

EXPLORING NIAS LOCAL WISDOM THROUGH AN ETHNOSCIENCE APPROACH AS A SCIENCE LEARNING RESOURCE IN SCHOOLS

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Abstract

This study explores the potential of Nias local wisdom as a science learning resource through an ethnosience approach in school education. The research aims to identify forms of local knowledge embedded in Nias cultural practices and analyze their relevance to scientific concepts for integration into science learning. A qualitative ethnographic method was employed, involving in-depth interviews, participant observation, and document analysis in selected communities in South Nias, Indonesia. The findings reveal that Nias local wisdom, such as *Hombo Batu* (stone jumping), traditional house construction (*Omo Hada*), and indigenous environmental management practices, contains implicit scientific concepts related to physics, biology, and environmental science. These cultural elements can be systematically transformed into contextual science learning resources that enhance students' understanding and engagement. The ethnosience approach bridges the gap between students' cultural background and formal scientific knowledge, making learning more meaningful and relevant. The study also shows that integrating local wisdom into science education supports students' scientific literacy, critical thinking, and cultural identity. However, challenges such as limited instructional materials and teacher readiness remain in implementing ethnosience-based learning. Overall, this study concludes that Nias local wisdom has strong potential to enrich science education in schools when appropriately integrated through an ethnosience framework.

Keywords: *Ethnosience; Local Wisdom; Nias Culture; Science Education; Contextual Learning; Scientific Literacy*

A. Introduction

Science education in the 21st century is expected not only to develop students' conceptual understanding but also to foster scientific literacy, critical thinking, and contextual awareness. However, many science learning practices in schools still emphasize abstract concepts that are disconnected from students' real-life experiences and cultural backgrounds.

This condition contributes to low levels of scientific literacy, as reflected in international assessments such as PISA. One promising approach to address this issue is the integration of local wisdom into science learning through an ethnosience perspective.

Ethnosience refers to the transformation and integration of indigenous or local knowledge systems



into formal scientific knowledge. It bridges the gap between scientific concepts and the cultural context of learners, making learning more meaningful and relevant. In science education, ethnoscience enables students to understand scientific phenomena through familiar cultural practices, beliefs, and local experiences. Research indicates that ethnoscience-based learning can enhance students' understanding of concepts, critical thinking skills, and scientific attitudes by connecting modern science with traditional knowledge systems (Hamna, et al 2024). Furthermore, ethnoscience has been widely recognized as an effective approach to improve scientific literacy and 21st-century skills in various educational contexts (Nur Hikmah, et al 2025).

The integration of local wisdom into science education is also aligned with global educational goals, particularly Sustainable Development Goal 4 (Quality Education), which emphasizes inclusive and culturally relevant learning. Local wisdom provides contextual knowledge that helps students understand environmental sustainability, social values, and human interaction with nature. Studies show that incorporating local wisdom into science learning can make scientific concepts more meaningful, contextual, and easier to understand, while also strengthening students' cultural identity. In addition, culturally responsive teaching approaches that

integrate local knowledge have been proven to significantly improve students' scientific literacy compared to conventional teaching methods (Rosyidah, F., et al 2025).

Indonesia, as a multicultural country, has abundant local wisdom that can be utilized as a learning resource in science education. One of the regions rich in cultural heritage is Nias, particularly South Nias. The local wisdom of Nias includes traditional practices, myths, ecological knowledge, and cultural activities such as Hombo Batu (stone jumping), traditional architecture, and environmental management systems. These cultural elements contain implicit scientific knowledge related to physics, biology, and environmental science. For example, traditional beliefs and myths about natural phenomena in Nias reflect early forms of scientific reasoning and can be used as entry points for teaching scientific concepts. A study by (Harefa, D., 2025) found that Nias myths contain explanations of natural phenomena that can support the development of scientific argumentation and reasoning skills among students.

Previous studies have highlighted the effectiveness of integrating local wisdom into science education. (Parmin et al. 2017) found that ethnoscience-based learning significantly improves students' conceptual understanding and scientific attitudes. Similarly, (Suryawati et al. 2020) reported that incorporating local cultural



contexts into science instruction enhances students' critical thinking and problem-solving skills. In the Indonesian context, research by Harefa (2024) revealed that Nias local wisdom contains educational values and environmental insights that can support science learning. These findings suggest that local wisdom is not only culturally significant but also pedagogically valuable.

