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Analysis of Mathematics Learning Management at Madrasah Tsanawiyah Integrated with Ethnomathematics

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Abstract: This study aims to determine the quality of mathematics learning management at the Madrasah Tsanawiyah level, integrated with Ethnomathematics, covering the planning, implementation, and evaluation conducted by mathematics teachers. The research was conducted at MTs Negeri 1 Lombok Timur in grades VII, VIII, and IX using a descriptive qualitative approach. Data collection was carried out in a natural setting using various techniques, including observation, interviews, document studies, and data triangulation to ensure the validity, credibility, and consistency of the research data. The methods used involved participant observation, in-depth interviews, and documentation. The findings of the study include: (1) Teachers have a good understanding of the curriculum and its development. (2) Teachers demonstrate competence in managing mathematics learning integrated with Ethnomathematics. (3) Challenges exist in managing mathematics learning when linked to Ethnomathematics. This study discusses the management of Mathematics Learning Integrated with Ethnomathematics at Madrasah Tsanawiyah, focusing on learning management, teacher understanding, and classroom implementation. The results indicate that although all teachers understand the curriculum, only 57.14% have an in-depth understanding of Ethnomathematics. While most teachers emphasize lesson planning (85.7%), only 28.57% apply Ethnomathematics-based learning models. The main challenges include limited teacher understanding, time constraints, and low student readiness. Efforts made to address these challenges include lecture and discussion methods, as well as the integration of Ethnomathematics in learning. However, the application of Ethnomathematics still requires improvement through further training and support to be effectively implemented and to contribute to the preservation of local culture.

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Introduction

One of the efforts to improve the quality of a nation is to enhance the quality of education through effective and high-quality learning management. According to the National Education System Law, education is a conscious effort to enable individuals to develop their potential

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through the learning process. Therefore, education plays a crucial role in shaping both individual and societal development. For this reason, education in Indonesia must be directed toward improving intellectual and professional abilities, as well as attitudes, personality, and morals, to create high-quality human resources (HR). The realization of high-quality and competitive Indonesian human resources will elevate the dignity of the nation. Well-developed human resources significantly influence the ability to compete globally, master science and technology, and acquire essential life skills (Kis, Kirana, Romadiana, Wijaya, & Raya, 2021; S. H. H. Lubis, Milfayetti, Lubis, & Purba, 2022; Saâ, 2018).

Effective mathematics learning management in MTs (Madrasah Tsanawiyah) is crucial because mathematics is a fundamental subject that students must master. It serves as a foundation for learning other sciences, both at higher education levels and in daily life. As a compulsory subject, mathematics contributes to the development of students' logical, analytical, and problem-solving skills. However, in practice, mathematics is often perceived as a difficult subject by many students. Therefore, proper mathematics learning management is essential to change students' perceptions of mathematics and create a more engaging and interactive learning environment(Khaerani, Arismunandar, & Tolla, 2024; Malikah, 2022; Nurani, 2020; Putra, 2022).

Ethnomathematics is a branch of mathematics that studies the relationship between culture, traditions, and mathematical ways of thinking that develop within a particular society. Ethnomathematics views mathematics not only as a set of abstract concepts taught in classrooms but also as a product of specific cultures that evolve within the context of daily life. Mathematical concepts used by various ethnic groups or communities are often influenced by their practical needs, such as in agriculture, navigation, craftsmanship, and social systems (Fauzi & Lu'luilmaknun, 2019; Marian & Saputra, 2023; Purbaningrum et al., 2021).

The main goal of ethnomathematics is to recognize that there are various ways of engaging in mathematical activities, influenced by the mathematical knowledge developed across different sectors of society. It also acknowledges the diverse approaches to activities such as classifying, counting, measuring, designing structures or tools, playing, and more, Thus, ethnomathematics aims to: (1) Appreciate Cultural Diversity in Mathematical Practices: Ethnomathematics recognizes that each culture has unique ways of applying mathematical concepts, many of which are not included in formal mathematics curricula. (2) Enhance the Relevance of Mathematics Learning: By integrating mathematical practices from various cultures, mathematics education becomes more contextual and relevant for students, thereby increasing their motivation and understanding of the subject. (3) Develop Comprehensive Mathematical Literacy: Ethnomathematics helps students understand and appreciate the cultural value of mathematical activities, which in turn supports the development of broader mathematical literacy. (4) Encourage Creativity and Innovation in Learning: The ethnomathematical approach stimulates students' creativity by connecting mathematical concepts with their cultural practices, making learning more engaging and innovative.

