

INTEGRATION OF LOCAL WISDOM IN NIAS MYTHS ABOUT NATURAL PHENOMENA AS A BASIS FOR DEVELOPING SCIENCE LEARNING AND STRENGTHENING SCIENTIFIC ARGUMENTATION

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Abstract

This study aims to explore the potential of Nias myths and local wisdom in the development of science learning (Natural Sciences) and the strengthening of students' scientific argumentation skills. The method employed is a library research approach with a systematic framework, including the identification, evaluation, and synthesis of literature related to local wisdom, ethnoscience, cultural narratives, the integration of culture into science learning, and the development of scientific argumentation. The findings indicate that Nias myths contain knowledge of natural phenomena that can serve as a contextual, relevant, and meaningful learning context for students. The narrative structure of the myths facilitates the extraction of scientific concepts, the development of cause-and-effect reasoning, and the understanding of human-environment interactions, thereby enhancing scientific literacy and critical thinking skills. The integration of local wisdom into science learning also supports the development of scientific argumentation, as students are trained to construct claims, link evidence, reason logically, and compare traditional perspectives with modern scientific knowledge. This study emphasizes that Nias myths are not merely cultural heritage but also an effective pedagogical resource for culturally based science education. The implications of this research can serve as a foundation for developing contextual science learning modules and teaching strategies that combine local cultural identity with scientific competencies.

Keywords: *Nias myths; Local wisdom; Learning; Scientific argumentation; Ethnoscience; Contextual education*

Abstrak

Penelitian ini bertujuan untuk mengeksplorasi potensi mitos Nias dan kearifan lokal dalam pengembangan pembelajaran Ilmu Pengetahuan Alam (IPA) serta penguatan kemampuan argumentasi ilmiah siswa. Metode yang digunakan adalah kajian pustaka (library research) dengan pendekatan sistematis, yang mencakup identifikasi, evaluasi, dan sintesis literatur terkait kearifan lokal, etnosains, narasi budaya, integrasi budaya dalam pembelajaran IPA, serta pengembangan argumentasi ilmiah. Hasil kajian menunjukkan bahwa mitos Nias mengandung pengetahuan fenomena alam yang dapat dijadikan konteks belajar IPA yang kontekstual, relevan, dan bermakna bagi siswa. Struktur naratif mitos memfasilitasi ekstraksi konsep ilmiah, pengembangan pola sebab-akibat, dan pemahaman interaksi manusia-lingkungan, sehingga dapat meningkatkan literasi sains dan keterampilan berpikir kritis. Integrasi kearifan lokal dalam pembelajaran IPA juga mendukung pengembangan argumentasi ilmiah, karena siswa dilatih untuk menyusun klaim,



mengaitkan bukti, dan menalar secara logis, serta membandingkan perspektif tradisional dengan pengetahuan ilmiah modern. Kajian ini menegaskan bahwa mitos Nias bukan sekadar warisan budaya, tetapi juga sumber pedagogis yang efektif untuk pembelajaran IPA berbasis budaya. Implikasi penelitian ini dapat menjadi dasar pengembangan modul pembelajaran IPA kontekstual dan strategi pembelajaran yang memadukan identitas budaya lokal dengan kompetensi ilmiah.

Kata Kunci: *Mitos Nias; Kearifan Lokal; Pembelajaran; Argumentasi Ilmiah; Etnosains; Pendidikan Kontekstual*

A. Introduction

Science education in Indonesian schools often faces challenges in delivering content that is contextual, relevant, and meaningful for students. Much of science learning remains theoretical and abstract, making it difficult for students to connect scientific concepts with their everyday experiences (Harefa, D. 2025). This situation can lead to low learning motivation, minimal student engagement, and limited conceptual understanding. Moreover, the gap between formal scientific knowledge and local cultural experiences makes learning less contextual, preventing students from seeing the connections between science, the environment, and social life. To bridge this gap, one promising strategy is the integration of local wisdom into science learning. Local wisdom encompasses knowledge, practices, and values developed through long-term interactions between communities and their natural and social environments. By linking scientific content with cultural experiences, learning becomes more meaningful and relevant, while also enhancing student engagement and motivation. For example, folklore, myths, and traditional practices can serve as contexts for understanding natural phenomena, allowing students not only to learn theory but also to interpret and observe their environment through a cultural lens.

In addition to improving conceptual understanding, integrating local wisdom supports the development of critical thinking and scientific argumentation skills, as students are trained to compare cultural perspectives with modern scientific knowledge. Therefore, the incorporation of local wisdom into science education not only enriches students' understanding of science but also strengthens their cultural identity, making science learning more contextual, relevant, and meaningful in their daily lives.

Local wisdom not only preserves cultural values but also encompasses traditional knowledge and community understanding of natural phenomena, which in many cases contain scientific concepts that can be empirically explained. In Indonesia, various initiatives have emerged to integrate such knowledge into science education. For instance, Suastra (2021), in the study *Elaborating Indigenous Science Content into Science Learning Process: A New Science Instructional Model to Develop Students' Local Wisdom Based Characters and Higher Order Thinking Skills*, successfully developed a science learning model based on indigenous science. The model aims not only to facilitate the understanding of scientific concepts but also to cultivate character development rooted in local wisdom and enhance higher-order thinking skills.



This approach emphasizes the relevance of connecting scientific knowledge with students' cultural background, making learning more meaningful and contextual. By incorporating indigenous science into the curriculum, students are encouraged to explore the natural environment through the lens of their cultural heritage, linking empirical observations with traditional narratives and practices. Such integration fosters both cognitive and moral development, as learners gain scientific literacy alongside a deeper appreciation for their cultural identity. Moreover, the model developed by Suastra demonstrates that local wisdom can serve as a rich pedagogical resource, providing real-world contexts that make abstract scientific concepts more tangible and understandable. Students are trained not only to grasp theoretical knowledge but also to engage in critical thinking, problem-solving, and reflective reasoning, bridging traditional knowledge with modern scientific inquiry. This synthesis of local wisdom and science education represents a promising strategy for creating holistic learning experiences that develop both intellectual and cultural competencies.