In addition, the local wisdom of South Nias also reflects environmental conservation values, such as sustainable agricultural practices and natural resource management. These practices are highly relevant to science topics, particularly in environmental education. Integrating such local wisdom into the science curriculum can enhance students' understanding of ecological concepts while fostering environmental awareness and responsibility. Research shows that incorporating Nias local wisdom into science learning can support the development of conservation-based curricula and improve students' attitudes toward sustainability (Harefa, D., 2024).

Despite its potential, the integration of Nias local wisdom into science learning remains limited. Many teachers still rely on conventional teaching methods and standardized textbooks that do not reflect local cultural contexts. As a result, students may find it difficult to relate scientific concepts to their daily lives. Previous studies also highlight challenges such as limited teaching resources, lack of

teacher training, and insufficient instructional models for integrating local wisdom into science education. Therefore, there is a need for systematic exploration and development of ethnosience-based learning resources that utilize Nias local wisdom.

This study aims to explore the potential of Nias local wisdom as a science learning resource through an ethnosience approach. By identifying and analyzing cultural practices, traditional knowledge, and local values in Nias, this research seeks to provide a framework for integrating ethnosience into science education. The findings of this study are expected to contribute to the development of contextual and culturally relevant science learning, enhance students' scientific literacy, and support the preservation of local cultural heritage. This study aims to explore Nias local wisdom through an ethnosience approach as a science learning resource in schools. Specifically, it seeks to identify forms of local knowledge embedded in Nias culture, analyze their relevance to scientific concepts, and propose strategies for integrating them into science learning. The findings of this study are expected to contribute to the development of contextual and culturally responsive science education, enhance students' scientific literacy, and support the preservation of local wisdom.

In conclusion, the ethnosience approach offers a strategic pathway to



bridge the gap between scientific knowledge and cultural context in science education. The rich local wisdom of Nias presents a valuable opportunity to develop meaningful and contextual science learning resources. Therefore, exploring and integrating Nias local wisdom into science education is not only important for improving learning outcomes but also for preserving cultural identity and promoting sustainable development. In conclusion, integrating ethnoscience into science education offers a meaningful way to bridge the gap between scientific knowledge and students' cultural contexts. Nias local wisdom provides a valuable and underutilized resource that can enrich science learning. Therefore, exploring and integrating this local knowledge into educational practice is essential not only for improving the quality of science education but also for promoting cultural sustainability and identity.

B. Methodology

This study employed a qualitative research design with an ethnographic approach, aiming to explore and document Nias local wisdom and analyze its potential as a science learning resource through an ethnoscience perspective. Qualitative ethnographic methods are particularly suitable for examining cultural practices, beliefs, and indigenous knowledge systems within their natural contexts (Creswell & Poth, 2018). This approach allows researchers to capture

the meaning, values, and implicit scientific concepts embedded in local traditions, which are essential for ethnoscience-based educational development.

1. Research Setting and Participants

The study was conducted in South Nias, Indonesia, a region known for its rich cultural heritage and strong preservation of local traditions. The research sites included selected villages that actively maintain traditional practices such as *Hombo Batu* (stone jumping), traditional house construction, and community-based environmental management. Participants were selected using purposive sampling, which is appropriate for qualitative research focusing on information-rich cases (Patton, 2015).

The participants consisted of:

- a. Local cultural practitioners and community elders who possess deep knowledge of Nias traditions,
- b. Science teachers at junior secondary schools, and
- c. Students who are engaged in science learning.

This combination of participants enabled triangulation of perspectives from cultural, educational, and learner viewpoints.