Thus, ethnomathematics not only enriches students' understanding of mathematics but also values and preserves the cultural heritage within society (Andriono, 2021; Dari & Jatmiko, 2024; Khaerani et al., 2024; Putra, 2022).

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Ethnomathematics-integrated mathematics learning involves using mathematical knowledge and practices derived from a specific culture as a foundation for classroom learning. By combining formal mathematics with ethnomathematics, learning becomes more contextual and helps students better understand mathematical concepts through their cultural experiences. The steps and key components in managing ethnomathematics-integrated mathematics learning, according to (Dari & Jatmiko, 2024; Marian & Saputra, 2023; Purbaningrum et al., 2021) are as follows:

1. Identifying Relevant Aspects of Local Culture
   The first step in managing mathematics learning integrated with ethnomathematics is identifying aspects of local culture that can be connected to mathematical concepts. This may include:
   a. Traditional measurement systems: For example, measurements based on footsteps, body length, or other local units used in the community.
   b. Geometric patterns in art or crafts: Such as patterns in batik, weaving, or carvings that can be analyzed using geometric concepts.
   c. Cultural practices in counting or measuring time: For instance, how certain communities manage time or perform calculations in their daily activities.

   By connecting mathematical concepts with these cultural practices, students can learn mathematics in a more meaningful context that is closely related to their everyday lives.
2. Adjusting Teaching Methods
   The teaching methods in managing mathematics learning integrated with ethnomathematics should be adapted to the cultural characteristics being used. Some methods that can be applied include:
   a. Project-based learning: Students can be assigned projects that combine mathematics and culture, such as designing geometric patterns based on traditional art or calculating dimensions in the construction of traditional houses.
   b. Problem-based learning: Students are given problems related to their daily lives, such as calculating the area of farmland using traditional units of measurement.
   c. Cultural discussion and reflection: Conducting discussions on how certain communities use mathematical concepts in their culture, as well as reflecting on the application of these mathematical concepts in modern life.
3. Learning Evaluation Focused on Process and Outcomes
   Evaluation in mathematics learning integrated with ethnomathematics should cover two aspects: process and outcomes. The process can be evaluated based on how students apply mathematical concepts within the cultural context being studied. The evaluation outcomes should also include students' understanding of how their culture contributes to mathematics learning. Evaluation can be conducted through:
   a. Project portfolios: Assessing students' work in ethnomathematics-based projects.
   b. Observation-based assessment: Observing students' engagement in discussions and collaboration during the learning process.

Benefits of Managing Mathematics Learning Integrated with Ethnomathematics According to (Achilla, 2024; A. P. Lubis et al., 2024; Widyaningrum & Prihastari, 2021) as follows:

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1. Strengthening Understanding of Mathematical Concepts: By linking mathematical concepts with local culture, students can understand mathematics more easily due to its relevance to their lives.
2. Increasing Student Interest and Motivation: Contextual and culture-based learning can make students more engaged and motivated to learn mathematics.
3. Helping to Preserve Local Culture: Mathematics learning that integrates ethnomathematics can serve as a means to preserve local culture while also increasing students' awareness of their cultural heritage.

The Management of Mathematics Learning Integrated with Ethnomathematics is an approach to managing mathematics learning that connects mathematical concepts with the local culture and traditions within the community. This approach seeks to integrate mathematical understanding with cultural contexts, allowing students to learn mathematics in a way that is more relevant to their daily lives while also appreciating cultural diversity (Achilla, 2024; A. P. Lubis et al., 2024; Widyaningrum & Prihastari, 2021).

