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Ethnomathematics-based examination of logical reasoning and measurement within the sritanjung and sidapaksa legend for mathematics education

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Abstract

This study is motivated by the need for contextual and culturally grounded mathematics learning, as well as the limited research exploring ethnomathematics through folklore, particularly the Sritanjung and Sidapaksa legend. This research aims to analyze elements of logical reasoning and quantitative measurement within the legend and to describe its potential as a source for contextual mathematics instruction. Employing a descriptive qualitative design with an ethnographic approach, data were collected through the documentation of narrative text and a literature review, and then analyzed through data reduction, classification, interpretation, and verification. The results indicate that the Sritanjung and Sidapaksa legend contains logical reasoning structures, such as cause–and–effect relations, implications, analogies, and moral reasoning. Measurement elements, on the other hand, appear in the description of Sidapaksa's journey, which relates to distance, time, speed, and spatial representation through maps and scales. These findings demonstrate that folklore can serve as an effective source of ethnomathematics for contextualizing mathematical concepts while simultaneously strengthening cultural values and character development. This research contributes to the expansion of ethnomathematics studies based on oral literature, which previously focused more on physical cultural artifacts. The identified logical reasoning and quantitative measurement concepts are particularly relevant for junior secondary school (7^{th} and 8^{th} grade) mathematics learning.

Keywords: Contextual Learning; Ethnomathematics; Folklore; Logical Reasoning; Measurement.

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INTRODUCTION

Mathematics is one of the sciences that has developed since ancient times and has become an integral part of human life. However, it is often perceived as an abstract discipline that is disconnected from real-life contexts. In fact, mathematical ideas and concepts have long been utilized by various cultural groups in their daily activities, although implicitly and informally (Siregar et al., 2024). Mathematics education plays an important role in developing students' logical, critical, and creative thinking skills. Many students consider mathematics

difficult and irrelevant due to factors such as mindset, learning experiences, and lack of real-life context. This perception arises from several factors, including the belief that mathematics is inherently difficult (Purbaningrum et al., 2023) as well as limited learning experiences and insufficient support from teachers (Putranto & Ratnasari, 2022). Therefore, collaboration among teachers and parents, along with the implementation of more contextual learning methods, is crucial to change these perceptions and improve students' motivation and understanding.

One relevant approach to realizing this goal is ethnomathematics. Ethnomathematics is a learning approach that connects mathematical concepts with local culture to enhance students' understanding in a contextual and meaningful way (D'Ambrosio, 2016). Through this approach, students not only learn about numbers and formulas but also understand how mathematics exists in their daily culture (Famella et al., 2025). This enables students to recognize that mathematical concepts are not only found in the classroom but are also reflected in the social and cultural activities of society. Furthermore, this approach aligns with the principles of Contextual Teaching and Learning (CTL), which emphasize the connection between academic concepts and students' real-life experiences.

Previous studies have shown that the implementation of ethnomathematics can improve students' conceptual understanding and learning motivation. Research on ethnomathematics confirms that integrating local culture into mathematics instruction can develop students' logical thinking skills and foster pride in their cultural identity, including through the use of folklore. According to Jan Harold Brunvand (James, 1994), folklore is classified into oral traditions, which include myths, legends, folktales, and folk songs. Banyuwangi folklore is one form of oral tradition that is still passed down from generation to generation (Rosidi & Fitroh, 2020).

Studies on ethnomathematics have also been conducted in various regions, such as by Umbara (2025) who examined the concept of modulo in the naming system in Tasikmalaya, and Puspadewi (2014) , who researched ethnomathematical elements in woven crafts, including the concepts of tiling, parallel lines, and angles. In addition, cultural values can be instilled through family, education, and community (Puspadewi & Wulandari, 2018). However, most of these studies focus on physical cultural artifacts such as batik, traditional games, traditional houses, cuisine, and musical instruments. Studies based on oral literature, such as folk tales, are still limited, including studies on the legends of Banyuwangi.