Similarly, the study *Raising the Issue of Local Wisdom in Science Learning and Its Impact on Increasing Students' Scientific Literacy* emphasizes that the integration of local wisdom into science education can significantly enhance students' scientific literacy compared to traditional methods. According to Verawati (2025), in the study *Integration of Local Wisdom in Science Learning to Improve Science Literacy of Junior High School Students*, the use of local practices, knowledge, and environmental norms—

such as environmental management, medicinal plant utilization, and traditional technologies as part of science learning materials enables students to become more active, engaged, and capable of understanding scientific concepts within the context of their daily lives.

By incorporating these elements, science learning becomes more meaningful and relevant, bridging the gap between formal scientific concepts and students' lived experiences. Students are not merely passive recipients of abstract knowledge but are encouraged to explore, observe, and analyze phenomena through the lens of their local culture (Harefa, D. 2025). This contextual approach enhances comprehension, promotes curiosity, and develops critical thinking skills, allowing students to connect theoretical concepts with practical applications in their communities.

Moreover, integrating local wisdom fosters a holistic learning environment where cultural identity and scientific inquiry complement each other. By recognizing and valuing indigenous knowledge, students gain a deeper appreciation for their cultural heritage while simultaneously improving their scientific reasoning and literacy. Such strategies demonstrate that embedding local wisdom into science curricula can create more engaging, effective, and culturally responsive education, ultimately preparing students to navigate both scientific and social challenges in their daily lives.

However, despite these advances, most studies have primarily focused on local wisdom related to environmental practices, agrarian culture, or general aspects of ethnoscience. Few have explored oral



heritage, myths, or folklore particularly local myths about natural phenomena as a resource for science learning. In fact, myths and traditional stories often contain narratives about nature, including mountains, earthquakes, weather, disasters, plants, animals, and human-environment interactions. These narratives provide rich insights into how communities have historically observed, interpreted, and explained natural events (Harefa, D. 2025). By examining such stories, students can connect traditional knowledge with scientific concepts, creating a bridge between cultural heritage and formal science education. This approach allows abstract scientific ideas to be grounded in contexts that are familiar and meaningful to learners, making the learning process more engaging and comprehensible.

Moreover, myths and folklore serve as an effective medium for developing culturally based scientific argumentation. Through the analysis of these narratives, students can identify patterns, causes, and effects, and then articulate claims supported by evidence, blending traditional perspectives with modern scientific reasoning. As noted by Ishep and Tufa Rizkil (2025), using myths in this way not only enriches students' understanding of natural phenomena but also strengthens critical thinking, reasoning, and the ability to construct coherent scientific arguments within a cultural framework. Thus, local myths and oral traditions represent an untapped resource for science education, offering both pedagogical value and cultural significance. By integrating these narratives into the curriculum, educators can foster contextualized, meaningful, and culturally responsive learning experiences in science

classrooms.

Furthermore, such integration is not merely about the transfer of knowledge, but also about cultural transformation through education, allowing students to appreciate local identity while developing scientific literacy, critical thinking, and argumentative skills. This aligns with the findings of *Integrating Local Science and School Science: The Benefits for Preserving Local Wisdom and Promoting Students' Learning*, which demonstrates that local science derived from community cultural activities can be integrated into formal science curricula. This approach enables students to become familiar with both "school" science and community or traditional knowledge (Kasi, Yohanes Freadyanus, et al., 2024). In this context, qualitative studies also provide valuable insights. For example, *Kajian Etnosains Budaya Sunda pada Pembelajaran IPA SD* examines how local culture, through ethnoscience and traditions, can serve as a foundation for science learning in elementary schools. Although the study focuses on Sundanese culture, the methodology and approach offer important inspiration for research in Nias (Nurulaeni, Fitria & Aulia Rahma, 2022).

By integrating local wisdom into science education, students are provided with learning experiences that are both culturally meaningful and academically enriching. This approach not only enhances conceptual understanding and scientific reasoning but also fosters respect for local heritage and identity. Moreover, it encourages students to see science not as an isolated discipline but as a dynamic body of knowledge connected to the environment and community practices. Consequently, the integration of local science into formal

education supports holistic learning that combines cognitive development, cultural awareness, and practical application, creating more engaging and contextually relevant science education for students.

Furthermore, research on the development of science learning tools based on local wisdom, such as *Pengembangan Perangkat Pembelajaran IPA Berbasis Kearifan Lokal untuk Meningkatkan Hasil Belajar Kognitif Siswa*, shows that culturally based approaches can significantly improve students' cognitive learning outcomes. This demonstrates that the integration of local wisdom is not merely an idealistic concept but a practical and impactful strategy (Khaerani et al., 2023). Against this background, research focusing on local myths particularly the myths of communities in South Nias as a source of local wisdom for science learning holds high novelty and significant potential. Such studies open new avenues in the literature, expanding the scope beyond contemporary cultural practices or environmental traditions to include narratives, myths, and local cosmology as science teaching materials.

Integrating local myths into science education allows students to engage with knowledge that is both culturally meaningful and academically enriching. These narratives provide context for understanding natural phenomena, linking empirical observation with traditional explanations. By exploring myths about mountains, earthquakes, weather, plants, and animals, students can develop critical thinking and scientific argumentation skills while appreciating their cultural heritage. Thus, focusing on South Nias myths as educational resources represents an

innovative approach in science pedagogy. It highlights the value of oral traditions and storytelling as complementary to formal scientific knowledge, offering a holistic framework that bridges cultural identity and scientific literacy. This approach not only enhances conceptual understanding but also promotes student engagement, making science learning more relevant, contextual, and culturally responsive.

This study is expected to make a significant contribution to the development of science learning based on Nias local wisdom. First, it provides contextual learning materials that are not only relevant to students' cultural environment but also capable of bridging scientific understanding with their daily experiences. By presenting content that is closely connected to cultural life, the learning process becomes more meaningful and easier to comprehend. Second, the integration of local cultural elements in learning is expected to enrich students' scientific literacy. Students do not merely understand scientific concepts in the abstract; they also see how this knowledge intertwines with the identity and traditions of the Nias community. This approach fosters deeper engagement and a more holistic understanding of science in a culturally relevant context.

Furthermore, the study promotes the development of scientific argumentation skills through narrative analysis of local myths. Students are guided to deconstruct story structures, examine cultural meanings, and then relate them to scientific explanations. This process enables them to construct logical, critical, and balanced arguments that consider both scientific perspectives and cultural values. Finally, the research contributes to cultural preservation

by documenting and transforming local myths into the curriculum without compromising the quality of science education. In this way, learning not only enhances intellectual development but also safeguards the continuity of local cultural heritage as an integral part of national identity. By embedding Nias local wisdom into science learning, the study demonstrates that education can simultaneously cultivate scientific competence and respect for cultural heritage.

