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TRANSFORMING MATHEMATICS EDUCATION IN INDIGENOUS COMMUNITIES OF INDONESIA: INTEGRATING ETHNOMATHEMATICS AND REDUCING STUDENTS' COGNITIVE LOAD

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Abstract: This study transforms mathematics education in indigenous communities by integrating ethnomathematics with modern teaching approaches. In this context, ethnomathematics connects mathematical concepts with Dayak culture, specifically through the Floating House (Huma Lanting), which reflects a local understanding of numeracy. The aim is to make mathematics learning more relevant to students' needs and easier for them to comprehend. Ethnomathematics links mathematical concepts with local cultural practices and indigenous knowledge, which can foster a deeper understanding of mathematics. However, the complexity of combining traditional knowledge with formal mathematics may increase the cognitive load on students, potentially hindering their learning process. This research employs a mixed-method approach to identify key strategies for effectively integrating ethnomathematics and reducing cognitive load. The methods used include the Worked Example, which provides concrete examples to ease comprehension difficulties; the Split-Attention Effect, which minimizes distractions by visually integrating information; and the Modality Effect, which uses a combination of visual and auditory modalities to enhance learning efficiency. The approach takes quantitative research, involving learning outcome tests, cognitive load assessments, and in-depth interviews. The research sample consists of 144 students who provide data for an in-depth analysis of the effectiveness of the applied strategies. The study's findings show that targeted teaching techniques can significantly reduce cognitive load, allowing students to engage more deeply with mathematical concepts and improve overall learning outcomes.

Keywords: mathematics education, indigenous communities, ethnomathematics, cognitive load, Introduction

Introduction

Research Background

Mathematics education in schools often faces challenges in making abstract concepts more meaningful and relevant to students. Teachers must explore students' existing knowledge and provide opportunities for them to discover and implement their own mathematical ideas. The mathematics learning required today is contextual learning using different methods. Contextual mathematics learning can utilise culture as a relevant and engaging learning resource (Ansori & Iskandar, 2023). This becomes more

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complex when applied in indigenous communities, which have cultural backgrounds and ways of thinking different from urban or modern contexts. One approach that can bridge this gap is ethnomathematics, which seeks to connect mathematical concepts with local culture. Ethnomathematics is an effort to explore and integrate cultural practices into mathematics education, making the concepts taught more contextual and aligned with students' everyday lives (Kurniawan et al., 2023).

Many studies linking education with ethnomathematics involve communities predominantly composed of Indigenous people. These communities often retain a language different from the national language (Lipka & Adams, 2004; Thornton & Watson-Verran, 1996) or consist of bilingual and immigrant students (Planas & Civil, 2009; Skovsmose, 2007). This research was conducted in a rural school, where Aboriginal language revitalization efforts are underway, and recognition of culture is increasingly emphasized. The main challenge lies not in mathematics itself but in mathematical thinking and how it can be implemented in teaching both inside and outside the classroom. In this context, the interaction between individuals involved and their relationship with the land they inhabit becomes crucial. For indigenous communities, the role and connection with indigenous leaders are central. Schools often react negatively to revived cultural approaches if they are seen as misaligned with the dominant school culture (Denis, 2007). Without specific policies accommodating the voices of Indigenous peoples and recognizing their knowledge and rights, progress in building sustainable education will be hindered (Owens, 2012).

The question is, are we talking about ethnomathematics or culturally responsive teaching (Castagno & Brayboy, 2008; Gay, 2002)? Rosa & Orey (2020) view ethnomathematics as distinct from culturally relevant teaching, but they also suggest that both can support equity in mathematics education. According to Gay (2002), ethnomathematics involves activities such as developing knowledge about cultural diversity, integrating ethnic and cultural diversity content into the curriculum, showing care, building learning communities, communicating with students from diverse ethnic backgrounds, and responding to ethnic diversity in teaching (Gay, 2002). Ethnomathematics, as a way of thinking mathematically within a community and integrating it into the school environment, can also serve as a means to achieve social justice (Gomes, 2006). However, critics of ethnomathematics tend to view it as an introduction to more formal mathematical concepts or merely as a cultural application of the mathematics taught in schools (Pais, 2011).

In Indonesia's indigenous communities, such as the Dayak people in Central Kalimantan, their cultural practices contain many mathematical concepts that are often overlooked. One example is the architecture of the Huma Lanting, a traditional floating house on a wooden raft. This house not only reflects the aesthetic aspects of culture but also contains mathematical concepts such as numbers, geometry, algebra, and data & uncertainty, which can be integrated into learning.

