Exploring Students' Mathematical Disposition through an Ethnomathematics Approach Based on Local Culture at SMP Negeri 8 Padangsidimpuan

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Abstract

Mathematical disposition is an affective aspect that plays an important role in determining students' success in mathematics learning. However, it has relatively received less attention in the practical implementation of learning at the junior high school level. Mathematics learning tends to emphasize cognitive and procedural aspects, so that students' attitudes, interests, and positive tendencies toward mathematics have not developed optimally. This study aims to explore the mathematical disposition of junior high school students through an ethnomathematics approach based on the local culture of Padangsidimpuan. The study uses a mixed-method approach with an exploratory design. The subjects of the study were eighth-grade students at SMP Negeri 8 in Padangsidimpuan City. Data were collected through a mathematical disposition questionnaire, in-depth interviews, classroom observations, and documentation. Data analysis was carried out using descriptive statistics and thematic analysis. The results show that the integration of local cultural contexts into mathematics learning can foster positive mathematical dispositions, especially in aspects of self-confidence, perseverance, interest, and appreciation for mathematics. These findings emphasize that ethnomathematics not only functions as a learning context but also as a means of shaping students' mathematical attitudes and values. This study recommends strengthening the ethnomathematics approach as part of a mathematics learning strategy that focuses on the development of the affective domain of junior high school students.

Keywords: *Mathematical Disposition; Ethnomathematics; Local Culture; Mathematics Learning.*

Abstrak

Disposisi matematis merupakan aspek afektif yang berperan penting dalam menentukan keberhasilan siswa dalam pembelajaran matematika, namun masih relatif kurang mendapat perhatian dalam praktik pembelajaran di tingkat SMP. Pembelajaran matematika cenderung menekankan aspek kognitif dan prosedural, sehingga sikap, minat, dan kecenderungan positif siswa terhadap matematika belum berkembang secara optimal. Penelitian ini bertujuan untuk mengeksplorasi disposisi matematis siswa SMP melalui pendekatan etnomatematika yang berbasis pada budaya lokal Padangsidimpuan. Penelitian menggunakan pendekatan mixed-method dengan desain eksploratif. Subjek penelitian adalah siswa kelas VIII SMP Negeri 8 di Kota Padangsidimpuan. Data dikumpulkan melalui angket disposisi matematis, wawancara mendalam,

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observasi pembelajaran, dan dokumentasi. Analisis data dilakukan melalui statistik deskriptif dan analisis tematik. Hasil penelitian menunjukkan bahwa integrasi konteks budaya lokal dalam pembelajaran matematika mampu membangun disposisi matematis positif, khususnya pada aspek kepercayaan diri, ketekunan, minat, dan apresiasi terhadap matematika. Temuan ini menegaskan bahwa etnomatematika tidak hanya berfungsi sebagai konteks pembelajaran, tetapi juga sebagai sarana pembentukan sikap dan nilai matematis siswa. Penelitian ini merekomendasikan penguatan pendekatan etnomatematika sebagai bagian dari strategi pembelajaran matematika yang berorientasi pada pengembangan ranah afektif siswa SMP.

Kata Kunci: Disposisi Matematis; Etnomatematika; Budaya Lokal; Pembelajaran Matematika

INTRODUCTION

Mathematics learning at the Junior High School (SMP) level plays an important role in shaping students' thinking, attitudes, and perspectives toward mathematics as a discipline. So far, the success of mathematics learning has often been measured solely by cognitive achievements, such as mastery of concepts, procedural skills, and written test results. However, in reality, learning success should not only focus on cognitive aspects but also take into account affective aspects (attitudes). A pessimistic or helpless explanatory style, thought to be a key characteristic of internalization problems and co-occurring school/achievement problems in childhood and adolescence, has been shown to contribute to unsuccessful mathematics learning (Roeser, 2015).

Currently, it is still often found that mathematics is taught using only formulas and steps to solve problems. However, it is known that this makes students lazy and lacks motivation and even makes mathematics a boring and scary subject (Safitri & Muhammad, 2023). Necessarily, mathematics learning that targets affective aspects places students' attitudes, values, emotions, and internal tendencies as an inseparable part of the learning objectives. Until now, mathematics learning in schools has tended to focus on the cognitive domain, such as mastery of concepts, procedures, and computational skills, while the affective domain is often treated as a secondary outcome of cognitive success. In fact, various studies show that the success of mathematics learning is significantly

influenced by students' attitudes and dispositions toward mathematics itself (NCTM, 2020).