Thus, this study is not merely a “culture + science” combination, but a systematic effort to develop a science learning model that is contextual, critical, and meaningful within the local Nias context. The research will explore narratives of Nias myths about natural phenomena by collecting and documenting them, analyzing their narrative structures and cosmological meanings, designing a science learning framework based on these myths, and evaluating their potential impact on students’ scientific literacy and scientific argumentation skills.

B. Research Method

This study employs a library research method, focusing on the exploration, analysis, and synthesis of literature related to local wisdom, Nias myths, ethnoscience, and the integration of culture into science learning and scientific argumentation. This approach was chosen because the research aims to establish a comprehensive theoretical foundation for the development of a science learning model without conducting direct field data collection. Through systematic literature review, relevant studies, articles, books, and academic reports are identified and

examined to understand how local knowledge and cultural narratives can be integrated into science education. The method emphasizes analyzing the content of Nias myths to extract scientific concepts, exploring ethnoscientific perspectives, and reviewing approaches for embedding cultural elements into science curricula.

The library research approach allows for the synthesis of diverse sources, drawing connections between traditional knowledge, narrative structures, and scientific reasoning. By consolidating findings from prior studies, the research aims to propose a robust theoretical framework that can inform the design of contextualized and culturally responsive science learning models. This approach ensures that the development of the instructional model is grounded in established literature, offering both academic rigor and practical relevance for integrating local wisdom and myths into science education. Ultimately, the method provides a structured and systematic pathway to examine the potential of Nias local wisdom and myths as pedagogical tools, highlighting their role in enhancing scientific literacy, critical thinking, and argumentation skills while maintaining cultural authenticity within the learning process.

According to George (2008), a literature review is a systematic process of identifying, evaluating, and synthesizing previous research to generate an integrated new perspective. Cohen, Manion, and Morrison (2018) emphasize that this method is crucial for formulating a conceptual framework and mapping research gaps, especially in educational studies related to cultural knowledge and pedagogical practices. By systematically reviewing

existing literature, researchers can build a solid theoretical foundation, identify trends and patterns, and highlight areas that require further investigation. This approach ensures that the study is grounded in established knowledge while contributing new insights. In the context of education, particularly studies involving the integration of local wisdom and cultural practices into learning, a thorough literature review helps link traditional knowledge with contemporary pedagogical strategies, providing a comprehensive basis for designing effective, culturally responsive educational models.

1. Types and Sources of Data

The sources of literature in this study are categorized into three main types to ensure a strong and relevant theoretical foundation. First, primary literature includes reputable journal articles that directly discuss concepts of ethnoscience, the integration of local wisdom in science learning, scientific argumentation theory, and narrative analysis methodology. The works of Aikenhead and Ogawa (2007) serve as a key reference for understanding the dynamic relationship between traditional knowledge and modern science, while Osborne and Patterson (2011) provide a conceptual basis for how scientific argumentation can be developed within the learning process. Additionally, Labov's (1972) narrative structure theory is employed to guide the analysis of local myths, allowing cultural data to be processed systematically and scientifically. This primary literature forms the core of the research, offering both theoretical depth and methodological guidance. By examining these sources, the study ensures that the development of science learning models

grounded in local wisdom is based on established academic principles, bridging cultural understanding with scientific reasoning.

Overall, the careful selection of primary literature enables the researcher to construct a coherent framework for integrating Nias local wisdom and myths into science education. It supports the systematic extraction of scientific concepts from cultural narratives and informs strategies to enhance students' scientific literacy, critical thinking, and argumentation skills while maintaining cultural authenticity.

Second, secondary literature includes academic books, book chapters, seminar proceedings, and research reports that focus on Nias culture, Nusantara mythology, and culturally based approaches to science learning. This type of literature helps broaden understanding of the social and cultural contexts that form the background of the study, providing essential insights into the traditions, narratives, and practices relevant to the research focus. Third, supporting literature consists of policy documents such as publications from the Ministry of Education and Culture, the latest science curriculum, and guidelines for contextualized learning, which serve as the foundation for designing instructional materials. These sources ensure that the study aligns with national educational standards while integrating local cultural content effectively.

All literature sources were obtained through international databases such as Google Scholar, Semantic Scholar, and ResearchGate, as well as national repositories like Garuda and Neliti, ensuring the quality and credibility of the data. By

combining primary, secondary, and supporting literature, the study is able to construct a robust theoretical and practical framework for integrating Nias local wisdom and myths into science education. This comprehensive approach ensures that the resulting learning model is academically sound, culturally relevant, and contextually appropriate, providing a strong foundation for enhancing students' scientific literacy and critical thinking skills within a culturally meaningful framework.

2. Literature Data Collection Techniques

The technique for collecting literature data in this study was conducted through a series of systematic steps to ensure that all sources used were relevant, high-quality, and scientifically robust. The process began with the identification of appropriate keywords, such as *Nias mythology*, *local wisdom*, *indigenous knowledge*, *ethnoscience*, *science education*, *scientific argumentation*, and *narrative analysis*. These keywords were used to search for literature across various national and international databases, ensuring a comprehensive coverage of relevant studies. Following the keyword search, literature was screened based on its relevance to the research topic, publication year with a preference for studies published within the last ten years for educational issues and full accessibility of the data. This step ensured that the selected sources were both current and directly applicable to the research objectives. By applying this systematic data collection technique, the study could identify and gather literature that provided a solid foundation for analyzing how Nias local wisdom, myths, and ethnoscientific knowledge could be integrated into science education. The approach also facilitated a focused and

efficient review process, allowing the researcher to extract meaningful insights, identify gaps in the existing literature, and synthesize information to support the development of a culturally responsive and academically rigorous science learning model.

