMATICS INTERACTIVE MATHEMATHICS LEARNING

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Abstract

This study to describe the mathematical disposition of students on the application of ethnomtematics in interactive mathematics learning in schools. The approach used is qualitative and quantitative with descriptive types. The research subject one person mathematics educator work and 30 students of Perti Jakarta Islamic Vocational High School. Data were obtained through interviews and filling out questionnaires with a Likert scale type. The results obtained indicate that the application of Ethnomathematics can have a positive influence on mathematics learning in schools. Based on research findings from an interview with a mathematics educator, it has been discovered that the implementation of ethnomathematics in mathematics education can enhance students' interest and self-confidence in the interactive mathematics learning process. This approach is popular among students. The findings of the research are further supported by the results of a mathematical disposition questionnaire, which was assessed from various aspects. First, students displayed a good level of confidence in the mathematics learning process, with an average score of 2.33. This indicates that the application of an ethnomathematical approach in their education fosters a sense of confidence and self-assuredness among students when dealing with mathematical concepts. Second, in terms of diligence and

perseverance in learning mathematics, the average score was 1.98, considered fairly good. This aspect suggests that students agree with the utilization of the ethnomathematical-based approach, which motivates them to be more diligent and persistent in their mathematical studies at school. These results highlight the positive impact of ethnomathematics on students' interest and self-confidence in interactive mathematics learning.

Kata Kunci:

Disposisi Matematika;
Etnomatematika;
Matematika.

Penelitian ini bertujuan untuk menggambarkan disposisi matematis siswa dalam penerapan etnomatematika dalam pembelajaran matematika interaktif di sekolah. Pendekatan yang digunakan adalah kualitatif dan kuantitatif dengan jenis deskriptif. Subjek penelitian melibatkan satu guru matematika dan 30 siswa dari SMK Islam Perti Jakarta. Data diperoleh melalui wawancara dan pengisian kuesioner dengan jenis skala Likert. Hasil penelitian menunjukkan bahwa penerapan etnomatematika dapat memiliki pengaruh positif pada pembelajaran matematika di sekolah. Berdasarkan temuan penelitian dari wawancara dengan seorang pendidik matematika, diketahui bahwa penerapan etnomatematika dalam pendidikan matematika dapat meningkatkan minat belajar dan rasa percaya diri siswa dalam proses pembelajaran matematika interaktif. Pendekatan ini populer di kalangan siswa. Temuan dari penelitian ini juga didukung oleh hasil kuesioner disposisi matematis, yang dievaluasi dari berbagai aspek. Pertama, siswa menunjukkan tingkat kepercayaan diri yang baik dalam proses pembelajaran matematika, dengan skor rata-rata sebesar 2,33. Hal ini menunjukkan bahwa penerapan pendekatan etnomatematika dalam pendidikan mereka membangun rasa percaya diri dan keyakinan diri siswa ketika berurusan dengan konsep matematika. Kedua, dalam hal ketekunan dan kesungguhan dalam belajar matematika, skor rata-rata adalah 1,98, yang dianggap cukup baik. Aspek ini menunjukkan bahwa siswa setuju dengan penggunaan pendekatan berbasis etnomatematika, yang mendorong mereka menjadi lebih rajin dan tekun dalam studi matematika di sekolah. Hasil ini menyoroti dampak positif etnomatematika terhadap minat dan kepercayaan diri siswa dalam pembelajaran matematika interaktif.

INTRODUCTION

Education is something very important which can be a potential and strategic means

in order to educate the nation's life and develop human resources in Indonesia as a whole, as well as being able to create

productive and highly competitive power. In formal education, learning shows positive changes so that at the final stage new skills, and knowledge will be acquired. School is a formal educational institution as the actualization of knowledge development in terms of achieving educational goals.