Mathematical disposition refers to the affective tendencies that reflect students' attitudes, interests, and thinking habits when engaging in mathematical activities. This disposition includes aspects of self-confidence, perseverance, curiosity, flexibility in thinking, as well as appreciation for the value and usefulness of mathematics. A positive mathematical disposition enables students to persevere when facing difficulties and view mathematics as a meaningful intellectual activity.

In the context of mathematics education, mathematical disposition is considered an integral part of students' mathematical competence. The development of mathematical disposition cannot be separated from the learning experiences that students undergo. Learning that provides opportunities for exploration, discussion, and reflection tends to be more effective in shaping a positive mathematical disposition compared to learning that is mechanistic and one-directional.

Mathematical disposition is also an important factor in learning. Mathematical disposition includes self-confidence, tenacity, flexibility of thinking, and appreciation for mathematics (Noviana et al., 2025). Anggia's research showed a significant influence between mathematical disposition and improving students' mathematical problem-solving abilities. This means that mathematical disposition makes a significant contribution to improving students' problem-solving abilities (Anggia, 2025).

Conceptually, mathematical disposition is understood as an internal tendency that encourages students to adopt a positive attitude toward mathematics, including self-confidence, perseverance, flexibility in thinking, and appreciation for the value and usefulness of mathematics. The National Council of Teachers of Mathematics (NCTM) affirms that mathematical disposition is an integral part of mathematical competence because a positive attitude toward mathematics plays a role in building student engagement and learning resilience (NCTM, 2020).

Mathematical disposition is not innate but develops through the learning experiences students encounter. A learning environment that is supportive, intellectually challenging, and relevant to students' lives significantly contributes to the formation of a positive mathematical disposition. Conversely, learning experiences that emphasize procedural memorization, lack dialogue, and are pressure-driven can weaken mathematical disposition and lead to negative attitudes toward mathematics (Jansen et al., 2016). Safitri can conclude that the disposition of mathematics namely the desire, tendency, awareness and a strong dedication to the student or big students to think and act in doing mathematics (Safitri et al., 2017).

Various studies have identified several key indicators of students' mathematical disposition, including self-confidence in solving mathematical problems, perseverance in facing difficulties, curiosity about mathematical ideas, flexibility in using solution strategies, and appreciation for the role of mathematics in everyday life (Kilpatrick, et al., 2001). These indicators are interrelated and form a pattern of attitudes that continuously influence students' learning behavior.

The affective aspects in mathematics learning include mathematical disposition, learning motivation, attitude toward mathematics, self-confidence, perseverance, and math anxiety. Specifically, mathematical disposition is understood as students' tendency to think and act positively when facing mathematical activities, including the willingness to persevere in the face of difficulties and to appreciate the role of mathematics in everyday life (Kilpatrick, et al., 2001). Students with a positive mathematical disposition tend to show higher engagement in learning and have better learning resilience.

Affective-oriented mathematics learning demands a paradigm shift from knowledge transmission-based learning to student-centered learning that focuses on the learning experience. The teacher plays the role of a facilitator who creates a psychologically safe learning environment, encourages active participation, and provides space for student reflection. A supportive learning environment has been

proven to contribute to the enhancement of students' self-confidence and positive attitudes toward mathematics (OECD, 2019).

Recent studies also show that mathematical disposition is closely linked to the teaching approach used by the teacher. Contextual, collaborative, and reflective learning tends to be more effective in fostering positive mathematical dispositions compared to lecture-based and routine practice-focused learning. This indicates that the development of mathematical disposition should be intentionally designed through teaching strategies that position students as active agents in constructing their mathematical knowledge (Hannula, 2015).

One of the key characteristics of mathematics learning aimed at affective aspects is the use of meaningful and relevant learning contexts related to students' lives. Contextual learning allows students to build an emotional connection with the material being studied, so that mathematics is not perceived as an abstract science detached from social realities. This approach aligns with the view that students' affection develops through authentic and meaningful learning experiences (Hannula, 2015).

Moreover, social interaction in mathematics learning, such as group discussions, collaborative work, and mathematical argumentation, plays an essential role in the development of affective aspects. Through these interactions, students learn to appreciate different strategies, express opinions with confidence, and build positive attitudes toward the process of mathematical thinking. Reflective activities after learning also help students realize the development of their attitudes and understanding toward mathematics (Jansen et al., 2016).