The next stage involved evaluating the quality of sources using the PRISMA principles as outlined by Moher et al. (2009). This approach ensures that only articles, books, or reports with sound methodological quality are included in the review, enhancing the reliability and credibility of the study. All literature that passed the selection criteria was then recorded and organized using reference management tools such as Zotero or Mendeley, facilitating efficient handling of citations and bibliographies. This step also allowed for systematic tracking of sources and streamlined management of the research materials. The final step was thematic synthesis, which involved categorizing the literature based on core themes such as local wisdom, myths and cultural narratives, science education, and scientific argumentation. By grouping the sources thematically, the study was able to construct a more structured and in-depth theoretical mapping, identifying connections, patterns, and gaps within the existing body of knowledge. This systematic approach to literature review ensured that the study not only drew upon high-quality, relevant sources but also synthesized the findings in a way that informed the development of a culturally grounded and pedagogically effective science learning model. The combination of rigorous source evaluation, organized reference management, and thematic synthesis

provided a solid foundation for integrating Nias local wisdom and myths into science education, supporting both conceptual understanding and the development of students' critical thinking and argumentation skills.

3. Data Analysis Techniques

The technique for analyzing literature data in this study was conducted using a content analysis approach as formulated by Krippendorff (2018), which allows researchers to interpret data systematically and in depth. The analysis process consisted of three main stages. First, the data reduction stage involved filtering various literature sources and selecting only those most relevant to the research focus, particularly studies discussing the integration of local culture into science learning. At this stage, the concept of *cultural border crossing* from Aikenhead and Jegede (1999) served as an important reference for understanding how students navigate between two knowledge worlds—modern science and traditional culture. This framework helped in identifying which aspects of local wisdom and cultural practices could be effectively connected with scientific concepts in the classroom. By systematically reducing the data, the study ensured that only high-quality and contextually relevant sources contributed to the theoretical framework, preventing extraneous or unrelated information from diluting the analysis. This step laid the foundation for deeper interpretation and the subsequent stages of data display and synthesis, facilitating a coherent understanding of how Nias local wisdom and myths could inform science education. The content analysis approach thus enabled the researcher to extract meaningful

patterns, highlight connections between cultural narratives and scientific reasoning, and build a structured, evidence-based model for culturally responsive science teaching.

The second stage is data display, which involves organizing key information into several thematic categories. These themes include concepts of local wisdom in education, ethnoscience and traditional knowledge, the integration of culture into science pedagogy, narrative analysis in cultural studies, and frameworks for scientific argumentation in schools. By categorizing the literature in this manner, the researcher is able to map conceptual relationships between sources, identify recurring patterns, and better understand how different studies complement and inform one another. This thematic organization facilitates the visualization of connections between local cultural knowledge and scientific concepts, highlighting how narratives, myths, and traditional practices can be systematically incorporated into science education.

Data display also supports the development of a coherent theoretical framework by allowing the researcher to trace the progression of ideas across multiple studies, compare perspectives, and synthesize findings in a structured way. It serves as a bridge between raw literature data and the final synthesis, ensuring that the resulting analysis is comprehensive, logically organized, and directly relevant to the research objectives. Ultimately, this approach enables a clear understanding of how Nias local wisdom and cultural narratives can be leveraged to enhance science learning, promote critical thinking, and support the development of students'

scientific argumentation skills, while maintaining alignment with culturally responsive pedagogy and educational best practices.

The third stage is synthesis. At this stage, findings from various sources are combined to form new perspectives. For example, literature on Nias myths, such as that examined by Hämmerle (2010), is connected with ethnoscience theories to generate interpretations regarding the potential of traditional narratives as a medium for contextual and meaningful science learning. Through this synthesis process, the study integrates insights from cultural, pedagogical, and scientific perspectives, allowing researchers to see how local myths can serve not only as cultural artifacts but also as pedagogical tools. By linking traditional narratives to scientific concepts, students can engage in learning that is both culturally relevant and academically rigorous. Synthesis also facilitates the identification of patterns, relationships, and gaps in the existing literature, providing a comprehensive foundation for the development of a theoretically sound and contextually grounded science education model. It highlights how narratives from local culture can support conceptual understanding, critical thinking, and scientific argumentation.

Ultimately, this stage transforms fragmented information from multiple studies into a coherent framework, demonstrating how Nias local wisdom and myths can be systematically utilized in science instruction. The resulting perspective emphasizes the dual value of cultural preservation and scientific literacy, showing that traditional narratives can

bridge the gap between everyday experiences and formal scientific knowledge while promoting students' engagement and higher-order thinking skills.

4. Research Validation

The validity of this literature-based study is maintained through a series of systematic strategies to ensure the reliability and accuracy of the findings. First, theoretical triangulation is applied, which involves comparing and integrating findings from multiple disciplines, including anthropology, linguistics, and science education. This approach allows the researcher to examine a phenomenon from diverse perspectives, resulting in more holistic interpretations and minimizing potential biases. Second, the credibility of sources is given significant attention. Only reputable scientific publications, peer-reviewed journal articles, and academic books are included, ensuring that the theoretical foundation is highly valid and academically accountable. By carefully selecting high-quality sources, the study strengthens the rigor of its literature analysis and provides a dependable basis for developing conceptual frameworks and instructional models.

Additionally, an audit trail is maintained to document every step of the literature search, selection, and analysis process, ensuring transparency and replicability. Cross-checking Digital Object Identifiers (DOIs) of all cited references further guarantees that sources are accurate and verifiable. Collectively, these validation strategies align with established recommendations in research methodology (Booth, Sutton & Papaioannou, 2016), providing confidence that the conclusions drawn from the literature review are robust,

credible, and relevant for informing the development of culturally responsive and scientifically rigorous instructional models in science education.

Third, this study implements an audit trail, which involves the transparent documentation of the entire process of literature search, selection, and analysis. With clear documentation, every step of the analysis can be traced, ensuring openness and accountability in the research process. Fourth, a cross-check of Digital Object Identifiers (DOIs) is conducted for each article to confirm that the sources used are genuinely valid and relevant to the research topic. This comprehensive approach ensures that all references are accurate, verifiable, and appropriately aligned with the study's objectives. Together, these strategies create a rigorous validation framework that strengthens the credibility of the literature review. By combining theoretical triangulation, source credibility evaluation, audit trails, and DOI verification, the study ensures that its findings are reliable, well-substantiated, and methodologically sound.