Schools are places where the learning process takes place and curriculum implementation that must be realized for the sake of increasing the knowledge of better students. Mathematics lessons given to students are to improve the quality and quality of education in Indonesia (Rostika, D., & Junita, 2017) Mathematics is a very important subject that can be used in various aspects of life because there are many problems in real life that cannot be separated from mathematics. In the national education curriculum, mathematics is one of the compulsory subjects that must be provided to students (Ariawan, R., & Nufus, 2017).

Mathematics is knowledge inherent in the activities of life, where every activity cannot be separated from mathematical activities (Muhtadi, D., Sukirwan, Warsito, & Prahmana, 2017). Various places such as in the market, in the fields or various places of human activity are inseparable from the science of mathematics which is always present, whether people realize it or not. In other words, mathematics is very close to culture in the context of behavior or habits that have existed since ancient times and have been carried out from generation to

generation. This shows that mathematics is a subject that needs to be taught to students from elementary school to college (Abdullah, 2017).

The low ability of the students themselves in mathematics is not something new because basically students think mathematics is an uninteresting and very difficult subject (Abdullah, 2017). There are various difficulties and challenges such as a low disposition to learn mathematics (Fouze, AQ, & Amit, 2018). Mathematical disposition is closely related to how students perceive and solve a problem. Are these students well dedicated, confident, innovative, and think critically to explore various strategies in solving a problem (Suharsono, 2015).

The mathematical disposition is one of the factors that is quite important as a support for the success of students' mathematics learning, however, students' bad assumptions about learning mathematics result in the students' mathematical disposition in learning mathematics becoming less (Nopriana, 2015). A high mathematical disposition can have a significant positive effect on the mathematics learning outcomes of students (Kusmaryono, I., & Suyitno, 2016). Lack of students' mathematical dispositions resulted in difficulties in understanding complex mathematical concepts, attention and concentration in class, an unpleasant mathematics learning process which had a negative impact on students' academic

achievement (Fouze & Amit, 2018). This may be one of the reasons for the inconsistency of educators in providing mathematics learning in schools that cannot take advantage of the surrounding environment (Abdullah, 2017).

To enhance students' mathematical disposition in the application of interactive ethnomathematics learning, educators can integrate culturally relevant instructional media, incorporate diverse learning resources that resonate with students' cultural backgrounds, and employ pedagogical approaches that foster a positive connection between students' cultural identities and mathematical concepts (Abdullah, 2017). This approach not only addresses mathematical disposition issues but also promotes a more engaging and inclusive learning environment, encouraging students to actively participate in the exploration and application of mathematical concepts within the context of their own cultural experiences.

Ethnomathematics is a study relationship that can utilize a culture to understand, articulate, discover concepts and practices in learning mathematics (Amor, 2016). This opinion is supported by (Nusantara & Rahardjo, 2017) Ethnomathematics is a concept to increase knowledge about the development of mathematics by utilizing various cultures around the world. Another statement suggests that ethno-mathematics is the way

in which people from different cultures use mathematics in real life (Maryati, & Pratiwi, 2019). Research conducted by (Astuningtyas, EL, Wulandari, AA, & Farahsanti, 2018), shows that learning activities using the application of ethnomathematics get a satisfactory score compared to learning using conventional techniques. The results of these studies are supported by the results of case study research conducted (Amor, D., Phys, J., Ser, C., Kusuma, DA, Dewanto, SP, & Nurani, 2016), which was obtained using a questionnaire on students with the results where students in grade 5 elementary school in Cipatujah felt that the mathematical concepts taught in the classroom were not related to everyday life (Ethnomathematics) and it made them think that mathematics was not interesting and fun making them think math is boring. (Farokhah, 2017) conducted a study to obtain results with data analysis using the t-test, it was found that the mathematical communication skills of students in the experimental class using an interactive mathematics approach based on ethnomathematics were better than control class students who received learning using a conventional approach.