However, the effort to combine traditional knowledge with formal mathematics education is not without challenges. One major obstacle is the high cognitive load experienced by students when confronted with new, complex concepts. This cognitive load can hinder the learning process, making it difficult for students to understand and apply the concepts being taught (Gupta & Zheng, 2020). Therefore, there is a need for teaching strategies that can reduce students' cognitive load while maintaining the cultural relevance and contextual nature of mathematics learning.

This study identifies effective strategies for integrating ethnomathematics with modern teaching methods focused on reducing students' cognitive load in indigenous communities. Several proposed strategies, such as the Worked Example, Split-Attention Effect, and Modality Effect, are expected to help students better understand mathematical concepts in a more accessible and efficient way (Gupta & Zheng, 2020). Through the integration of ethnomathematics and the application of these strategies, students are expected to be more engaged in the learning process while improving learning outcomes and reducing their overall cognitive load. This research is important in the context of education in Indonesia, particularly for indigenous communities that require more inclusive and culturally adaptive teaching approaches. Thus, mathematics learning not only becomes a tool for developing students' cognitive abilities but also serves as a means to preserve local culture and strengthen community identity.

Theoretical Perspectives

Ethnomathematics

D'Ambrosio (2001) defines ethnomathematics as the mathematics practiced within specific cultural groups, encompassing the mathematical concepts and techniques developed across various cultures to solve everyday life problems. Ethnomathematics represents a way of thinking, understanding, and applying mathematical techniques integrated into the culture of a community. The term "ethno" refers to identifiable groups of people and is not necessarily tied to local societies or linguistic identification.

In the context of education, the ethnomathematical approach integrates mathematical concepts and practices derived from students' cultural backgrounds with conventional formal academic mathematics (Mohr-Schroeder et al., 2015; Orey & Rosa, 2010). Ethnomathematics-based learning allows students to use mathematical experiences from their own culture and others to understand how mathematical ideas are formulated and applied (Rosa et al., 2016). This approach also aims to address various factors influencing the learning process by introducing conventional mathematics in a way that is easier to grasp, so that its power, beauty, and usefulness are more appreciated. The relationship between formal mathematics and familiar cultural practices becomes clearer (Achor et al., 2009a). Through ethnomathematics, students better understand how mathematics is applied in everyday life, which in turn enhances their ability to build meaningful mathematical connections and deepens their understanding of all forms of mathematics (Begg, 2001). Ultimately, this approach bridges the gap between formal mathematics and local culture, making mathematics learning more relevant and contextual.

Ethnomathematics can enrich the mathematics curriculum in several ways: 1) helping students understand abstract mathematical concepts (Owens, 2014), 2) increasing student engagement (Verner et al., 2013), 3) improving motivation and positive attitudes toward mathematics (Shirley, 2001), 4) developing visuospatial reasoning skills (Owens, 2014), 5) strengthening problem-solving skills (Amit & Abu Qouder, 2017), and 6) encouraging creativity (D'Ambrosio & D'Ambrosio, 2013; Massarwe et al., 2012). The cultural context in ethnomathematical activities enables mathematics teachers to enrich students' knowledge of their own and other cultures (d'Ambrosio, 2001; Presmeg, 1998), support the formation of their cultural identity (Rosa & Orey, 2010; Verner et al., 2013), and promote multicultural awareness and openness (Gerdes, 2010). On the other hand, the effectiveness of ethnomathematics-based learning depends on the chosen teaching strategies (Achor et al., 2009).

(Pais, 2011) examined the literature on the shortcomings of integrating ethnomathematical activities into the school mathematics curriculum. He noted criticisms of the tendency to view ethnomathematics as a ready-to-use educational tool or as a substitute for mathematics learning through exposure to the mathematical practices of specific ethnic groups. Pais also emphasized the need for deeper theoretical discussions on the educational implications of ethnomathematics. In this regard, it is essential for educators to strike a balance between teaching formal mathematical concepts and utilizing cultural contexts to make learning more meaningful and effective. Marsigit (2016) states that concrete things related to students' everyday experiences can serve as interesting learning resources. One aspect that can be developed for innovative learning is the local culture.