Previous research also shows that traditional communities often use non-standard measurement systems, such as the Wasakwakwalwa puzzle game in the Hausa culture of Northern Nigeria, the methods of South African carpenters in determining the center of rectangular box lids, and so on (Puspadewi & Putra, 2014). Thus, there is still a research gap in exploring the elements of logical reasoning and quantitative measurement contained in the Sritanjung and Sidapaksa legend as a source of ethnomathematics in mathematics learning.

The use of folklore (the Sritanjung and Sidapaksa legend) as the object of ethnomathematics research, rather than visual cultural artifacts such as rituals or traditional games, constitutes the novelty of this study. The Sritanjung and Sidapaksa legend is a well-known Banyuwangi folklore that tells the story of Sritanjung, a woman renowned for her loyalty and honesty, and her husband Sidapaksa, a royal messenger. The legend narrates a conflict arising from false accusations against Sritanjung, leading to her unjust death. Her innocence is ultimately revealed when her blood emits a fragrant aroma, symbolizing purity and truth. This legend is deeply rooted in Banyuwangi cultural identity and conveys moral values such as faithfulness, integrity, and justice (Hariyono, 2006). Two important components of mathematical thinking, namely logical reasoning and quantitative measurement, serve as the main focus. This study offers a new perspective on the relationship between culture, literature, and mathematics, as these two elements are rarely discussed together in a narrative context. The legend not only promotes values of loyalty and honesty but also contains logical reasoning and quantitative measurement components that are relevant to mathematical concepts. Therefore, analyzing this legend is essential because it provides a concrete example of how local cultural values can serve as a bridge for understanding formal mathematical concepts. This highlights the importance of reinforcing mathematics learning that encompasses not only cognitive aspects but also affective and cultural aspects.

It is expected that this study will enrich the perspective of ethnomathematics and serve as an initial step toward incorporating local legends into more contextual and meaningful mathematics learning. It also supports the implementation of the Merdeka Curriculum, which emphasizes culturally based learning and local wisdom, contributes to the revitalization of Banyuwangi culture through contextual mathematics learning aligned with the Profil Pelajar Pancasila, provides culturally based mathematics teaching materials that are relevant to students' lives, and simultaneously enhances respect and appreciation for local culture (Handayani et al., 2022).

Several previous studies are relevant to this topic, including research by Nurjanah et al. (2024) who explored the ethnomathematics of the Keraton Tanjung Raya Belitang traditional house. In addition, Puspadewi and Wulandari (2018) conducted an analysis of ethnomathematics in Balinese weaving practices in relation to the teaching of plane geometry. Meanwhile, Abi (2017) examined the integration of ethnomathematics into school mathematics curricula. However, no study has specifically analyzed the Sritanjung legend of Banyuwangi from the perspective of logical reasoning and mathematical measurement. The Sritanjung and Sidapaksa legend was chosen because its narrative presents clear cause and effect relationships and journey descriptions that implicitly involve logical reasoning and quantitative measurement, making it a relevant source for ethnomathematics analysis.

This study differs from previous works because it examines ethnomathematical elements through folklore rather than physical cultural practices such as rituals or traditional games. Furthermore, the analytical focus is directed toward two fundamental aspects of mathematical thinking: logical reasoning and measurement, which are rarely discussed together in a narrative context. Thus, this research offers a new perspective on the application of ethnomathematics within cultural literacy. Based on this rationale, this study aims to analyze ethnomathematical elements in the Sritanjung and Sidapaksa legend, particularly those related to logical reasoning and quantitative measurement, and to describe how these elements can be applied in contextual mathematics learning. The results of this study are expected to contribute to the development of culturally based learning resources, enrich mathematics learning approaches, and foster students' character and pride in the cultural heritage of Banyuwangi.

Logical reasoning and quantitative measurement were chosen as the focus of this study because both abilities represent fundamental components of mathematical thinking that are closely related to students' problem-solving processes. The selection of logical reasoning and measurement topics is also based on a review of mathematics materials in grades 7 and 8 of junior high school. Logical reasoning enables students to analyze situations, draw conclusions, and justify solutions, while quantitative measurement involves comparing, estimating, and interpreting numerical relationships in meaningful contexts. In this study, logical reasoning refers to students' ability to identify relationships, make logical inferences, and interpret cause and effect patterns embedded in narrative situations. Quantitative measurement refers to the understanding and application of measurement concepts such as

length, distance, time, and quantity, which often appear implicitly in everyday and cultural contexts, including folklore narratives.