In gaining an understanding of the concept of learning mathematics, teaching and learning activities need to be held in cultural values (Putra, R., & Indriani, 2017). It can be concluded that interactive mathematics learning based on an ethno-

mathematical approach can help in overcoming various problems in the mathematics learning process, especially mathematical dispositions (Imswatama, A., & Lukman, 2018). From the explanation above, it shows that mathematical disposition has an important role in interactive mathematics learning, so the researcher wants to examine how the mathematical disposition of students towards interactive mathematics learning using the ethnomatematic approach.

Therefore, investigating the relationship between students' mathematical disposition and the application of interactive ethnomathematics learning becomes crucial. Understanding how a positive mathematical disposition, as highlighted by Nopriana (2015), can be cultivated and enhanced through the interactive exploration of ethnomathematics may offer valuable insights into optimizing the learning process. This research is significant in providing a deeper understanding of how the integration of ethnomathematics in interactive learning environments can positively influence students' attitudes towards mathematics, thereby contributing to the development of more effective teaching strategies and curriculum designs (Putra & Indriani, 2017).

METHOD

This research uses descriptive quantitative and qualitative approaches. The subjects in the study were an educator in

mathematics and 30 students at the Perti Islamic Vocational High School. The interview was aimed at a mathematics educator who carried out teaching and learning activities using ethno-mathematics-based learning. This is done to obtain in-depth information about mathematics learning by applying Ethnomathematics and educators' assessment of students related to students' mathematical dispositions, the interview used is an unstructured interview where the researcher conducts an open interview by asking questions related to the object of research. Questionnaire with the Likert scale type, there are several answer options that have a score on each choice, namely "very much agree" with a score of four, "agree" with a score of three, "disagree" with a score of two, and "strongly disagree" with a score of one. The distribution of questionnaires was aimed at and carried out in order to obtain data about how the mathematical disposition of students in the application of the ethno-mathematical approach in learning mathematics. Data analysis was performed using interactive analysis models (data reduction, data presentation, and conclusion drawing). Apart from the data obtained, it was also analyzed using descriptive statistics (calculation of the percentage and average value). The mathematical disposition questionnaire grid can be seen in table 1.

Table 1. Distribution of the Number of Questionnaire Items

No.	Aspect	Number of Items	
		+	-
1.	Confidence in learning mathematics	3	2
2.	Craft and Persistence in learning mathematics	3	2

RESULTS AND DISCUSSION

The first step taken by interviews with mathematics educators to obtain various kinds of in-depth information about interactive mathematics learning in schools using an ethnomatematic approach. The next step is to provide a questionnaire to students to obtain information about the mathematical disposition of students towards learning mathematics when using the ethnomatematic approach. This is evident from the students' responses, as they are quite responsive, enjoy, show interest, and feel happy during the learning process or when working on the exercises provided by educators. This can be seen from the response of students who are less enthusiastic, like, interested and feel difficulties in the learning process or working on the questions given by the educator which results in low understanding and learning outcomes of students, while the 2013 curriculum emphasizes that students have high mathematical abilities.

In our interview, we have gathered valuable insights and perspectives on mathematical disposition from educators, researchers, and students. The discussions shed light on the impact of fostering a positive mathematical disposition, providing a deeper understanding of how it influences students' learning experiences and their overall confidence in mathematics.

P: Have you ever applied mathematics teaching using an ethnomatematic approach?

G: Alhamdulillah, I often use it sir, if it's not like that, then many students don't understand the material given.

P: What do you think about the application of this approach during the mathematics learning process?

G: Father and I must have known that mathematics is important and is very closely related to social and social life. So, in giving my questions, I tried to take examples from everyday life while studying mathematics. The students I teach can understand the material easily.

P: What kind of Ethnomatematics have you applied in learning a mathematical concept?

G: In my class, there are many people who live on the beach, namely Muara Angke, so I take the problem of fish prices as an example. Classroom for learning to build a room, volleyball,

futsal, basketball to calculate the diameter or the radius.

P: Is there a positive influence seen on students using Ethnomathematics?

G: My students have a better understanding of the meter, in fact my students prefer it when I give story questions to the formulas.