Based on observation results at MTs N 1 Lombok Timur, the implementation of mathematics learning, indicates that teachers' skills in managing mathematics lessons in the classroom are inadequate. This has resulted in student boredom and fatigue during the learning process. This is reflected in the low results of learning mathematics because it is less popular. Additionally, there is a perception that mathematics learning focuses solely on memorizing material, making the teaching and learning process monotonous and unengaging, with no challenges for critical thinking. Consequently, academic achievement relies mainly on lower-order cognitive skills.

This perception arises because teachers view students as recipients of knowledge rather than actively guiding and training them in searching for, analyzing, and applying information, finding solutions, developing options, and making decisions key characteristics of mathematics learning. The ineffective management of learning is due to the misalignment of input elements, including overlapping curriculum policies, implementation issues, and learning outcomes.
Based on the results of interviews, initial observations with mathematics teachers, and a documentation study at MTs N 1 Lombok Timur, it was found that some mathematics teachers still have a limited understanding of ethnomathematics. This lack of understanding is a critical issue that needs to be addressed, as it affects the management of science learning, including planning, implementation, and evaluation in schools. There is also a mismatch between the lesson plans (RPP) that have been designed and the actual implementation of learning in the classroom. Although teachers explicitly include ethnomathematics aspects in their lesson plans, as seen in their innovative learning model designs, they do not fully implement the lessons according to the planned RPP.

Several studies related to the management of mathematics learning integrated with ethnomathematics include the research conducted by Achilla (2024), titled "Innovation in Mathematics Learning Using the Ethnomathematics Approach on Troso Fabric Motifs as a Local Wisdom Project." This study explores the integration of traditional Troso fabric motifs into mathematics learning.

Using an ethnomathematics approach, the research connects mathematical concepts with local culture, aiming to enhance students' understanding and appreciation of mathematics and

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cultural heritage. The findings indicate that this approach not only enriches students' learning experiences but also strengthens their engagement in preserving local wisdom.
Achilla's research focuses more on a specific aspect (Troso fabric motifs in mathematics), whereas research on learning management takes a more comprehensive approach in understanding how ethnomathematics can be integrated into the education system on a broader scale.

This study aims to analyze and develop strategies for managing mathematics learning integrated with ethnomathematics, an approach that connects mathematical concepts with local culture. The research focuses on the effectiveness of teaching methods, students' understanding and motivation, and the impact of learning on cultural preservation.
The assessed aspects include pedagogical (teaching strategies and teacher readiness), cognitive (students' understanding of concepts and critical thinking), affective (students' motivation and interest), and implementation and learning management (challenges and effectiveness of ethnomathematics integration). The study is expected to provide an innovative learning management model that supports both effective education and the preservation of local wisdom.

Based on the explanation above, it is deemed necessary to conduct research on the management of mathematics learning integrated with ethnomathematics at the Madrasah Tsanawiyah level, focusing on lesson planning, implementation, and assessment. This research is important because professional teachers are expected to be able to develop lesson planning tools that adhere to process standards, implement the learning process according to the prepared plans, assess learning outcomes, and create a classroom environment that aligns with the planned instruction. This study is an interesting exploration aimed at describing the management of mathematics learning integrated with ethnomathematics at Madrasah Tsanawiyah in the Selong district.

Research Method

The purpose of this research is to assess the quality of mathematics learning management at Madrasah Tsanawiyah, which is integrated with ethnomathematics, covering planning, implementation, and evaluation. This study is conducted at Madrasah Tsanawiyah in the Selong district, with MTs N 1 Lombok Timur as the research sample. The population of this study consists of all students at MTs N 1 Lombok Timur, while the sample is the mathematics subject teachers. The research focuses on the management of mathematics learning integrated with ethnomathematics, specifically in terms of planning, implementation, and evaluation carried out by mathematics teachers. Data collection in this study employs three methods: (1) Participant observation; (2) In-depth interviews; (3) Documentation. This study applies data triangulation to ensure validity and reliability in analyzing the management of mathematics learning integrated with ethnomathematics. Triangulation is conducted through participant observation, in-depth interviews, and documentation. Data validity is achieved by comparing results from various methods and sources, such as teachers, school principals, and students, to ensure consistency in findings. Meanwhile, reliability is ensured through systematic recording and repeated analysis, so that the research results remain consistent if replicated. With this

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approach, the study produces objective and reliable data, providing deep insights into the effectiveness of ethnomathematics-based learning in Madrasah Tsanawiyah.