2. Data Collection Techniques

Data were collected through multiple techniques to ensure depth and validity:

a. In-depth Interviews



Semi-structured interviews were conducted with cultural experts, teachers, and community leaders to explore local wisdom, beliefs, and practices. The interviews focused on identifying cultural elements that contain implicit scientific concepts. According to Kvale (2007), semi-structured interviews allow flexibility while maintaining a focused exploration of research topics.

b. Participant Observation

The researcher conducted direct observations of cultural activities such as *Hombo Batu*, traditional ceremonies, and daily practices. Observation is a key method in ethnographic research, enabling researchers to understand behaviors and contexts in real-life settings (Spradley, 1980).

c. Document Analysis

Relevant documents, including local manuscripts, educational materials, and previous research studies, were analyzed to support data from interviews and observations. Document analysis helps provide contextual and historical insights into local knowledge systems.

d. Focus Group Discussions (FGD)

FGDs were conducted with science teachers to discuss the potential integration of local wisdom into science learning. This method encourages collaborative reflection and idea generation among participants.

3. Data Analysis

Data analysis followed the interactive model of Miles, Huberman,

and Saldaña (2014), which includes three main steps: data condensation, data display, and conclusion drawing/verification. First, raw data from interviews, observations, and documents were transcribed and coded to identify key themes related to local wisdom and scientific concepts. Second, categorized data were organized into thematic matrices to facilitate interpretation. Finally, conclusions were drawn by linking cultural practices with relevant scientific principles. In addition, the study applied an ethnoscience analysis framework, which involves transforming indigenous knowledge into formal scientific concepts (Aikenhead, 2006). For example, cultural practices such as *Hombo Batu* were analyzed in terms of physics concepts like force, motion, and energy, while traditional ecological practices were linked to environmental science concepts.

4. Validity and Reliability

To ensure the trustworthiness of the data, the study employed several validation strategies:

- a. Triangulation:** Data were collected from multiple sources (interviews, observations, documents) to ensure consistency.
- b. Member Checking:** Participants were asked to verify the accuracy of the findings and interpretations.
- c. Peer Debriefing:** Discussions with fellow researchers were conducted to minimize bias and enhance analytical rigor.



These strategies are widely recommended in qualitative research to enhance credibility and dependability (Lincoln & Guba to Harefa, D. 2025).

5. Ethical Considerations

Ethical approval was obtained prior to data collection. Participants were informed about the purpose of the study and their rights, including confidentiality and voluntary participation. Cultural sensitivity was maintained throughout the research process, particularly when documenting indigenous knowledge and practices.

6. Relevance to Ethnoscience-Based Learning

The methodological framework of this study is grounded in previous research highlighting the effectiveness of ethnoscience in science education. Studies by Parmin et al. (2017) and Suryawati et al. (2020) demonstrate that integrating local wisdom into science learning improves students' scientific literacy and engagement. By adopting an ethnographic and ethnoscience approach, this study not only documents local knowledge but also systematically transforms it into educational resources that can be implemented in school settings.

C. Results and Discussion

1. Identification of Nias Local Wisdom and Its Scientific Relevance

The findings of this study reveal that Nias local wisdom contains rich and diverse knowledge systems that are closely related to scientific concepts.

Through interviews, observations, and document analysis, several forms of local wisdom were identified, including *Hombo Batu* (stone jumping), traditional house construction (*Omo Hada*), and community-based environmental practices.

Hombo Batu, a well-known cultural practice in South Nias, was found to reflect fundamental physics concepts such as force, motion, energy, and momentum. Participants explained that successful execution of the jump requires not only physical strength but also precise calculation of speed, angle, and timing. From an ethnoscience perspective, this practice can be transformed into a contextual learning resource to teach mechanics in physics. This finding aligns with previous research indicating that local cultural practices often embed implicit scientific knowledge that can support conceptual understanding (Parmin et al., 2017).

Similarly, traditional Nias houses (*Omo Hada*) demonstrate sophisticated indigenous knowledge related to structural engineering and environmental adaptation. The houses are built using earthquake-resistant techniques, relying on flexible wooden structures and specific joint systems. These features reflect scientific principles such as force distribution, equilibrium, and material elasticity. This finding supports the argument that indigenous architecture contains valuable scientific insights that



can be integrated into science education (Suryawati et al., 2020).

In addition, local environmental practices in Nias, such as sustainable farming and natural resource management, were found to embody ecological knowledge. Community members demonstrated an understanding of soil fertility, seasonal cycles, and biodiversity conservation. These practices are highly relevant to environmental science topics and can be used to teach sustainability concepts in schools.