Huma Lanting

According to Dalidjo (2020), the Dayak people have a unique heritage of floating houses called huma lanting, traditionally passed down through generations along the banks of the Barito River. A huma lanting is a wooden house that floats or drifts (without a foundation or stilts). The house is designed like a stilt house, supported by logs or bamboo tied together like a raft, which also serves as the house's floor. These houses are typically built by the Dayak Bakumpai community in the provinces of Central Kalimantan and South Kalimantan, Indonesia.

Figure 1: Huma Lanting

The huma lanting have existed since ancient times, with many being found along the banks of the Barito River as early as 1972. According to (Karlina et al., 2022), the existence of lanting houses represents an adaptation to environmental conditions. Additionally, this area lacks access to piped water (PAM) or other water sources, so the community relies on the Barito River for their water needs. The lanting houses also facilitate the community's activities, which often take place in the river area.

As noted by (Abriazizu et al., 2023), constructing a lanting house requires several materials, including: 1) red meranti wood, which serves as the structural support for the lanting house; 2) zinc, known locally as mol tirup; 3) plywood or calcium board, referred to locally as kasibut; 4) ropes, nails, bolts, and other materials. From these materials, it is evident that: 1) Most of the materials used to construct lanting houses are lightweight; 2) The lanting houses float on the river water, necessitating the use of materials that are not heavy; 3) The primary material used is red meranti wood. The choice of materials for lanting houses is influenced by environmental conditions, as lightweight materials are essential for ensuring that a lanting house floats well. In this context, the use of red meranti wood remains the primary choice due to its lightweight and durable characteristics.

Cognitive Load Theory

Cognitive Load Theory (CLT) is a theory developed to understand how cognitive load can affect learning (Sweller, 2010). CLT is based on knowledge of human cognitive architecture, particularly the limitations of working memory capacity and duration (Sweller, 2011). Working memory has a very limited capacity, making cognitive load management essential in instructional design to ensure information can be processed and stored effectively in long-term memory (Kirschner et al., 2018). There are three types of cognitive load: 1) Intrinsic Load: This load is related to the complexity of the material being learned and is an inherent characteristic of the task itself (Sweller, 2010). In the context of mathematics learning, intrinsic load can be influenced by the difficulty level of the mathematical concepts being taught. 2) Extraneous Load: This load arises from how information or material is presented (Sweller, 2011). Inefficient or unclear instructions can increase extraneous load, hindering the learning process. Poorly designed materials or unnecessary distractions are examples of high extraneous load. 3) Germane Load: This load pertains to the cognitive effort that directly contributes to learning and schema development. Germane load is a desirable load because it supports the understanding and integration of new information into existing cognitive structures (Kirschner et al., 2018).

Cognitive Load Theory offers an effective approach to optimize the learning process by minimizing unnecessary cognitive load and maximizing the efficiency of working memory use (Sweller, 2010). Several strategies can be employed to enhance mathematics learning, including Worked Example, Split-Attention, and Modality. The Worked Example Effect is a strategy that can be utilized in mathematics learning, effectively minimizing extraneous cognitive load and assisting students with limited initial abilities (Irwansyah & Retnowati, 2019; Sweller, 2011). This strategy facilitates students' knowledge construction by providing detailed, sequential steps from the beginning to the solution of a given problem. The order of these steps greatly helps students concentrate and focus on understanding the concepts being taught.

Split-Attention Effect refers to presenting material by providing two related pieces of information separately. This effect should be avoided by teachers when delivering material, especially in mathematics, as avoiding this effect has been shown to reduce extraneous cognitive load (Sweller, 1999). Lastly, the Modality Effect suggests that when confronted with two sources of difficult-to-understand information presented separately, they can be delivered in different modalities. One source can be presented visually, while the other can be presented auditorily. Dual-modality presentation should enhance effective working memory and thus reduce external cognitive load (Sweller, 2011).

Consequently, the modality effect is often applied when presenting materials using multimedia, as multimedia relates to visualization and auditory input.

Applying Cognitive Load Theory in mathematics learning can enhance the effectiveness of instruction by optimally managing students' cognitive load (Paas & Sweller, 2012). By understanding and managing the three types of cognitive load—intrinsic, extraneous, and germane—educators can design instruction that not only facilitates understanding but also supports the development of students' cognitive abilities. This approach will assist students in solving complex mathematical problems. By integrating this theory into teaching practices, teachers can help students better and more efficiently understand mathematical concepts, allowing them to develop deeper skills and understanding.