This approach aligns with the recommendations of Booth, Sutton, and Papaioannou (2016) regarding validity in literature-based research. Consequently, the results of this study can be regarded as authentic, trustworthy, and highly relevant for developing theoretical frameworks and implementing science education models that integrate local wisdom. By adhering to these validation procedures, the research not only guarantees the scholarly quality of its literature synthesis but also provides a solid foundation for designing instructional strategies that are both culturally responsive and scientifically rigorous, ensuring meaningful learning experiences for

students.

C. Research Results and Discussion

Research Results

Based on the conducted literature review, the relevant literature can be categorized into four main themes: (1) local wisdom and ethnoscience, (2) myths and cultural narratives as sources of knowledge, (3) the integration of local wisdom in science learning, and (4) culture-based scientific argumentation.

These thematic groupings provide a structured framework for understanding how traditional knowledge and cultural narratives can inform science education. Local wisdom and ethnoscience highlight the value of community-based knowledge in interpreting natural phenomena, while myths and cultural stories offer narrative structures that facilitate the extraction of scientific concepts. The integration of local wisdom into science learning emphasizes contextualized and meaningful educational experiences, enhancing students' engagement and comprehension. Finally, culture-based scientific argumentation demonstrates how students can develop critical thinking and reasoning skills by connecting traditional perspectives with modern scientific explanations.

This categorization serves as a foundation for synthesizing the literature and designing instructional models that effectively bridge cultural knowledge and scientific understanding.

1. Local Wisdom and Ethnoscience

Literature review indicates that local wisdom represents an accumulation of knowledge, values, and practices developed through long-term interactions between communities and their natural and social environments (Aikenhead & Ogawa, 2007).



Local wisdom encompasses traditional methods of resource management, lifestyle patterns, as well as cultural norms and practices passed down through generations. In the context of education, this concept serves as a crucial bridge between students' life experiences and formal scientific content. Ethnoscience, or indigenous science, is a concrete manifestation of local wisdom that allows natural phenomena to be understood through cultural and ecological perspectives. Aikenhead & Jegede (1999) emphasize the importance of cultural border crossing, which refers to students' ability to connect school-based scientific knowledge with their traditional knowledge. This approach enables science learning to become more relevant, meaningful, and connected to students' everyday experiences.

Integrating local wisdom and ethnoscience into the science curriculum not only enriches content but also promotes critical thinking and reflective learning, as students explore how traditional practices and ecological understanding relate to modern scientific concepts. By valuing both cultural knowledge and formal science, educators can create learning experiences that respect community heritage while fostering scientific literacy. This approach underlines the pedagogical potential of local wisdom as a resource for contextualized, culturally responsive science education that strengthens both cognitive and cultural competencies in students.

Moreover, a systematic review by Lubis et al. (2025) demonstrates that integrating local wisdom into science learning through cultural practices such as environmental management, myths, and ecological rituals not only enriches students'

understanding of scientific concepts but also enhances their critical thinking skills. This finding underscores that local wisdom is not merely passive cultural content; rather, it constitutes a valid source of scientific knowledge that can serve as a pedagogical foundation. Consequently, ethnoscience provides a framework that enables science education to be more contextual, analytical, and rooted in local cultural identity. By incorporating traditional practices and ecological knowledge into the curriculum, students are encouraged to explore the relationships between their cultural heritage and scientific principles. This approach fosters a deeper engagement with learning, as students can relate abstract scientific concepts to real-life experiences and community practices.

In essence, the integration of local wisdom into science education transforms it from a purely theoretical subject into a meaningful, culturally relevant learning process. It allows students to navigate between traditional knowledge and modern science, promoting conceptual bridging, critical reasoning, and reflective understanding. Ultimately, ethnoscience offers a robust pathway for developing science curricula that are both academically rigorous and culturally responsive, empowering students to appreciate and apply scientific knowledge within the context of their own community and environment.

2. Myths and Cultural Narratives as Sources of Knowledge

Myths and cultural narratives constitute rich sources of knowledge that can be effectively utilized in education, particularly in science learning based on local wisdom. Myths, including Nias myths,



function not only as entertainment or a means of cultural preservation but also as vehicles for conveying community understanding of natural phenomena, human-environment interactions, and the social norms and values upheld within the society. According to Hämmerle (2010), Nias myths contain numerous narratives related to cosmology, natural disasters, ocean currents, and meteorological phenomena. These stories demonstrate that the Nias people have systematically observed and interpreted their environment, albeit through cultural and symbolic perspectives, providing empirically grounded insights that have been refined over generations. Such narratives can be leveraged in science education to bridge traditional knowledge with formal scientific concepts. By analyzing the structures, sequences, and causal relationships embedded in these myths, educators can extract scientific principles in a culturally relevant manner.

Incorporating myths into learning not only preserves cultural heritage but also fosters critical thinking and analytical skills, as students learn to compare traditional interpretations with scientific explanations. This approach transforms folklore from mere storytelling into an educational resource that supports conceptual understanding, environmental awareness, and the development of scientific reasoning, making science learning both meaningful and contextually grounded.

Narrative analysis serves as an essential tool for extracting scientific knowledge embedded within myths. Labov & Waletzky (1967) demonstrate that the narrative structure including plot, characters, conflict, resolution, and moral messages can be employed to understand

the implicit concepts within folklore. For instance, myths depicting large ocean waves or earthquakes can be linked to scientific concepts such as wave energy, plate tectonics, and other natural phenomena in science education. Through this approach, cultural narratives are not merely heritage artifacts but also valid sources of knowledge that can be integrated into science learning. By connecting traditional stories with scientific explanations, students gain a deeper understanding of natural phenomena while remaining grounded in the cultural context of their community. This method allows learners to appreciate the empirical observations and interpretations embedded in local myths, fostering critical thinking and analytical skills. Moreover, using narrative analysis in education bridges the gap between indigenous knowledge and formal science, transforming storytelling into a pedagogical strategy that enhances comprehension and engagement. It reinforces the relevance of learning by situating abstract scientific concepts within familiar cultural frameworks, making the educational experience more meaningful. Consequently, cultural narratives become a dual resource: preserving identity while simultaneously enriching scientific literacy, enabling students to develop both cognitive skills and cultural awareness in an integrated manner.

3. Integration of Local Wisdom in Science Learning

The integration of local wisdom into science learning has been shown to positively impact student engagement, conceptual understanding, and cultural awareness. Literature indicates that when instructional materials are designed with attention to local culture and experience,



students become more motivated and capable of connecting scientific knowledge with everyday life. A study by Verawati & Wahyudi (2025) found that using science learning materials based on local wisdom not only enhances science literacy but also stimulates student interest and active participation in the learning process. This demonstrates that a contextual approach can bridge the gap between formal science and students' cultural experiences.