Based on the interview results above, it is evident that educators employ the ethnomathematical approach in mathematics education because it is popular among students. This approach is closely related to students' culture and everyday life, which makes it engaging and relevant for them. The application of ethno-mathematics can have a positive influence on the understanding and disposition of students towards learning mathematics, especially when working on questions given by educators related to culture or ethnomtematics. So that Ethnomathematics becomes an alternative that can be used in learning mathematics. The following table 2 is the result of the analysis of students' mathematical dispositions on the application of the ethno-mathematical approach to learning mathematics.

Table 2. Confidence in learning mathematics

No	Item	Option				Average
		SS	S	TS	STS	
1.	I believe I can get good grades math when given problems with Ethnomathematics	3	24	2	1	2.8
		10%	80%	6.7%	3.3%	

No	Item	Option				Average
		SS	S	TS	STS	
2.	I am sure that I can do math assignments related to Ethnomathematics	2	22	1	5	2.6
		6.7%	73.3%	3.3%	16.7%	
3.	I believe my math score will remain low even though I have studied hard	1	3	24	2	2.8
		3.3%	10%	80%	6.7%	
4.	I am ashamed of being found out by others if I get poor grades in math	4	3	10	13	1.8
		13.3%	10%	33.3%	43.3%	
5.	I feel happy and motivated when learning mathematics with an ethnomathematics approach	4	23	3	0	2.9
		13.3	76.7	19%	0%	
Average		2.8	15	8	4	2.4
		9.3%	50%	26.7%	13.3%	

Confidence in learning mathematics is of utmost importance in students' development. It encompasses their belief in and self-assurance about their abilities to comprehend and master mathematics. Students who have confidence in mathematics tend to perceive themselves as capable of tackling mathematical tasks effectively, as evident by the survey results, where an average of 50% agreed with this statement. They are also more motivated to learn and do not easily give up when faced with challenges. They view failures as opportunities for learning rather than obstacles. They take pleasure in the process of learning mathematics and feel content when they successfully solve problems or grasp initially complex concepts.

Table 3. Diligence and persistence in learning mathematics

No	Item	Option				Average
		SS	S	TS	STS	
1.	I studied mathematics in moderation which I am biased towards	1	1	12	16	3.32
		3.3%	3.3%	40%	53.3	
2.	I studied mathematics only at school	0	2	10	18	3.42
		0%	6.7%	33.3%	60%	
3.	I first studied the material to be taught with the culture and life around me	4	22	3	1	2.87
		13.3%	73.3%	10%	3.3%	
4.	I like to do practice questions or assignments related to Ethnomathematics to deepen my understanding	6	23	1	0	3.23
		20%	76.7%	3.3%	0%	
5.	I review the mathematics subject matter that has been studied in school with the culture and life around me	12	15	2	1	3.16
		40%	50%	6.7%	3.3%	
Average		4.6	8.2	5.6	7.2	1.98
		15.3%	27.3%	18.7%	24%	

Diligence and persistence in learning mathematics play a central role in shaping students' mathematical disposition, as evidenced by an average score of 1.98. This implies that students are expected to comprehend how their self-confidence, as one aspect of mathematical disposition, is influenced by interactive ethnomathematics learning. Investigating the relationship between diligence, persistence, and mathematical disposition, this research provides valuable insights that serve as a foundation for the development of targeted interventions and focused learning strategies. Recognizing the importance of cultivating a positive disposition toward mathematics, particularly through interactive and culturally relevant approaches such as ethnomathematics, becomes imperative in

creating a conducive learning environment where students are motivated to persistently engage and succeed in the subject.