At the junior secondary school level, students' logical reasoning and quantitative measurement abilities are still developing and are often limited to procedural understanding. Many students struggle to connect mathematical concepts to real-life contexts, particularly when mathematical ideas are presented implicitly rather than in symbolic form. Therefore, contextual learning approaches, such as ethnomathematics-based instruction, are considered effective in supporting the development of these abilities

METHOD

This study uses a qualitative descriptive research design with an ethnographic approach. A qualitative approach was chosen because the purpose of this study is to analyze the ethnomathematical elements contained in the Sri Tanjung–Sidapaksa folk tale as a source of contextual mathematics learning. According to Creswell (Ishtiaq, 2019) qualitative research aims to understand the meaning constructed by individuals or groups regarding a phenomenon in depth, while the ethnographic approach is defined as the interpretation of a culture or social group system (Rohviana et al., 2024).

The main data source for this study was the text of the Sri Tanjung–Sidapaksa folk tale published by Hariyono (2006) in the book A Banyuwangi Cultural Dialogue. In addition, the researcher also used various supporting literature such as books, journal articles, and previous studies relevant to the themes of ethnomathematics, folk tales, and contextual learning. Data were collected through documentation and literature study techniques. The data collection process was carried out by reading, analyzing, and identifying elements of the story that related to mathematical concepts, especially in terms of logical reasoning and quantitative measurement (Mailani et al., 2024).

Data analysis was conducted descriptively and qualitatively by interpreting the findings based on D'Ambrosio's theory of ethnomathematics and Johnson's concept of contextual learning. The stages of analysis consisted of (1) data reduction, which involved selecting story segments relevant to mathematical concepts. This stage resulted in the selection of narrative segments from the Sritanjung and Sidapaksa legend that contain implicit mathematical ideas related to logical reasoning and quantitative measurement, while irrelevant parts of the story were excluded (Ritonga & Muhandhis, 2021); (2) data classification, which involved grouping the selected narrative segments based on the characteristics of the identified

mathematical concepts. This stage resulted in the organization of the data into two main categories, namely logical reasoning and quantitative measurement, to facilitate systematic analysis of the ethnomathematical elements contained in the Sritanjung and Sidapaksa legend (Kusumawati et al., 2022); (3) data interpretation, which involved explaining and constructing meaning from the classified data by linking the identified narrative segments with relevant mathematical concepts and cultural contexts. This stage resulted in an in-depth interpretation of how logical reasoning and quantitative measurement are implicitly embedded in the folklore narrative within an ethnomathematical framework (Mahanum, 2021); and (4) result verification, which involved confirming the credibility and consistency of the analytical findings through comparison with relevant ethnomathematics theories and previous studies. This stage resulted in the validation of the identified logical reasoning and quantitative measurement elements in the Sritanjung and Sidapaksa legend, thereby strengthening the trustworthiness of the research results (Sa'adah et al., 2020). The results of the analysis were then described narratively to demonstrate the relationship between cultural elements in the Sritanjung and Sidapaksa legend and mathematical concepts that can be integrated into mathematics learning in schools (Lestari & Asyhara, 2024).

RESULTS AND DISCUSSION

The legend of Sri Tanjung-Sidapaksa is one of Banyuwangi's folk tales that has been passed down from generation to generation, rich in moral and cultural values. This story tells of Sri Tanjung's loyalty to her husband, Sidapaksa, who was slandered by the king. Before she died, Sri Tanjung swore that if she was innocent, the river where she drowned herself would give off a fragrant aroma. After that, the river did indeed become fragrant, so the area became known as Banyuwangi, which means "fragrant water" (Hariyono, 2006).

This story conveys a moral message about loyalty and honesty. However, other interesting aspects can be explored. This story also contains elements of logical and quantitative thinking that can be studied from an ethnomathematics perspective. According to D'Ambrosio, ethnomathematics is the study of how a cultural group understands, expresses, and uses mathematical concepts in everyday life (Dewi et al., 2022).