Aikenhead & Ogawa (2007) emphasize the importance of conceptual bridging, which refers to students' ability to connect traditional knowledge with modern scientific understanding in science education. Through this approach, students are not merely passive recipients of information but are encouraged to analyze, compare, and interpret natural phenomena through the lens of their culture. For example, Nias myths about storms or volcanoes can be used as contexts for science experiments, simulations, or relevant scientific discussions.

Consequently, learning becomes more meaningful, contextual, and capable of reinforcing scientific understanding while respecting local cultural values. Such integration illustrates that science education can advance in harmony with the preservation of cultural identity. By leveraging local narratives and wisdom, educators can create a science curriculum that is both academically rigorous and culturally resonant, fostering deeper engagement, critical thinking, and a stronger connection between students and their environment.

4. Culture-Based Scientific Argumentation

The development of scientific argumentation skills is a crucial aspect of

modern science education, as it emphasizes not only mastery of facts but also critical thinking and the ability to construct logical reasoning. Osborne & Patterson (2011) explain that ideal scientific argumentation consists of three main components: claim, evidence, and reasoning, commonly referred to as the C-E-R framework (Claim-Evidence-Reasoning). By integrating cultural narratives, such as Nias myths, into the learning process, students can build scientific arguments in a more contextualized manner. They are encouraged to compare cultural interpretations of natural phenomena with scientific explanations, making the learning process an interdisciplinary dialogue between science and local culture. Lubis et al. (2025) further assert that cultural narratives serve as scaffolds for developing critical thinking skills. Myths or traditional stories provide students with an initial framework to observe, analyze, and evaluate phenomena before formulating scientific arguments supported by empirical data. This approach not only strengthens argumentation skills but also fosters awareness of cultural values and human-environment relationships.

Thus, the integration of local wisdom into scientific argumentation helps students develop a more holistic understanding: scientific concepts are not isolated from cultural context but are enriched by meaningful local experiences and knowledge. By connecting empirical science with traditional narratives, students learn to appreciate the relevance of science in everyday life while maintaining a strong link to their cultural heritage, promoting both intellectual and cultural literacy in science education. The integration of culture

and science also supports the development of scientific literacy and students' scientific argumentation skills. Myths and cultural narratives can serve as scaffolds for students to construct claims, support them with evidence, and formulate logical reasoning. By utilizing a narrative approach, traditional stories can be effectively transformed into scientific instructional materials, ensuring that cultural identity is preserved while simultaneously enhancing students' academic competencies. This approach allows learners to connect their local cultural experiences with scientific concepts, fostering deeper understanding and engagement in the learning process.

Consequently, this literature review underscores the urgency of research that combines Nias myths, local wisdom, and scientific argumentation as the foundation for developing a contextualized science education model in South Nias. Such an approach not only enriches science education but also systematically preserves and revitalizes local cultural values in a meaningful way. By bridging traditional knowledge with modern scientific frameworks, students are encouraged to critically analyze natural phenomena, draw evidence-based conclusions, and appreciate the epistemological contributions of indigenous knowledge.

In addition, integrating cultural narratives into science instruction promotes culturally responsive pedagogy, which has been shown to increase student motivation, engagement, and achievement. The application of local myths as pedagogical tools offers an innovative avenue for educators to design learning experiences that are both contextually relevant and academically rigorous. Ultimately, this

strategy represents a dual benefit: advancing scientific literacy while sustaining cultural heritage, thereby creating a holistic model for science education that respects and leverages the rich cultural traditions of Nias.

The integration of culture and science also supports the development of scientific literacy and students' scientific argumentation skills. Myths and cultural narratives can serve as scaffolds for students to construct claims, substantiate them with evidence, and formulate logical reasoning. The narrative approach has proven effective in transforming traditional stories into scientific instructional materials, ensuring that cultural identity is preserved while simultaneously enhancing students' academic competencies. By linking local cultural knowledge with scientific concepts, students are encouraged to engage deeply with learning content, fostering both comprehension and critical thinking skills. Accordingly, this literature review highlights the urgency of research that integrates Nias myths, local wisdom, and scientific argumentation as a foundation for developing a contextualized science education model in South Nias. This approach not only enriches science education but also systematically preserves and revitalizes local cultural values in a meaningful and sustainable manner. By bridging traditional knowledge and contemporary scientific frameworks, students can analyze natural phenomena critically, construct evidence-based conclusions, and appreciate the epistemological contributions of indigenous knowledge.

Moreover, incorporating cultural narratives into science teaching promotes

culturally responsive pedagogy, which has been shown to enhance student motivation, engagement, and achievement. Utilizing myths as educational tools provides an innovative pathway for educators to design learning experiences that are both contextually relevant and academically rigorous. Ultimately, this strategy achieves a dual purpose: advancing scientific literacy while sustaining cultural heritage, creating a holistic, culturally-informed model of science education that leverages the rich traditions of Nias for meaningful learning outcomes.

Discussion

The results of the literature review indicate that Nias myths contain local wisdom values that can serve as a foundation for science education and the development of scientific argumentation skills. This discussion is organized around four main perspectives: (1) the relevance of local wisdom in science education, (2) the contribution of myth narratives to the development of scientific concepts, (3) the integration of local wisdom and science in learning, and (4) the strengthening of culture-based scientific argumentation.

By examining these perspectives, it becomes evident that local myths are not merely cultural artifacts but also serve as pedagogical resources that can enrich science learning. Their narratives provide contextualized examples that facilitate students' understanding of natural phenomena, promote critical thinking, and support the formulation of evidence-based arguments. Integrating Nias cultural knowledge into science education thus fosters both academic competence and cultural awareness, highlighting the potential of culturally responsive pedagogy

in enhancing learning outcomes and preserving indigenous knowledge.

1. The Relevance of Local Wisdom in Science Education

Local wisdom holds significant relevance in science education as it reflects knowledge acquired by communities through prolonged interactions with their natural and social environments. Aikenhead and Ogawa (2007) emphasize that indigenous knowledge is not only culturally valuable but can also serve as a valid source of scientific understanding. In Nias, for instance, folktales and myths describing natural phenomena such as high waves, earthquakes, storms, and volcanic activity represent empirical experiences that have been filtered and transmitted through generations. These narratives reflect community observations of nature, recurring patterns, and environmental impacts, providing an initial framework for students to comprehend scientific phenomena contextually.