Materials and Methods

This research adopts a quantitative approach, integrating learning outcome assessments, in-depth interviews, and cognitive load evaluations. A total of 114 students from the Dayak Bakumpai indigenous community in Indonesia participated in the study. The experimental group consisted of 72 students who received learning through ethnomathematics by applying three key strategies: Worked Example, Split-Attention, and Modality. Meanwhile, 72 students in the control group followed conventional learning (teacher instruction methods) without using these strategies.

All learning materials were based on the local context of ethnomathematics, particularly by integrating the traditional practice of huma lanting. The taught materials covered the domain of numbers, with the subdomain of sequences and series, which was divided into five subtopics: arithmetic sequences, arithmetic series, geometric sequences, geometric series, and infinite geometric series.

The learning process consisted of five sessions:
Session 1: Arithmetic Sequences
Session 2: Arithmetic Series
Session 3: Geometric Sequences
Session 4: Geometric Series
Session 5: Infinite Geometric Series

At the end of the learning period, both groups underwent a learning outcome test (scores ranging from 0 to 100) and a cognitive load test (on a scale of 1 to 9, from very easy to very difficult). The data were analyzed descriptively and inferentially. Additionally, interviews were conducted to gather students' experiences during the learning process. This methodology ensures a thorough investigation of the impact of ethnomathematics by applying the three key strategies and its cognitive load implications.

Mathematics education in the context of indigenous communities in Indonesia, particularly among the Dayak people, requires a more relevant and contextual approach. In this regard, the integration of ethnomathematics becomes key to creating a more meaningful learning experience for students. Ethnomathematics connects mathematical concepts with local cultural practices, allowing students to understand and apply mathematics through contexts they are familiar with. For instance, the Huma Lanting, as part of Dayak culture, reflects not only architectural aspects but also encompasses an understanding of numeracy. In this study, ethnomathematics is applied to explore numeracy aspects in the domains of numbers with the subdomain of sequences and series.

Arithmetic Sequences

The number of pillars in huma lanting houses is usually odd. According to local beliefs, an odd number of pillars is intended to ward off misfortune and bring good luck. If observed, the pattern of odd-numbered pillars forms an arithmetic sequence with a constant difference of two.

Arithmetic Series

The people living in huma lanting settlements are accustomed to the rising and falling of the river's water level, which affects their daily activities. When the river level rises, they pull the ropes that have been installed to adjust the position of their houses. Conversely, when the water recedes, they loosen the ropes. The total length of rope pulled or loosened in multiple stages forms an arithmetic series.

Geometric Sequences

The layers of support that allow huma lanting houses to float on water are arranged in a tiered manner with specific measurements. This arrangement follows a pattern that forms a geometric sequence, where the size or number of support layers follows a fixed ratio from the base to the top of the house.

Geometric Series

The rising of floodwaters due to river overflow often occurs in stages, with each level of increase following a particular pattern over time. If observed, the pattern of rising water levels can be represented as a geometric series, where each successive increase has a fixed ratio compared to the previous one.

Infinite Geometric Series

When large boats pass through the river, the waves they create cause huma lanting houses to sway until they eventually come to a stop. The decreasing movement of the houses follows the concept of an infinite geometric series, where each wave's amplitude diminishes according to a fixed ratio until it approaches zero.

Results and Discussion

Learning Outcomes

The assessment of learning outcomes is based on test scores at the end of the learning process. The results of descriptive analysis indicate that the learning outcomes in the ethnomathematics-based learning group that applied three specific strategies (mean = 81.88, standard deviation = 70.83) compared to students in the group without treatment (mean = 55.00, standard deviation = 17.72). The results of inferential analysis indicate a significant difference between ethnomathematics-based learning with three specific strategies compared to the group without treatment (F-value = 9.21, p-value = 0.0028). The significance value obtained is 0.00285, where $p < 0.05$, thus H0 is rejected. Therefore, the effectiveness of ethnomathematics-based learning and the application of several key strategies is higher compared to the group without treatment in terms of learning outcomes.