In the context of mathematics education at the junior high school (SMP) level, learning that emphasizes affective aspects has long-term implications for students' continued learning. Positive attitudes and strong mathematical dispositions at the SMP level serve as an important foundation for students to face mathematical challenges at higher levels of education. Therefore, mathematics learning that targets affective aspects needs to be consciously and systematically designed as part of a strategy to improve the overall quality of mathematics education.

Thus, mathematics learning that integrates affective aspects not only contributes to improved learning outcomes but also fosters a healthier and more meaningful relationship between students and mathematics. This approach emphasizes that the success of mathematics education is determined not only by what students know but also by how they perceive, feel, and make sense of mathematics in their lives (Hannula, 2015). This narrow focus has led to the affective aspects, particularly students' mathematical dispositions, receiving insufficient attention.

Mathematical disposition reflects students' internal tendencies in how they view, respond to, and interact with mathematics. Students who possess a positive mathematical disposition tend to demonstrate self-confidence, perseverance, flexibility in thinking, and appreciation for the role of mathematics in life. Conversely, low mathematical disposition often leads to negative attitudes, anxiety, and rejection of mathematics learning.

In the context of mathematics learning at the SMP level, mathematical disposition is highly significant. At this developmental stage, students begin to form their academic identity and long-term attitudes toward specific subjects. Positive mathematical dispositions at the SMP level contribute to success in mathematics learning at higher levels, while negative dispositions often lead to mathematics anxiety and low student participation (OECD, 2019).

Thus, students' mathematical disposition cannot be separated from the overall quality of mathematics learning. Strengthening mathematical disposition is a long-term investment in mathematics education as it shapes attitudes, values, and thinking habits that support learning success. Therefore, mathematics education should not only focus on cognitive achievements but also on the development of positive and sustainable mathematical dispositions (National Council of Teachers of Mathematics (NCTM), 2020).

Various studies indicate that low mathematical disposition among students is not solely caused by the level of difficulty of the material but also by a learning approach that lacks contextual relevance and is far from students' real-life experiences. Abstract mathematics learning, detached from students' cultural

experiences, has the potential to create an emotional distance between students and mathematics. This situation presents a particular challenge, especially in regions rich in local culture, which could actually be utilized as a valuable learning resource.

Local culture-based learning in mathematics learning is called Ethnomathematics. Ethnomathematics is the study of mathematical practices that develop within specific cultural contexts. This approach views mathematics as a cultural product that emerges from human activities in daily life. In education, ethnomathematics serves as a bridge between formal mathematics and students' cultural experiences.

The use of ethnomathematics in mathematics education provides students with opportunities to understand mathematical concepts through familiar contexts. This not only enhances conceptual understanding but also strengthens cultural identity and a sense of ownership over the mathematics learning process. Therefore, ethnomathematics holds great potential in building positive mathematical dispositions.

Ethnomathematics is a branch of study that examines the relationship between mathematics and culture. This concept identifies mathematical practices found in various cultures around the world, which include ways of thinking, problem-solving strategies, and mathematical tools that have developed within specific cultural contexts. In mathematics education, ethnomathematics offers an approach that integrates mathematical concepts with students' cultural and social realities, making them more meaningful and relevant to their lives.

The ethnomathematics approach to mathematics education focuses on recognizing the richness of local cultures in students' everyday lives. This includes recognizing that mathematics is not only found in the classroom or textbooks but also exists in cultural practices rooted in local traditions. For example, in certain cultures, time calculations, distance measurements, or symmetrical patterns found in art and architecture are forms of ethnomathematics that can be introduced in the context of mathematics learning.

The application of ethnomathematics in mathematics education offers several benefits. One of them is its ability to foster an emotional connection between students and the material being studied, as they can see mathematics as something close to their lives (Rosa et al., 2010). This can reduce the mathematics anxiety often experienced by students, as they see mathematics not as a field disconnected from their daily lives.

Furthermore, ethnomathematics supports the development of critical thinking and problem-solving skills. By linking mathematics to real-life problems, students are expected to gain a deeper understanding of mathematical concepts, as they can see the application of mathematics within their own cultural contexts (Khaerani, Arismunandar, 2024). This also facilitates more contextual and experiential learning, which can help students develop positive mathematical dispositions.