2. Transformation of Local Wisdom into Ethnoscience-Based Learning Resources

The second major finding concerns the transformation of local wisdom into science learning resources through an ethnoscience approach. The data analysis shows that local knowledge can be systematically mapped to scientific concepts and incorporated into teaching materials such as lesson plans, student worksheets, and contextual problem scenarios.

For example, *Hombo Batu* can be used as a contextual problem in physics lessons, where students analyze the motion of a jumper using equations of kinematics and dynamics. Similarly, the structure of *Omo Hada* can be used to introduce concepts of force, balance, and engineering design. Environmental practices can be integrated into lessons on ecosystems and sustainability.

This transformation process involves three stages: (1) identification of local

knowledge, (2) scientific interpretation, and (3) pedagogical integration. This approach is consistent with the ethnoscience framework proposed by Glen Aikenhead, which emphasizes the translation of indigenous knowledge into formal scientific understanding.

Furthermore, teachers who participated in the focus group discussions expressed positive attitudes toward the integration of local wisdom into science learning. They reported that ethnoscience-based materials can make lessons more engaging, meaningful, and easier for students to understand. However, they also highlighted the need for structured guidelines and training to effectively implement this approach.

3. Impact on Students' Learning Engagement and Understanding

The findings also indicate that the use of ethnoscience-based learning resources has the potential to improve students' engagement and conceptual understanding. Students who were exposed to contextual examples based on local culture showed higher interest and participation in science lessons. They were able to relate scientific concepts to their daily experiences, which facilitated deeper understanding.

This result is supported by previous studies showing that culturally relevant teaching enhances students' motivation and learning outcomes. For instance, Suryawati et al. (2020) found that ethnoscience-based learning significantly



improves students' scientific literacy. Similarly, Parmin et al. (2017) reported that integrating local wisdom into science instruction enhances students' critical thinking and scientific attitudes.

In addition, the integration of Nias local wisdom was found to strengthen students' cultural identity and appreciation of their heritage. This aligns with the perspective of William Cobern, who argues that science education should respect and incorporate students' cultural worldviews to be more effective.

4. Challenges in Implementation

Despite its potential, the study identified several challenges in implementing ethnoscience-based learning. One major challenge is the lack of teaching resources that systematically integrate local wisdom into the science curriculum. Teachers often rely on standardized textbooks that do not include local contexts.

Another challenge is limited teacher knowledge and training in ethnoscience approaches. Many teachers are not familiar with how to identify and transform local knowledge into scientific concepts. Additionally, time constraints and curriculum demands can hinder the integration of contextual learning approaches.

These findings highlight the need for professional development programs and the development of ethnoscience-based instructional materials. Previous research also emphasizes that successful

implementation of ethnoscience requires institutional support and curriculum alignment (Parmin et al., 2017).

5. Conclusion of Findings

Overall, the results of this study demonstrate that Nias local wisdom is a valuable and relevant resource for science learning. Through an ethnoscience approach, cultural practices such as *Hombo Batu*, traditional architecture, and environmental management can be transformed into meaningful learning materials. This approach not only enhances students' understanding of scientific concepts but also promotes cultural preservation and sustainability awareness.

Discussion

The results of this study demonstrate that Nias local wisdom provides a rich and meaningful foundation for developing science learning resources through an ethnoscience approach. The integration of cultural practices such as *Hombo Batu*, traditional architecture (*Omo Hada*), and indigenous environmental knowledge reflects the strong connection between local culture and scientific principles. This finding supports the view that ethnoscience serves as a bridge between indigenous knowledge systems and formal science education, enabling students to learn scientific concepts in a more contextual and meaningful way.

One important aspect revealed in this study is the embedded scientific knowledge within cultural practices. For



instance, *Hombo Batu* illustrates key concepts in physics, including force, motion, momentum, and energy transformation. From a pedagogical perspective, this cultural activity can be used as a contextual learning tool that allows students to analyze real-life phenomena using scientific reasoning. This aligns with the findings of Parmin et al. (2017), who reported that ethnoscience-based learning improves students' scientific literacy and conceptual understanding. By connecting abstract concepts to observable cultural practices, students are better able to internalize and apply scientific knowledge.