Cognitive Load

The assessment of cognitive load is based on the results of a Likert scale questionnaire at the end of the learning process. The results of descriptive analysis indicate that the ethnomathematics-based learning group applying three specific strategies experienced a lower cognitive load (mean = 3.76, standard deviation = 1.25) compared to students in the group without treatment (mean = 6.71, standard deviation = 1.16). The results of inferential analysis indicate a significant difference between ethnomathematics-based learning with three specific strategies compared to the group without treatment (F-value = 43.158, p-value = 0.00000000562). The significance value obtained is 0.00000000562, where $p < 0.05$, thus H0 is rejected. Therefore, the effectiveness of ethnomathematics-based learning and the application of several key strategies is better compared to the group without treatment in terms of cognitive load.

Student Experience

Based on interviews conducted with students in the experimental and control classes, various responses were obtained regarding their experiences in numeracy learning. The interview results showed significant differences between the two classes, particularly in terms of material understanding and learning comfort.

In the experimental class, which used the ethnomathematics approach along with three key strategies—worked example, split attention, and modality—most students stated that the learning was more engaging and easier to understand. They expressed that through ethnomathematics, mathematical concepts became more relevant as they were linked to culture and everyday life. For example, some students mentioned that the mathematical concepts explained through "huma lanting" made abstract concepts more tangible in their minds. This approach helped them understand that mathematics is inseparable from the life and culture they know.

Moreover, the worked example strategy also had a positive impact. Many students felt more confident in solving problems after being given detailed and systematic examples. They explained that by seeing examples solved step by step, they could better understand the problem-solving process without feeling burdened to try it on their own from the beginning. Students admitted that this method reduced confusion and fear when tackling problems. Furthermore, the split attention strategy proved very helpful in reducing students' cognitive load. The information presented without separation, both visually and verbally, allowed students to focus on one type of information at a time. Some students explained that, in their previous experiences, information presented separately made it difficult for them to concentrate. With the integration of this information, they felt more comfortable and less likely to lose focus. The modality strategy was also recognized as effective by students with different learning styles. Students who tended to be visual felt very supported by the presence of clear illustrations and diagrams, while auditory students expressed that verbal explanations accompanied by images made it easier for them to understand the material. The use of various modalities in learning created a more dynamic and enjoyable learning atmosphere.

On the other hand, students in the control class, who did not use specific approaches and strategies, showed different results in the interviews. Some students stated that numeracy learning felt difficult to understand, especially because the material was delivered conventionally and was less engaging and not related to their everyday lives. They felt that number patterns were an abstract concept that was hard to grasp without relevant examples tied to their experiences. Students in the control class also expressed that they often felt confused when trying to solve problems because they were not provided with step-by-step examples like those in the experimental class. They had to attempt to solve problems independently without clear guidance, leading some students to feel frustrated when facing more challenging problems. Additionally, the separation between visual and verbal information also posed a barrier. Students reported that when information was not presented simultaneously, they struggled to focus, resulting in decreased understanding of the material. Finally, students in the control class also mentioned that the more conventional teaching methods felt monotonous because they only focused on text and verbal explanations without variations in modality. This caused some students to feel bored and less engaged in the learning process.

The results of these interviews indicate that students in the experimental class, who were taught using the ethnomathematics approach and the strategies of worked example, split attention, and modality, tended to find numeracy easier to understand and felt more comfortable in the learning process. In contrast, students in the control class faced more difficulties in understanding the material and solving problems. The innovative, culture-based approach, combined with teaching strategies focused on reducing cognitive load, proved to have a positive impact on learning.

Discussion

The integration of ethnomathematics in mathematics learning is an innovative and relevant approach to connecting mathematical concepts with local cultural contexts. In indigenous communities in Indonesia, such as the Dayak tribe in Kalimantan, various cultural elements are used as teaching media to explain mathematical concepts that were previously considered abstract by students. For instance, the Huma Lanting involves concepts of numeracy. The application of ethnomathematics provides a bridge between the mathematical theories taught in schools and the everyday practices familiar to students, helping them construct a deeper and more relevant understanding of mathematics lessons.

The ethnomathematics approach enables students to see mathematics as an integral part of their lives, rather than merely an isolated academic subject. For example, geometric concepts can be viewed through the shapes of the roofs of Huma Lanting, which directly embody mathematical values such as symmetry, patterns, and measurements. Additionally, ethnomathematics encourages the development of critical thinking and problem-solving skills by linking local cultural experiences with mathematical problem-solving. In this way, students become more engaged in the learning process because they can identify the connections between what they learn and what they see and do in their everyday lives.