This study employs qualitative analysis using thematic analysis and content analysis to evaluate the management of mathematics learning integrated with ethnomathematics. The data analysis process is carried out in three stages: before entering the field, during fieldwork, and after fieldwork. Data is collected through observations, in-depth interviews, and documentation, then analyzed using thematic coding to identify patterns in the planning, implementation, and evaluation of learning. Content analysis is used to review instructional documents and assess the extent to which ethnomathematics is integrated into teaching.

Result and Discussion

Based on the results of a five-month study conducted at MTs N 1 Lombok Timur, which was selected as the research sample, it was found that the management of Mathematics Learning Integrated with Ethnomathematics is divided into three aspects: (1) Mathematics learning management; (2) Understanding of ethnomathematics; (3) Its implementation and the challenges encountered in applying ethnomathematics in classroom mathematics learning. These findings were derived from interviews, observations, and documentation studies. The collected data was then analyzed through several steps: data reduction, data presentation, and conclusion drawing. The patterns that emerged from this study are as follows:

Based on the presentation of previous interview results, the mathematics teachers at MTs Negeri 1 Lombok Timur have a good understanding of the curriculum and its development. In general, teachers stated that "the curriculum is a set of plans and arrangements regarding objectives, content, and learning materials, as well as the methods used as guidelines for conducting learning activities to achieve specific educational goals, and this curriculum is developed by educational institutions." This means that the pattern observed in curriculum understanding and development indicates that teachers have a strong grasp of curriculum design and development. This is further reinforced by the fact that each school conducts training through MGMP (Teacher Working Group) to develop the curriculum within their educational units. Based on the analysis results, 100% of mathematics teachers at MTs N 1 Lombok Timur understand the curriculum and its development.

The statement above indicates that teachers understand the importance of the curriculum in learning. The curriculum serves as a fundamental guideline in the teaching and learning process within the education system. The success of education, the ability of students to absorb lessons, the effectiveness of teachers in delivering instruction, and the achievement of educational goals are all significantly influenced by the curriculum(Anwar, Nuris, & Wijaya, 2019; Widodo & Nugroho, 2019; Zunaidi, Fatmawatie, Natalina, & Mushlihin, 2021).

In the problem background described above, it is explained that teachers still have limited knowledge of ethnomathematics. Furthermore, the results of interviews conducted by the researcher indicate that teachers' responses during interviews and observations regarding ethnomathematics revealed three patterns of understanding: (1) teachers who are familiar with ethnomathematics and can explain its aspects; (2) teachers who are aware of ethnomathematics but cannot identify or explain its aspects; and (3) teachers who do not understand ethnomathematics

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Based on the analysis, teachers' understanding of ethnomathematics varies in several aspects. In terms of initial knowledge, 57.14% of teachers had heard of ethnomathematics, while 28.57% had heard of it but could not recall its aspects, and 14.28% had never encountered the concept before. Regarding their sources of knowledge, the majority (85.71%) gained an understanding of ethnomathematics through self-study and online resources. In terms of comprehending its aspects, 57.14% of teachers demonstrated a solid understanding and could explain various elements of ethnomathematics, whereas 28.57% had some understanding but were unable to explain its aspects fully. Meanwhile, 14.28% of teachers had no knowledge of ethnomathematics aspects at all. These findings indicate that while some teachers have a strong grasp of ethnomathematics, others still require further exposure and deeper comprehension.

Based on the analysis results, only four teachers have a deep understanding of ethnomathematics and are able to internalize it in their teaching practices. A strong understanding of the nature of science significantly impacts teachers' performance, particularly in mathematics instruction. Teachers' comprehension of ethnomathematics plays a crucial role in managing mathematics learning. By understanding ethnomathematics, teachers can connect mathematical concepts with local culture, making learning more contextual and relevant for students. This approach enhances conceptual understanding, learning outcomes, as well as students' creativity and engagement in the learning process. Moreover, it contributes to the preservation of local culture and creates a more engaging learning environment. However, its implementation requires a deep understanding and teachers' readiness to integrate it into the curriculum (Fajrina, 2022; Fauzi, Umar, & Rahmatih, 2023).