The application of ethnomathematics in mathematics education can also introduce diversity in mathematics. Each culture has unique ways of perceiving and using mathematics. For example, traditional number systems in certain cultures or geometric patterns in arts and crafts can open new perspectives on the diversity of mathematical concepts around the world. This provides an opportunity for students to see that mathematics is a universal language used by all humans, albeit in different forms.

Thus, ethnomathematics not only enriches students' understanding of mathematics but also enhances their appreciation for cultural diversity. This approach encourages students to connect mathematics to their real-life experiences, introduces global perspectives, and enriches their critical thinking skills in solving mathematical problems.

The ethnomathematics approach offers an alternative perspective in mathematics education by linking mathematical concepts with cultural practices, traditions, and daily activities of the community. In the context of Padangsidimpuan, the local culture, rich in patterns, structures, and traditional numerical systems, holds great potential to serve as a meaningful context for mathematics learning. Integrating local culture into learning not only strengthens

conceptual understanding but also has the potential to build positive attitudes toward mathematics. According to Supriyati et al., in mathematics learning in schools, there is a tendency that exploring students' prior knowledge must begin by linking formal mathematics to students' experiences in everyday life (Supiyati & Hanum, 2019).

Based on this background, this study focuses on exploring the mathematical disposition of junior high school students through an ethnomathematics approach based on the local culture of Padangsidimpuan. This study is expected to provide both theoretical and practical contributions to the development of more humanistic and contextual mathematics education.

RESEARCH METHODS

This study uses a mixed-method approach with an exploratory design. This approach was chosen to obtain a comprehensive understanding of students' mathematical disposition, both quantitatively and qualitatively (Sugiyono, 2022). The subjects of the study are eighth-grade students from junior high schools in Padangsidimpuan, selected purposively.

This mathematical disposition aligns with the principles of the Independent Curriculum. There are three principles formulated in designing the Independent Curriculum: (1) ensuring and supporting the development of competencies and character, (2) being flexible, and (3) focusing on essential content (Kemendikbud, 2024). Mathematical disposition is an important component in mathematics education related to the affective domain of students. Unlike cognitive abilities, which focus on mastering concepts and procedures, mathematical disposition emphasizes students' tendencies in attitudes, thinking habits, and emotional responses when faced with mathematical activities. This disposition influences how students view mathematics, confront challenges, and persist in the learning process (Kilpatrick, et al, 2001).

The research instruments include a mathematical disposition questionnaire, interview guidelines, observation sheets, and learning documentation. The mathematical disposition questionnaire was developed based

on the indicators of mathematical disposition and has undergone content validity testing as well as reliability testing. Interviews were conducted to explore students' experiences and perceptions of mathematics learning based on local culture.

Quantitative data analysis was conducted using descriptive statistics to describe the profile of students' mathematical disposition. Qualitative data were analyzed using thematic analysis techniques through stages of data reduction, data presentation, and conclusion drawing. Data triangulation was used to enhance the credibility of the research findings.

RESULTS AND DISCUSSION

The analysis of the questionnaire results shows that the majority of students fall into the moderate to high category of mathematical disposition. Aspects of self-confidence and perseverance showed improvement after students participated in mathematics learning that integrated the context of local culture. Students demonstrated greater courage in expressing their opinions and trying various problem-solving strategies.

Qualitative findings revealed that the use of local cultural contexts, such as traditional house patterns, activities in traditional markets, and calculations in local traditions, made mathematics learning feel closer to the students' lives. Students stated that they found it easier to understand mathematical concepts and felt that mathematics was no longer something foreign.

Classroom observations indicated an increase in student participation in group discussions. Students appeared more enthusiastic and actively engaged when mathematical problems were linked to cultural experiences they were familiar with. This had a positive impact on students' overall attitudes toward mathematics.

The results of this study indicate that the ethnomathematics approach based on the local culture of Padangsidimpuan contributes positively to the development of junior high school students' mathematical dispositions. The integration of cultural contexts into mathematics learning allows students to

construct personal meaning of mathematical concepts, thereby fostering positive attitudes and self-confidence.

These findings align with the view that mathematical disposition cannot be formed solely through procedural practice but requires meaningful learning experiences that are relevant to students' lives. Ethnomathematics serves as a medium that connects formal mathematics with the social-cultural realities of students, thereby strengthening emotional engagement in the learning process.

Furthermore, this approach also contributes to the reinforcement of students' cultural identity. When local culture is raised as a learning resource, students feel that their experiences and backgrounds are valued in the learning process. This has a positive impact on their attitudes and motivation toward learning mathematics.