The analysis results from Table 2 reveal that the mathematical disposition concerning self-confidence in interactive mathematics learning yielded an average score of 2.33, falling into the "good" category. However, one item was categorized as "deficient," specifically the fourth item. This signifies that students disagreed with the statement implying that they feel embarrassed if known by others when they receive poor grades in mathematics. Conversely, items with the highest average score, at 2.87, are classified as "good." Statements within these items indicate that students feel confident in their ability to achieve good grades in interactive mathematics lessons, particularly when presented with questions employing the Ethnomathematics approach. Thus, the analysis outcomes provide a qualitative insight into how students perceive their self-confidence within the context of interactive mathematics learning with the application of Ethnomathematics.

Etnomathematics provides education to students, allowing them to develop a sense of cultural awareness and historical knowledge. This is achieved through cultural literacy activities integrated into the learning process (Richardo, et al, 2020). The results showed that the application of the ethnomathematical approach can improve the mathematical disposition of students towards learning mathematics. This can improve the

various abilities of students in the field of mathematics (Fouze & Amit, 2018). The use of culture and the environment around students has a positive influence on the world of education which makes the learning process of mathematics more interactive and fun so that the various abilities of students are in the field of mathematics (Amor, 2016). This is because the culture and activities of daily life are very well known not only for students but also by educators and even people around the world. The ethnomathematical approach not only enables students to grasp mathematical concepts but also introduces them to foster a love for mathematics and an appreciation for their culture. (Putra & Indriani, 2017). Ethnomathematics can generate new desires and interests, increase creativity, motivation and stimulation of the learning process, and have a positive effect on the psychology of students (Fouze & Amit, 2018).

The attitudes and beliefs of students in dealing with interactive mathematics can affect their learning outcomes. Disposition is very necessary in the world of education so that students are confident in facing problems with high thinking, develop good habits and have a positive view of mathematics. (Facione, PA, Giancarlo, CA, Noreen, C., & Gainen, 2015). Therefore, every learning process is accompanied by a strong awareness and dedication in students and educators related to mathematical dispositions.

Students' mathematical disposition can develop when they learn aspects of

mathematical competence (Facione et al, 2015). For example, when a student is given mathematical problems related to contextual problems or with the culture that surrounds him. The ethnomatematic approach can help in explaining mathematical concepts, story problems and adequate strategies in learning mathematics to enable students to develop their abilities (Abdullah, 2017).

Research indicates that the implementation of ethnomathematics in mathematics education can enhance students' interest in learning and boost their confidence when dealing with mathematical concepts. This is consistent with theories that emphasize the importance of connecting mathematical content with students' cultural and everyday contexts to make learning more engaging and relevant. Furthermore, ethnomathematics acknowledges that mathematical knowledge can be constructed within various cultural contexts, supporting the notion that mathematical disposition can be shaped through the understanding and application of mathematics within cultural contexts.

Moreover, ethnomathematics empowers students by providing them with opportunities to identify and solve mathematical problems within their cultural settings, thus activating their engagement in mathematical learning. This aligns with educational theories that emphasize student empowerment as a crucial aspect of effective learning. In conclusion, ethnomathematics promotes the relevance and real-world

application of mathematics within students' daily lives and cultures, which can ultimately enhance their mathematical disposition as a whole.

CLOSING

Conclusion

The application of ethnomathematics in interactive learning has a positive impact on the mathematical disposition of students. It enhances their interest and confidence in learning mathematics by connecting mathematical concepts to their cultural contexts and daily lives. This approach fosters a love for mathematics and a deeper appreciation of their own culture. It encourages students to view math as a relevant and engaging subject, ultimately contributing to the development of positive mathematical dispositions. This can be seen based on the results of data analysis which reveal that in every aspect of mathematical disposition, among others: 1) Self-confidence in learning mathematics; and 2) diligence and persistence in learning mathematics, showing that students give a positive attitude or response to each of the aspects that have been given. So it is suggested to educators to take advantage of and apply the ethno-mathematical approach in interactive mathematics learning.

Recommendation

Hopefully, the research that I have made can become a source of further research to make it even better and a source

of information about ethnomathematics which is currently being hotly discussed.