A study by Lubis et al. (2025) indicates that integrating local wisdom into science learning enhances student engagement and motivation, as instructional materials become more closely connected to their lived experiences. This approach enables students to link formal scientific concepts with cultural practices and observable phenomena in their surroundings, making learning more meaningful and relevant. In South Nias, incorporating local wisdom into the science curriculum allows students not only to grasp scientific theories but also to appreciate traditional knowledge embedded within their communities. By bridging indigenous understanding and formal science education, this approach fosters deeper comprehension, critical thinking,

and a sense of cultural continuity, thereby enriching both academic and socio-cultural dimensions of learning.

Furthermore, local wisdom plays a crucial role in developing students' critical and analytical thinking skills. By comparing cultural explanations with scientific principles, students are trained to evaluate information, draw informed conclusions, and enhance their scientific reasoning. This process encourages learners to think reflectively and critically, bridging the gap between traditional knowledge and formal scientific understanding. Consequently, integrating local wisdom into science education not only enriches scientific literacy but also strengthens cultural identity, making science learning more contextual, relevant, and meaningful to students' daily lives. Through this approach, students gain a deeper appreciation of their cultural heritage while simultaneously acquiring essential academic competencies. By situating scientific concepts within familiar cultural frameworks, educators can foster an engaging and effective learning environment that promotes both intellectual growth and cultural continuity, ultimately preparing students to navigate scientific and societal challenges with informed judgment and a strong sense of cultural awareness.

2. The Contribution of Myth Narratives to the Development of Scientific Concepts

Myth narratives play a strategic role in the development of scientific concepts as they present knowledge structured in the form of stories that are easy to understand and analyze. Nias myths, for instance, have rich narrative structures that include characters, plots, conflicts, and resolutions, as described by Labov and Waletzky (1967). This structure allows researchers or

educators to systematically extract scientific concepts. Stories about large ocean waves, mountain movements, or other natural disasters in myths can be linked to scientific concepts such as energy, waves, plate tectonics, and other natural dynamics in science. Through this approach, natural phenomena initially understood symbolically or culturally can be interpreted scientifically, providing students with a more comprehensive and contextual understanding.

Hämmerle (2010) emphasizes that myth narratives also serve as scaffolds for understanding human interaction with the natural environment. Myths provide an initial framework for students to observe, analyze, and interpret phenomena before conducting experiments or scientific testing. This approach helps students build deeper understanding, as they learn to connect cultural experiences with formal scientific concepts. By integrating narrative myths into science education, educators can facilitate meaningful learning experiences that simultaneously respect cultural heritage and promote conceptual mastery. Ultimately, this method enhances students' ability to reason scientifically while appreciating the epistemological value embedded in local myths.

Furthermore, Osborne and Patterson (2011) argue that students' ability to identify patterns, cause-and-effect relationships, and connections between events in traditional stories forms an essential foundation for developing scientific argumentation. Cultural narratives, therefore, are not merely storytelling or entertainment; they serve as effective pedagogical tools for cultivating critical, analytical, and scientific thinking skills. By analyzing the sequence of

events and underlying relationships in myths, students are encouraged to reason logically, evaluate evidence, and construct well-founded scientific explanations. Integrating myth narratives into science education allows students to learn scientific concepts within a meaningful cultural context, bridging the gap between traditional knowledge and formal scientific frameworks. This approach enhances scientific literacy by providing students with opportunities to engage with concepts actively and contextually, rather than through abstract or decontextualized instruction. At the same time, it fosters respect for local cultural heritage and strengthens students' cultural identity.

By situating science learning within familiar cultural narratives, educators can create learning experiences that are both academically rigorous and culturally relevant. Students can draw upon their understanding of myths to explore natural phenomena, make predictions, and test hypotheses, thereby reinforcing the practice of scientific reasoning. Ultimately, the integration of cultural narratives into science instruction provides a dual benefit: advancing students' cognitive and analytical skills while preserving and revitalizing local knowledge, contributing to a holistic and culturally responsive model of science education.

3. Integration of Local Wisdom and Science in Learning

The integration of local wisdom and science in science education represents a strategic approach to bridge formal knowledge with students' real-life experiences. By linking scientific concepts with local culture, learning becomes more contextual, relevant, and meaningful.

Aikenhead and Jegede (1999) describe the concept of *cultural border crossing*, which refers to students' ability to navigate and compare scientific knowledge with their cultural experiences. In the context of Nias, teachers can utilize local myths as case studies of natural phenomena, such as earthquakes, ocean waves, or volcanic activity. These stories serve as entry points for discussions, observations, or scientific experiments, allowing students to systematically test traditional claims using scientific methods.

This approach not only facilitates the understanding of scientific concepts but also enhances student motivation and engagement. Verawati and Wahyudi (2025) found that learning strategies based on local wisdom make students perceive the material as closer to their daily lives, encouraging more active participation in the learning process. Additionally, integrating local culture into science instruction promotes the development of critical and reflective thinking skills. Students are trained to analyze, evaluate, and interpret natural phenomena through their cultural lens before drawing conclusions based on scientific evidence. By combining local narratives with formal scientific inquiry, educators can create learning experiences that cultivate both conceptual understanding and cultural appreciation, fostering holistic scientific literacy that is grounded in students' lived realities.

Furthermore, the use of Nias myths as a learning medium also contributes to cultural preservation. Traditional stories are not only transmitted orally but are transformed into educational resources that support science learning. By integrating local wisdom with science in teaching, these

narratives help strengthen scientific literacy, foster the development of students' scientific argumentation skills, and simultaneously preserve local cultural identity. This approach positions cultural knowledge as an integral component of contextualized education in schools, allowing students to engage with science in a meaningful and culturally relevant way. By connecting scientific concepts with familiar cultural narratives, educators can create a learning environment that promotes both academic competence and respect for heritage. Consequently, the integration of Nias myths into science education exemplifies a dual benefit: advancing students' understanding of science while sustaining and revitalizing local traditions, demonstrating the potential of culturally responsive pedagogy to enhance learning outcomes and cultural continuity simultaneously.