However, despite the numerous benefits of integrating ethnomathematics, its implementation also presents challenges, particularly concerning students' cognitive load. Cognitive load refers to the amount of mental effort required by students to process new information during learning. Students who are not accustomed to complex material, such as the application of formal mathematical concepts within their cultural context, may experience increased cognitive load, which can impact their learning performance.

To address this, teaching strategies that focus on reducing cognitive load are needed so that students can maximize their learning potential. One proven effective strategy is the use of Worked Examples, where students are given step-by-step examples to solve mathematical problems. This technique helps reduce cognitive load by eliminating the need for students to independently find solutions during the initial stages of learning. Worked examples can be created by linking mathematical problems with local cultural elements, such as measuring the length of wood in constructing traditional Dayak houses, which helps students understand how to apply mathematical concepts in their daily lives.

Research literature supports the use of worked examples alongside incorrect examples (Siegler, 2002). Incorrect examples are clearly marked as incorrect and often present common errors. Studies exploring the use of incorrect examples have found that students benefit from this experience (Adams et al., 2014; Booth et al., 2013; Durkin & Rittle-Johnson, 2012). In fact, increasing literature cites the benefits of learning from mistakes (Metcalfe, 2017). For example, (Booth et al., 2013) suggested that studying incorrect examples enhances students' feature coding in algebraic equations. Proper coding is the process of paying attention to the important features of a problem and processing them in an understandable way (Barbieri et al., 2019). Studies have found that proper coding is a predictor of students' problem-solving abilities (Alibali et al., 2009; Rittle-Johnson & Alibali, 1999). Learning from incorrect examples can help students focus on key features that lead to mistakes, allowing them to correct this erroneous knowledge and refine their problem-solving strategies (Ohlsson, 1996). Ultimately, the use of incorrect examples helps students accept that wrong strategies are inappropriate and reduces the likelihood of making the same mistakes again (Siegler, 2002).

Finally, worked examples have been shown to improve conceptual and procedural knowledge in mathematics. (Booth et al., 2015) found that students who studied algebra worked examples and answered self-explanation questions scored higher on procedural knowledge assessments compared to those who solved traditional algebra problems independently. Additionally, students with low prior knowledge performed significantly better in conceptual understanding assessments when they studied algebra worked examples and answered self-explanation questions compared to those who solved problems on their own.

Other techniques, such as the Split-Attention Effect and Modality Effect, can also be employed to reduce cognitive interference by providing information in a structured and multimodal manner.

Often when the split-attention effect occurs, it is assumed that this effect is caused by the "split attention" on spatially separated information. However, the underlying mechanisms of the split-attention effect are rarely directly tested. A general explanation for the split-attention effect is provided by Cognitive Load Theory (CLT) (Sweller et al., 2011), which states that learning decreases due to increased cognitive load triggered by spatial separation (Paas & Sweller, 2014). The need to seek interrelated elements in textual and pictorial information while keeping relevant information active in working memory to mentally connect appropriate information has been seen as adding extrinsic cognitive load.

Since working memory has limited capacity and duration (Baddeley, 2000, this reduces the working memory resources available for processes relevant to learning, such as schema construction, elaboration, and automation in long-term memory (Sweller, 1994). As a result, learning is hindered. However, for integrated sources of information, the load on working memory is more limited because the sources of information can be visually compared directly.

Thus, although the application of ethnomathematics can enhance students' understanding and engagement in mathematics learning, special attention must be given to managing cognitive load. The implementation of structured teaching techniques oriented toward reducing cognitive load is an important step to ensure students can optimally absorb material without feeling overwhelmed.

Conclusion

The application of ethnomathematics in mathematics learning within indigenous communities in Indonesia has proven to have a positive impact on improving learning outcomes. The integration of local cultural elements with formal mathematical concepts makes learning more relevant and meaningful for students. They can relate the subject matter to their daily lives and understand that mathematics is an inseparable part of their culture and life experiences. However, a major challenge in implementing ethnomathematics is managing students' cognitive load, especially when the mathematical concepts taught are too complex or distant from students' experiences. To overcome this, carefully designed learning strategies are needed, such as the application of worked examples, which have been shown to reduce cognitive load and improve students' understanding of the subject matter. By using teaching techniques focused on reducing cognitive load, the positive impact of ethnomathematics can be maximized, allowing students to achieve a deeper understanding of mathematical concepts. Therefore, the integration of ethnomathematics combined with cognitive load theory-based teaching strategies can result in a more effective and meaningful learning experience for students, particularly in the context of indigenous communities in Indonesia.

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