Mathematics education. By linking mathematical concepts to local culture, learning becomes more contextual, meaningful, and engaging for students. This approach helps students grasp mathematical concepts more easily, as they are connected to real-life experiences, making learning more relatable and practical. Additionally, incorporating ethnomathematics in teaching increases students' motivation and participation, as they see the relevance of mathematics in their own cultural context. Teachers who understand ethnomathematics can develop more creative and innovative teaching methods, ultimately improving students' learning outcomes. Moreover, this understanding contributes to the preservation of local culture, as integrating cultural elements into learning allows students to not only acquire mathematical knowledge but also appreciate and uphold their cultural heritage. Given its significance, professional training and development in ethnomathematics are essential to equip teachers with the necessary skills to integrate this approach effectively into the learning process, ensuring a richer and more impactful educational experience (Razak, Tahmir, & Thalib, 2020; Syarifuddin, Adiansha, Anam, & Diana, 2024).

Based on the analysis, the management of mathematics learning in the classroom involves several key aspects. In terms of teachers' emphasis on learning management, 71.42% of teachers focus on students' mental readiness and the availability of learning facilities, 57.14% emphasize students' knowledge, and 85.7% prioritize lesson planning (RPP). Regarding classroom management strategies, 71.42% of teachers align their teaching with the RPP they designed, while 85.7% focus on preparing students mentally and ensuring their readiness to learn. In terms of implementing innovative learning models, all teachers (100%) strive to conduct inquiry-based learning using innovative teaching methods, and none use traditional

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lecture or discussion-based approaches. However, further in-depth observations revealed that some teachers do not fully adhere to their lesson plans during classroom instruction. Additionally, almost all teachers have never implemented learning models that integrate local culture into the teaching process. Instead, most rely solely on textbooks as the primary reference for teaching.

Based on the results of observations and interviews, the development of mathematics learning materials can be categorized into three groups. First, some teachers understand and incorporate ethnomathematics into their lesson plans (RPP), implement the plans accordingly, and conduct assessments based on aspects of the nature of science. Second, some teachers include aspects of ethnomathematics in their lesson plans but do not fully integrate them into the teaching process or assessment. Third, some teachers have little or no understanding of ethnomathematics, making it difficult for them to incorporate it into the learning process.

Based on the analysis, the implementation of ethnomathematics in mathematics learning can be categorized into several aspects. First, teachers have incorporated ethnomathematical aspects into the lesson plans (RPP) developed collaboratively through subject group discussions at MTs Negeri 1 Lombok Timur. Second, in terms of applying ethnomathematics in teaching, 28.57% of teachers use innovative learning models to introduce ethnomathematics, while another 28.57% rely on problem-solving exercises and lectures, which do not fully highlight scientific aspects. Third, regarding assessment, 71.4% of teachers focus on evaluating students' knowledge, and 85.7% conduct assessments based on the instruments outlined in the RPP. Lastly, in terms of alignment between lesson plans and classroom implementation, 14.28% of teachers do not follow or pay attention to the RPP when conducting lessons, whereas 85.7% adhere to their lesson plans as a guide, ensuring the implementation of inquiry-based learning in the classroom.

Based on interviews with sources, several reasons why teachers do not conduct learning activities according to the designed lesson plans (RPP) include students' relatively low prior knowledge, dense subject matter, time allocation constraints, and the complexity of learning models with lengthy steps. A deeper analysis by the researcher revealed that a key issue also lies in the teachers' limited understanding of ethnomathematics. Ideally, teachers should have extensive knowledge of learning approaches, as they play a crucial role as the frontline in developing students' human resources and overall educational growth.