BIBLIOGRAPHY

- Abdullah, AS (2017). Ethnomathematics In Perspective Of Sundanese Culture. *Journal on Mathematics Education*, 8 (1), 1-16. <https://doi.org/10.22342/jme.8.1.3877.1-16>
- Amor, D., Phys, J., Ser, C., Kusuma, DA, Dewanto, SP, & Nurani, B. (2016). The role of ethnomathematics in West Java (a preliminary analysis of case study in Cipatujah). *Journal of Physics*, 3 (2), 1-8. <https://doi.org/10.1088/1742-6596/893/1/012020>
- Ariawan, R., & Nufus, H. (2017). Relationship between Mathematical Problem Solving Ability and Students' Mathematical Communication Ability. *Journal of THEOREMS (The Original Research of Mathematics)*, 7(2), 139-145. <https://doi.org/10.26858/jds.v7i2.9811>
- Astuningtyas, EL, Wulandari, AA, & Farahsanti, I. (2018). Ethnomathematics and Combinatoric Problem Solving. *MATH EDUCATOR NUSANTARA JOURNAL*, 3 (2), 59–134.
- Facione, PA, Giancarlo, CA, Noreen, C., & Gainen, J. (2015). The Disposition Toward Critical Thinking 1. *Journal of General Education*, 44(1), 1–17. <https://www.researchgate.net/publication/241897896>
- Fouze, AQ, & Amit, M. (2018). (2018). Development of Mathematical Thinking through Integration of

- Ethnomathematic Folklore Game in Math Instruction. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(2), 617–630. <https://doi.org/10.12973/ejmste/80626>
- Imswatama, A., & Lukman, HS (2018). The Effectiveness of Mathematics Teaching Material Based on Ethnomathematics. *International Journal of Trends in Mathematics Education Research*, 1(1), 35–38. <https://doi.org/10.33122/ijtmer.v1i1.11>
- Kusmaryono, I., & Suyitno, H. (2016). The Role of Mathematical Representation and Disposition in Improving Students' Mathematical Power. *AdMathEdu*, 6(1), 11-24.
- Maryati, & Pratiwi, W. (2019). Ethnomathematics: exploration in traditional dance at the opening of the 2018 Asian Games. *Journal of Mathematics and Mathematics Education*, 5(1), 23–28. <https://doi.org/10.24853/fbc.5.1.23-28>
- Muhtadi, D., Sukirwan, Warsito, & Prahmana, I. (2017). Sundanese Ethnomathematics: Mathematical Activities In Estimating, Measuring, And Making Patterns. *Journal on Mathematics Education*, 8(2), 185–198. <http://dx.doi.org/10.22342/jme.8.2.4055.185-198>
- Nopriana, T. (2015). Students' Mathematical Disposition through Van Hiele's Geometry Learning Model. *Mathematics & Mathematics Education Journal*, 1(2), 80–94. <https://doi.org/10.24853/fbc.1.2.80-94>
- Putra, R., & Indriani, P. (2017). Implementation of Local Culture-Based Ethnomathematics in Mathematics Learning at the Elementary School Level. *Journal of Mathematics and Mathematics Education*, 1(1), 21–34. <https://doi.org/10.25217/numerical.v1i1.118>
- Richardo, et al, (2020). Learning mathematics through Islamic Nusantara culture: An ethnomathematics study in Indonesia. *Ethnomathematics Journal*, 1(1), 30-35. <http://dx.doi.org/10.21831/ej.v1i1.33129>
- Rostika, D., & Junita, H. (2017). Improved Elementary School Students' Problem Solving Ability in Mathematics Learning with the Multy Representation (DMR) Discourse Model. *Journal of Elementary Education*, 9(1), 35–46. <https://dx.doi.org/10.17509/eh.v9i1.6176>
- Suharsono, S. (2015). Improving High School Students' Mathematical Understanding and Disposition Ability Using Probing Prompting Techniques. *Edusentric*, 2(3), 278. <http://dx.doi.org/10.17509/edusentric.v2i3.180>