Based on the analysis results, two main elements represent the concept of ethnomathematics in this legend, namely logical reasoning and quantitative measurement. These two elements describe the mathematical thinking of traditional societies and also have

great potential to be integrated into culture-based mathematics learning in schools, as presented in the Table 1.

Table 1. Analysis of Ethnomathematics Elements in the Legend of Sri Tanjung–Sidapaksa

Story Text Excerpt	Mathematical Elements	
	Reasoning	**Measurement**
"If I am pure, then the river water will become fragrant."	A cause-and-effect relationship that reflects implication logic (if-then). The community uses deductive thinking patterns in assessing the truth of an event.	Not directly apparent in this excerpt, but it shows a logical relationship that can be linked to an understanding of causality in comparison.
Sidapaksa traveled far for several days to carry out the king's task.	Shows a pattern of thinking about the sequence of events (cause → effect). It can be analyzed in the context of chronological logic.	Contains the concepts of distance, time, and speed measurement (can be used to calculate the average daily travel distance).
The river water became fragrant after Sri Tanjung's death.	Analogical reasoning between purity (moral value) and physical effect (fragrant water).	It does not contain numerical values, but can be used as a context for comparing the "before" and "after" concepts conceptually.
Sidapaksa's journey as depicted in a map or route.	Shows spatial logic (point-to-point movement).	Contains the concepts of distance, scale, and size comparison on a map.
Sri Tanjung remained steadfast in defending the truth, even though she was slandered	Moral deductive reasoning: truth → positive consequences.	Not directly related to measurement, but can be linked to the concept of value balance (moral–results).

1. Concept of Reasoning

The element of logical reasoning in this legend appears through the causal relationship between actions and their consequences. Sri Tanjung's oath "If I am pure, then the river will become fragrant" reflects a logical implication structure (If–Then), which is commonly used in mathematical logic (Siregar et al., 2024). In a deductive reasoning framework, the statement can be represented as:

If p = "Sri Tanjung is pure" and q = "the river becomes fragrant," then the implication is $p \rightarrow q$. This demonstrates that traditional society implicitly applied logical thinking when assessing truth and consequences in decision-making.

In the learning context, teachers can utilize this element by guiding students to analyze the narrative structure using mathematical statements. For example, students can be asked to rewrite plot events in if–then form and determine their truth values. Logical reasoning is a crucial competence in mathematics education, as it supports the development of critical thinking and problem-solving skills (Mashuri Anwas, 2025).

In addition to deductive reasoning, the legend also contains analogical reasoning. This is reflected when Sidapaksa seeks to prove Sri Tanjung's purity by comparing human behavior with a natural sign, namely the river's fragrance. This comparison illustrates analogical thinking, where conclusions are drawn by identifying similarities between two different situations. Teachers may use this example to train students in identifying relationships among events and forming conclusions based on real-life contexts.

Furthermore, the logical elements embedded in the Sritanjung and Sidapaksa legend reflect moral reasoning processes that are closely related to the development of students' character values, such as honesty, responsibility, and loyalty. The narrative presents clear cause and effect relationships and ethical consequences of the characters' actions, requiring readers to analyze situations, draw logical conclusions, and evaluate decisions based on moral considerations. These reasoning processes are parallel to the forms of logical thinking required in mathematical problem solving, where students must identify relationships, justify solutions, and assess the validity of conclusions. According to Udani (2025), learning that integrates moral values with logical reasoning can foster learners who are not only critical thinkers but also ethical individuals. In the context of ethnomathematics-based learning, folklore serves as a meaningful medium through which logical reasoning is developed alongside value formation. Thus, logical reasoning in the Sritanjung and Sidapaksa legend functions not only as a tool for cognitive development in mathematics learning but also as a means of strengthening moral and character education through reflective and contextual learning experiences.

2. Concept of Measurement

Elements of measurement and comparison appear in the narrative of Sidapaksa's journey, who must travel a long distance within a certain time to carry out the king's task. This description can be linked to the concepts of length, time, and speed measurement. In learning, teachers can invite students to estimate the duration of the trip, compare distances, or calculate travel time based on simple illustrations.