Furthermore, based on the analysis results, it is evident that only three teachers apply the nature of science in mathematics learning, while others are either inconsistent with the lesson plans (RPP) or do not implement ethnomathematics in their teaching. This indicates that the integration of ethnomathematics in mathematics learning is directly proportional to teachers' understanding of the concept. Teachers with a strong grasp of ethnomathematics are more likely to implement mathematics lessons that creatively integrate mathematical concepts with local culture, making learning more innovative and engaging in the classroom.

The previous discussion highlighted several challenges faced by teachers in implementing mathematics learning in the classroom, including students' mental readiness, the alignment of subject matter with time allocation, students' prior knowledge, teachers' limited understanding of ethnomathematics, and the government's assessment requirements, which place greater emphasis on cognitive evaluation (cognitive-oriented assessment). This suggests that teachers

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believe if mathematics learning is required to focus on scientific attitudes and scientific performance, students will have relatively low knowledge, potentially leading to failure in final assessments such as national exams. As a result, teachers tend to emphasize lectures and discussions as a means to improve students' knowledge.

Based on the analysis, the obstacles and efforts in implementing the nature of science in learning are as follows: (1) Regarding the challenges in teaching, all sources indicated several issues, including the teachers' minimal understanding of ethnomathematics, students' relatively low mental readiness and prior knowledge, low concentration levels during learning, misalignment of assessment aspects in final evaluations (which are primarily cognitive-oriented), and students' generally low mathematical abilities. (2) In terms of efforts to minimize these challenges, 28.57% of teachers implement lectures and discussions as their teaching methods, while another 28.57% strive to integrate mathematics learning with ethnomathematics.

Conclusion

Research conducted at Madrasah Tsanawiyah indicates that the management of Integrated Ethnomathematics Learning in Mathematics involves three main aspects: learning management, understanding of ethnomathematics, and its application in the classroom. Teachers at Madrasah Tsanawiyah have a good understanding of the curriculum, with all teachers demonstrating comprehension of its structure and development. However, regarding ethnomathematics, only 57.14% of teachers possess a deep understanding, with their primary sources of knowledge coming from self-study and the internet.

In terms of learning management, the majority of teachers (85.7%) emphasize lesson planning (RPP) as a crucial aspect. Although all teachers attempt to implement innovative methods, not all integrate local culture into the learning process. The application of ethnomathematics in teaching remains limited, with only 28.57% of teachers using innovative learning models based on ethnomathematics. Several challenges hinder its implementation, including limited teacher understanding, time constraints, and students' low readiness.

Key obstacles in the application of ethnomathematics include teachers' lack of understanding, students' preparedness, and an assessment focus that prioritizes cognitive aspects. Efforts to overcome these challenges include the use of lecture and discussion methods (28.57%) and the integration of ethnomathematics into lessons (28.57%). Overall, the implementation of ethnomathematics still requires improvement, particularly in enhancing teachers' understanding and application. Further training and support are necessary to effectively integrate this approach into learning while also preserving local culture. In conclusion, the implementation of ethnomathematics faces significant challenges, particularly in teacher comprehension and application. Additional training is essential to ensure this approach effectively enhances learning and contributes to the preservation of local culture.

Recommendation

To enhance the implementation of ethnomathematics in mathematics learning at Madrasah Tsanawiyah, several key recommendations are proposed. First, regular training programs and workshops should be organized to improve teachers' understanding of ethnomathematics, along

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with access to relevant resources and best practices. The curriculum should also incorporate ethnomathematics to create culturally relevant learning experiences, supported by the development of teaching materials that integrate local cultural elements. Additionally, innovative teaching strategies, such as inquiry-based and problem-solving approaches, should be encouraged to help students connect mathematical concepts with real-life cultural contexts. Assessment methods need to be improved by balancing cognitive-based evaluations with those measuring students' ability to apply mathematical concepts in cultural settings. Moreover, efforts should be made to enhance student engagement and readiness through interactive and culturally relevant activities while providing additional support for those with lower prior knowledge. Institutional and policy support is also essential, including collaboration with local communities and cultural experts to strengthen the integration of ethnomathematics in education. By implementing these recommendations, mathematics learning can become more meaningful and engaging, ultimately improving student outcomes while preserving local cultural heritage.

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