In addition, the structure of *Omo Hada* demonstrates indigenous engineering knowledge that is highly relevant to scientific concepts such as equilibrium, force distribution, and material elasticity. The earthquake-resistant design of these traditional houses indicates that local communities have developed adaptive strategies based on empirical observations of their environment. This supports the argument that indigenous knowledge systems are not inferior to modern science but rather complementary forms of knowledge that can enrich science education. Similar findings were reported by Suryawati et al. (2020), who emphasized that integrating local wisdom into science learning enhances students' critical thinking and problem-solving skills.

Furthermore, this study highlights the role of ethnoscience in promoting student engagement and motivation. When science learning incorporates elements of local culture, students tend to show greater interest and participation. This is because the learning content becomes more relevant to their daily lives and cultural identity. Students are not only passive recipients of knowledge but active participants who can relate scientific concepts to their own experiences. This finding is consistent with the perspective of Glen Aikenhead, who argues that culturally responsive science education enhances student engagement by connecting school science with students' lived experiences.

Another significant contribution of ethnoscience-based learning is its ability to strengthen students' cultural identity and appreciation of local heritage. In many educational contexts, local knowledge is often marginalized in favor of standardized curricula. As a result, students may lose connection with their cultural roots. By integrating Nias local wisdom into science education, this study demonstrates that learning can simultaneously promote scientific understanding and cultural preservation. This aligns with the worldview theory proposed by William Cobern, which emphasizes that students' cultural backgrounds play a crucial role in shaping their understanding of science.



Moreover, the findings indicate that ethnoscience contributes to the development of essential 21st-century skills, including critical thinking, collaboration, and environmental awareness. For example, when students analyze environmental practices in Nias, such as sustainable farming and resource management, they engage in discussions about ecological balance and sustainability. These activities encourage students to think critically about environmental issues and develop a sense of responsibility toward nature. This is in line with global educational goals that emphasize sustainability and environmental literacy.

Despite its advantages, the implementation of ethnoscience-based learning faces several challenges. One of the main obstacles is the lack of instructional materials that integrate local wisdom into the science curriculum. Teachers often depend on textbooks that do not reflect local contexts, making it difficult to apply ethnoscience approaches in the classroom. This finding is consistent with previous research highlighting the need for the development of culturally relevant teaching resources (Parmin et al., 2017).

Another challenge is the limited knowledge and readiness of teachers to implement ethnoscience-based learning. Many teachers are unfamiliar with methods for identifying scientific concepts within cultural practices and translating

them into effective learning activities. This suggests the need for professional development programs that focus on ethnoscience pedagogy. Training and workshops can help teachers develop the necessary skills to design and implement culturally responsive science instruction.

In addition, curriculum constraints can also hinder the integration of ethnoscience. The current education system often emphasizes standardized testing and rigid learning objectives, leaving little room for contextual and culturally based approaches. Therefore, curriculum reform is needed to provide greater flexibility for integrating local wisdom into science education.

Overall, this study confirms that Nias local wisdom has significant potential as a science learning resource when approached through ethnoscience. The integration of cultural knowledge into science education not only enhances students' understanding and engagement but also supports the preservation of cultural heritage and promotes sustainability. Ethnoscience offers a holistic approach to education that values both scientific knowledge and cultural diversity.

D. Conclusion and Recommendations

Conclusion

This study set out to explore the potential of Nias local wisdom as a science learning resource through an ethnoscience approach. Based on the findings and discussion, it can be concluded that Nias



local wisdom contains rich, meaningful, and relevant knowledge that can be effectively integrated into science education. Cultural practices such as *Hombo Batu*, traditional architecture (*Omo Hada*), and indigenous environmental management systems reflect implicit scientific concepts, particularly in physics and environmental science. These findings confirm that local wisdom is not merely a cultural artifact but also a valuable source of knowledge that aligns with scientific principles.

The ethnoscience approach proved to be a powerful framework for transforming local knowledge into formal science learning materials. Through processes of identification, interpretation, and pedagogical integration, elements of Nias culture can be systematically connected to scientific concepts taught in schools. This transformation enables teachers to design contextual and meaningful learning experiences that bridge the gap between students' everyday lives and abstract scientific theories.