For example, the teacher presents the context: “Sidapaksa traveled 90 kilometers in three days. What was the average distance traveled each day?” Questions like this connect cultural stories with basic arithmetic and the concept of average speed. In addition, measurement can also be integrated with activities such as creating a map of Sidapaksa's journey using a specific scale. Students can learn to determine the actual distance based on map scale comparisons.

This activity not only hones calculation skills but also trains spatial abilities and basic geometric understanding. In the context of ethnomathematics, this demonstrates how abstract measurement concepts in formal mathematics can be interpreted through real cultural activities.

The integration of ethnomathematics from the Sri Tanjung legend into mathematics learning can be done through the Contextual Teaching and Learning (CTL) approach. CTL emphasizes the importance of linking academic concepts to students' real experiences. Through local legends, students learn mathematics in a context that is close to their own lives and culture (Finsensius Yesekiel Naja , Agustina Mei, 2023).

Some activities that can be developed include: (1) Logical Reasoning: students write down the sequence of events in the story in the form of logical sentences and determine their truth value; (2) Measurement and Comparison: students draw a map of Sidapaksa's journey using a specific scale and calculate the distance traveled or travel time; and (3) Mini Project: creating a map of the journey using a specific scale.

Through this activity, the process of learning mathematics can become more contextual and meaningful because students not only focus on numbers and formulas, but also understand concepts through stories that are close to their lives. This folk tale from Banyuwangi provides a relevant learning experience and builds a connection between local culture and the subject matter. By utilizing the story of Sri Tanjung, teachers can help students see that the concepts of logic, measurement, and comparison that they are learning are also alive in their own culture. This also fosters a sense of pride in the local wisdom of Banyuwangi and strengthens cultural identity in students' lives. In addition, teachers can link this learning to the instillation of character values such as honesty, responsibility, and hard work, which are reflected in the determination of the character Sri Tanjun. Thus, learning activities not only help students understand mathematical concepts concretely but also instill moral and social values that are important in everyday life.

These findings support previous studies indicating that cultural context can serve as an effective source of mathematics learning. Azizah and Wieka (2025) highlight that learning rooted in local culture enables students to construct mathematical understanding in a more meaningful and relatable way. In line with this view, Rosa and Orey (2011) emphasize that ethnomathematics functions as a bridge between local knowledge and formal academic mathematics by situating abstract concepts within familiar cultural experiences. In the context of this study, the Sri Tanjung–Sidapaksa legend demonstrates how narrative-based cultural knowledge can implicitly convey mathematical ideas, particularly logical reasoning and quantitative measurement. When such cultural narratives are integrated into mathematics instruction, students are encouraged to interpret situations, identify relationships, and connect mathematical concepts with real-life and cultural contexts. Consequently, the application of ethnomathematical elements in the Sri Tanjung legend not only supports the mastery of mathematical concepts but also contributes to character development and the preservation of local culture through culturally responsive and contextual learning.

By utilizing the elements of reasoning and measurement in the Sri Tanjung legend, mathematics learning can be a means to foster logical thinking skills, understand quantitative concepts in context, and instill the cultural values of Banyuwangi in students.

CONCLUSION

Based on the results of the study, the legend of Sri Tanjung and Sidapaksa contains strong ethnomathematical elements, especially in terms of logical reasoning and quantitative measurement. Logical reasoning is reflected in the cause-and-effect relationship in Sri Tanjung's oath, which resembles the structure of mathematical logic implications, while the concept of measurement appears in the description of Sidapaksa's journey, which can be associated with length, time, and comparison. These two elements show that mathematical thinking has long been present in the local culture of the Banyuwangi community. These findings confirm that folklore can be a source of contextual learning that not only strengthens the understanding of mathematical concepts but also instills character values and a love for local culture. The novelty of this research lies in the exploration of ethnomathematics elements through the medium of folklore, rather than through physical cultural practices as in previous studies. Therefore, further research is recommended to develop other local story-based learning media that can also highlight mathematical concepts and implement them in

the actual learning process so that their benefits can be felt practically in mathematics education in schools.

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