CONCLUSION

This study concludes that the ethnomathematics approach based on the local culture of Padangsidimpuan has great potential in developing junior high school students' mathematical dispositions. The integration of local cultural contexts into mathematics learning is able to foster positive attitudes, self-confidence, perseverance, and students' appreciation for mathematics. Therefore, the ethnomathematics approach should be considered as a learning strategy oriented toward the development of students' affective domain.

And recommended mathematics teachers at the junior high school level are encouraged to systematically integrate local cultural elements into mathematics learning. Further research could examine the impact of the ethnomathematics approach on other mathematical aspects, such as problem-solving skills or mathematical literacy, with a broader research design.

REFERENCES

Anggia, I. P., Sripatmi, Supiarmo, M. G. (2025). Pengaruh Disposisi Matematis Terhadap Kemampuan Pemecahan Masalah Matematika pada Siswa kelas VIII SMP. *Mandalika Mathematics and Education Journal*, *7*(3), 1095–1107. https://doi.org/10.29303/jm.v7i3.9715

Hannula, M. S. (2015). Emotions in problem solving. *Selected Regular Lectures from the 12th International Congress on Mathematical Education*, 269–288.

Jansen, E. H. A., Kaasila, R., Lutovac, S., Di, P., Francesca, M., Middleton, J. A., & Pantziara, M. (n.d.). *Attitudes , Beliefs , Motivation and Identity in Mathematics Education*.

Jeremy Kilpatrick, Jane Swafford, and B. F. (2001). *Adding It Up: Helping Children Learn Mathematics.* (and B. F. Jeremy Kilpatrick, Jane Swafford (ed.)). National Academy Press. https://www.researchgate.net/publication/317953584_Adding_it_up_Helping_children_learn_mathematics

Kemendikbud. (2024). *Kurikulum Merdeka*. Jakarta: Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia.

Khaerani, Arismunandar, I. T. (2024). *Peran Etnomatematika dalam Meningkatkan Mutu Pembelajaran Matematika : Tinjauan Literatur The Role Of Ethnomathematics in Improving the Quality of Mathematics Learning : Literature Review*. *5*(1), 20–26.

National Council of Teachers of Mathematics (NCTM). (2020). *Catalyzing change in middle school mathematics*. Reston, VA: NCTM.

Noviana, R., Supratman, M., & Rahmawati, H. (2025). *Efektivitas Model Pembelajaran Berbasis Masalah dalam Meningkatkan Pemahaman Konsep Matematis dan Disposisi Matematis Siswa The Effectiveness of Problem-Based Learning Model in Improving Students ' Mathematical Conceptual Understanding and Disposition*. *8*, 54–56.

OECD. (2019). *PISA 2018 results: What students know and can do: Vol. I*. Paris: OECD Publishing.

Roeser, R. W. and J. S. E. (2015). *Handbook of Developmental Psychopathology* (M. L. and K. D. Rudolph (ed.)). Springer. https://doi.org/10.1007/978-1-4614-9608-3

Rosa, M., Orey, D. C., Rosa, M., & Orey, D. C. (2010). Culturally relevant pedagogy : an ethnomathematical approach. *ZDM Mathematics Education*, *1996*, 19–31.

Safitri, A., & Muhammad, R. B. (2023). Development of Android-Based Mathematics Learning Media at SMP Negeri 4 Padangsidimpuan. *Logaritma : Jurnal Ilmu-Ilmu Pendidikan Dan Sains*, *11*(02), 147–162. https://doi.org/10.24952/logaritma.v11i02.10064

Safitri, A., Surya, E., Syahputra, E., & ... (2017). Impact of Indonesian Realistic Mathematics Approach to Students Mathematic Disposition on Chapter Two Composition Function and Invers Fungtion in Grade …. *... Research in Education …*, *4*(July), 93–100. https://www.researchgate.net/profile/Edy-Surya-2/publication/318585138_Impact_of_Indonesian_Realistic_Mathematics_Approach_to_Students_Mathematic_Disposition_on_Chapter_Two_Composition_Function_and_Invers_Fungtion_in_Grade_XI_IA-1_SMA_Negeri_4_Padangsidim

Sugiyono. (2022). *Metode penelitian pendidikan*. Bandung: Alfabeta.

Supiyati, S., & Hanum, F. (2019). *Ethnomathematics in sasaknese architecture*. *10*(1), 47–58.