4. Strengthening Culture-Based Scientific Argumentation

Strengthening culture-based scientific argumentation is a vital strategy in modern science education, as it emphasizes not only concept mastery but also critical thinking, logical reasoning, and the ability to construct systematic arguments. By utilizing myth narratives, such as Nias myths, students are provided with opportunities to develop scientific argumentation competencies through the process of formulating claims, gathering evidence, and reasoning logically, following the Claim-Evidence-Reasoning (C-E-R) framework proposed by Osborne and Patterson (2011). This approach ensures that students do not passively receive information but actively analyze and interpret natural phenomena within the context of their own cultural

backgrounds.

Lubis et al. (2025) highlight that linking cultural phenomena with scientific concepts enhances students' scientific reasoning and critical thinking skills. Cultural narratives serve as scaffolds, guiding students to connect traditional experiences with modern scientific concepts. For example, stories about large ocean waves or earthquakes in Nias myths can serve as starting points for scientific discussions, simple experiments, or observations, allowing students to evaluate traditional claims and relate them to empirical evidence. Integrating local wisdom into scientific argumentation also enables students to compare traditional and scientific perspectives, recognize similarities and differences, and build a holistic understanding of natural phenomena. In this way, Nias myth narratives function not only as engaging and contextual learning media but also as essential instruments for developing scientific argumentation skills, enhancing scientific literacy, and strengthening the connection between formal education and local cultural identity. This approach demonstrates that science learning can be harmonized with cultural preservation while simultaneously fostering students' academic competencies.

5. Synthesis of the Discussion

Based on the literature review, the synthesis of the discussion indicates that Nias myths contain knowledge about natural phenomena that is highly relevant to science concepts. Traditional stories passed down through generations, such as myths about earthquakes, ocean waves, volcanic eruptions, and other natural events, not only embody cultural values but also reflect empirical observations of the community's



environment. These phenomena can be interpreted scientifically to understand principles such as wave energy, plate tectonics, or natural cycles, providing students with a tangible context for learning science.

The narrative structure of myths, including plot, characters, conflict, resolution, and moral lessons, allows for the systematic extraction of scientific concepts. Narrative analysis supports the development of students' scientific literacy as they learn to identify key information, draw conclusions, and connect traditional stories with modern scientific concepts. Furthermore, integrating local wisdom into science learning has been shown to enhance student engagement and motivation. Using cultural contexts helps students comprehend material more meaningfully while also cultivating critical thinking skills through observation, analysis, and reflection.

Moreover, cultural narratives function as scaffolds for developing scientific argumentation. Students can construct claims, support them with evidence from observations or experiments, and develop logical reasoning that strengthens their analytical skills. Consequently, this literature review emphasizes the significant potential of Nias myths as a source of culturally grounded science education. This approach aligns with contextualized learning, promotes the development of scientific literacy, and preserves local cultural identity as an integral part of teaching and learning in schools.

D. Conclusion

Based on the results of the literature review, this study draws several key conclusions regarding the potential of Nias

myths as a resource for science education and the development of students' scientific argumentation skills.

First, Nias myths about natural phenomena contain rich local wisdom that is highly relevant to scientific concepts. Folktales about earthquakes, tsunamis, storms, or volcanic activity reflect the community's understanding of natural dynamics and their surrounding environment. Literature studies, as noted by Hämmerle (2010), indicate that myth narratives are not merely fantastical stories but also represent empirical observations internalized through symbols, values, and cultural practices. This knowledge is contextual, rooted in local experiences, and can serve as an authentic source for science learning for students in South Nias.

Second, the narrative structure of myths facilitates the extraction of scientific concepts and the development of critical thinking skills. Narrative analysis enables the identification of story elements that can be linked to scientific concepts, such as cause-and-effect relationships, natural patterns, and human-environment interactions. Students' ability to dissect narratives and analyze these relationships forms a crucial foundation for building scientific argumentation.

Third, integrating local wisdom into science learning enhances student engagement, motivation, and scientific literacy by enabling *cultural border crossing*—the ability to connect traditional knowledge with formal scientific concepts. This makes learning more contextual, meaningful, and conducive to deeper conceptual understanding. By using myths as instructional materials, teachers can connect described natural phenomena with simple

experiments, field observations, or scientific discussions, creating an interactive and reflective learning environment.

Fourth, cultural narratives can function as scaffolding for developing scientific argumentation. Students are trained not only to recognize natural phenomena but also to construct claims, support them with evidence, and reason logically through the Claim-Evidence-Reasoning (C-E-R) framework. Integrating traditional and scientific perspectives helps students understand that modern science and local knowledge can complement each other, enriching understanding and fostering critical attitudes toward natural phenomena.

Overall, this literature review confirms that Nias myths are a promising resource for culturally grounded science education, capable of enhancing students' scientific argumentation skills. The integration of local wisdom into science learning not only preserves cultural identity but also improves pedagogical quality and students' scientific thinking abilities.

Recommendations

Based on the conclusions above, this study provides several recommendations for the development of learning and further research:

1. For Science Educators

Teachers are encouraged to utilize myths and local wisdom as contexts for science learning. For instance, stories about earthquakes or tsunamis can serve as the basis for simple experiments, simulations, or group discussions to enhance scientific literacy and argumentation skills.

2. For Curriculum Developers and Policymakers

The integration of local wisdom into

the science curriculum should be strengthened through systematic, culturally based learning modules, enabling students to study science in contexts relevant to their environment and traditions.

3. For Future Researchers

Field research is necessary to validate the findings of this literature review. Empirical studies can be conducted through R&D projects or classroom experiments to test the effectiveness of using Nias myths in improving students' understanding of science concepts and their scientific argumentation skills.

4. For Cultural Preservationists

This study emphasizes the importance of documenting myths and local wisdom practices to ensure their sustainability and usability as educational resources. Preservation is essential not only for cultural identity but also as a legitimate source of scientific knowledge.

The implementation of these recommendations is expected to make the integration of local wisdom and science education an effective strategy for developing contextual, creative, and culturally responsive learning. Simultaneously, it can enhance students' scientific competencies comprehensively, fostering both academic growth and cultural appreciation. By bridging indigenous knowledge with formal science education, educators can cultivate a learning environment that is meaningful, engaging, and aligned with students' lived experiences.

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