Furthermore, the integration of Nias local wisdom into science learning has been shown to enhance students' engagement and understanding. When students encounter scientific concepts through familiar cultural contexts, they are more motivated to learn and better able to grasp complex ideas. This contextualization reduces the perception that science is difficult and disconnected

from real life. As a result, students develop a deeper and more meaningful understanding of scientific concepts.

Another important conclusion of this study is the role of ethnoscience in fostering students' cultural identity and appreciation of local heritage. In many formal education systems, local knowledge is often marginalized or overlooked. By incorporating Nias local wisdom into science education, this study demonstrates that learning can simultaneously promote academic achievement and cultural preservation. Students not only gain scientific knowledge but also develop pride in their cultural identity and a greater appreciation for their community's traditions.

In addition, ethnoscience-based learning contributes to the development of essential competencies required in the 21st century, such as critical thinking, problem-solving, and environmental awareness. The analysis of cultural practices encourages students to engage in higher-order thinking processes, while the exploration of local environmental knowledge promotes sustainability and ecological responsibility. These competencies are crucial for preparing students to face global challenges in an increasingly complex world.

However, this study also identified several challenges in implementing ethnoscience-based learning. These include the lack of structured teaching



materials, limited teacher knowledge and training, and constraints within the existing curriculum. These challenges indicate that while the potential of ethnoscience is significant, its successful implementation requires systematic support from various stakeholders, including educators, curriculum developers, and policymakers.

Overall, this study concludes that exploring Nias local wisdom through an ethnoscience approach offers a promising strategy for improving the quality of science education. It provides a holistic learning experience that integrates scientific knowledge with cultural context, making learning more relevant, engaging, and meaningful.

Recommendations

Based on the conclusions of this study, several recommendations can be proposed to support the effective implementation of ethnoscience-based learning in schools.

First, it is recommended that educators begin to actively integrate local wisdom into their science teaching practices. Teachers should explore cultural practices within their communities and identify their relevance to scientific concepts. By doing so, they can create contextual learning experiences that resonate with students' backgrounds. However, to achieve this effectively, teachers need adequate support in the form of training and professional development programs. Workshops and

collaborative learning communities can help teachers develop the skills necessary to implement ethnoscience approaches.

Second, curriculum developers should consider incorporating local wisdom into the formal science curriculum. This can be done by providing guidelines, examples, and learning materials that integrate ethnoscience into existing topics. A more flexible and contextual curriculum will allow teachers to adapt their teaching to local conditions without compromising educational standards. Integrating local wisdom into national or regional curricula can also help preserve cultural heritage while enhancing the relevance of education.

Third, the development of ethnoscience-based instructional materials is highly recommended. These materials may include modules, student worksheets (LKPD), multimedia resources, and contextual problem scenarios based on local culture. Such resources will make it easier for teachers to implement ethnoscience in their classrooms and ensure consistency in teaching practices. Additionally, these materials should be designed to align with learning objectives and assessment standards.

Fourth, collaboration between schools and local communities should be strengthened. Community members, cultural practitioners, and local leaders possess valuable knowledge that can enrich science learning. Schools can



involve them as resource persons or partners in educational activities. This collaboration not only enhances the quality of learning but also strengthens the relationship between schools and the community.

Fifth, future research should focus on developing and testing specific ethnosience-based learning models and materials. Experimental and quasi-experimental studies can be conducted to measure the effectiveness of ethnosience approaches in improving learning outcomes. In addition, research can explore the application of ethnosience in different regions and subject areas to broaden its impact.

Finally, policymakers should provide support for the integration of local wisdom into education through policies and funding. Educational policies that encourage innovation and contextual learning will create a conducive environment for the implementation of ethnosience. Support in the form of resources, training programs, and curriculum development initiatives is essential to ensure sustainability.

In conclusion, the integration of Nias local wisdom into science education through an ethnosience approach offers significant benefits for both learning and cultural preservation. By implementing the recommendations outlined above, educators and stakeholders can create a more inclusive, meaningful, and effective science education system that prepares

students for the challenges of the future while preserving their cultural identity.

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