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Local wisdom of manongkah kerang as biology learning context in independent curriculum: A narrative review

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ABSTRACT

Local wisdom holds significant potential as a contextual biology learning resource, yet its integration into the Independent Curriculum remains underexplored, particularly in coastal communities. This study aims to examine the integration of the local wisdom of the Duano Tribe's mussel *tradition* into biology learning in the Independent Curriculum. This tradition contains ecological knowledge, organismal adaptation, biomechanics of motion, as well as conservation values relevant to biological concepts. The research uses the *Narrative Literature Review* (NLR) design by examining articles published in 2018–2025 that discuss local wisdom, ethnopedagogy, coastal biology, and curriculum implementation. The analysis is carried out through thematic coding to identify concept patterns and potential integration in learning. The results of the study show that the tradition of mussels can be used to strengthen the understanding of coastal ecosystems, the morphological and physiological adaptation of blood mussels, as well as the issue of environmental change. The integration of local potential is also relevant for the development of inquiry-based learning activities and *project-based learning*, as well as supporting the achievement of the Pancasila Student Profile. Overall, this study confirms that the manongkah kerang tradition has strong educational value and can be implemented as a contextual learning resource to improve students' ecological competence, cultural identity, and environmental awareness.

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INTRODUCTION

Indonesia is a country rich in culture, traditions, and local wisdom spread across various traditional villages (Mozes & Zega, 2025). This cultural wealth is not only the identity of the nation, but also a high-value potential that needs to be preserved and developed (Sofya et al.,

2025). However, in the context of education, the integration of local wisdom in learning materials is still limited, and the use of the real environment is still not widely applied. This condition has the potential to cause the fading of local values, potential, and wisdom that live and develop in the community (Haka et al. 2020; Rummar 2022).

Cultural heritage also faces threats in the modern era, such as the loss of practices and traditions due to social changes and the development of the times (Purnawibawa, Sembiring, and Wirawan 2021). In addition, in the midst of globalization and modernization, the survival of local culture also faces serious challenges such as declining interest among the younger generation, cultural commercialization, and the threat of traditional extinction (Philia et al., 2025; Tasya et al., 2023). Therefore, an educational strategy is needed that is able to maintain cultural values while adapting them to the development of science and technology that can contribute to improving the quality of education through a contextual and meaningful learning process (Bani 2021).

The integration or utilization of local wisdom is one of the important strategies that can be used to relate biological concepts to real life, or the potential of local wisdom in the student environment. Through the integration of learning, not only adapting the curriculum, but also incorporating real-world problems and utilizing examples that are relevant to students' experiences and environments, so that learning becomes more meaningful and contextual (Mensah 2021). In addition, integrating local science into learning provides benefits for students and culture because it can foster a sense of identity, environmental concern, and appreciation for local values (Kasi et al. 2024).

As a form of implementation of the integration of local wisdom in the regional context, Riau is one of the provinces that has a wealth of local wisdom that is firmly rooted in the lives of its people (Ilhami et al. 2021). The values contained in local wisdom should be one of the focuses in learning, especially in the context of learning, which is related to the natural environment. This is in line with the direction of the Merdeka curriculum, which emphasizes respect for cultural diversity as an important aspect that should be studied (Sari, Riandi, and Surtikanti 2024).

In addition to the local context, the integration of local wisdom is also in line with the Independent Curriculum, which has the main characteristics in the form of learning that emphasizes *soft skills* and the character of students, one of the themes of which includes the integration of local wisdom into the learning process. This integration can help students understand concepts more fully, contextually, and increase learning motivation (Laamena & Laurens, 2021). The integration of local wisdom in biology learning is also in line with strengthening the Pancasila Student Profile, especially in the dimension of global diversity and critical thinking (Ministry of Education and Culture of the Republic of Indonesia 2022).

One form of local wisdom that has the potential to be integrated into science learning is the tradition of manongkah clam (Ilhami et al. 2021). Manongkah kerang is a local wisdom from the Duano tribe in Indragiri Hilir regency, Riau province, which is carried out as a process of catching shellfish in the mud when the river water recedes by using a base of a board that is useful as a footrest for skating, while the other foot acts as a propeller (Yektyastuti et al. 2024).

Several previous studies have shown the positive potential of integrating local wisdom in biology learning. One of them is research conducted by Subrata & Rai (2023). Religious ceremonies in Bali show that the integration of local wisdom into learning materials increases motivation and shapes students' character, especially those related to concern for the environment. In addition, the research conducted by Nur et al. (2025) stated that the integration of local wisdom in biology learning has been proven to facilitate understanding of concepts while increasing students' awareness of the surrounding culture and environment. Other research by Sriyati et al. (2022), who developed teaching materials by utilizing the local wisdom of the Rimba people in Jambi, also showed an increase in the literacy of the students' environment. Thus, the value of local

wisdom in the midst of the implementation of the Independent Learning curriculum should be maintained and developed (Annisha 2024).

Based on this urgency, this article aims to examine the integration of the local potential of manongkah clams into biology learning in the Independent Curriculum. This article focuses on the identification of local knowledge in the manongkah kerang tradition and the analysis of its implementation in science learning to strengthen students' local identity, increase learning relevance, and support cultural preservation in the midst of global dynamics.

RESEARCH METHODS

Research Design

This study uses the Narrative Literature Review (NLR) research design. This design was chosen to allow researchers to interpret, integrate, and synthesize a wide range of academic literature related to local wisdom, ethnopedagogy, and contextual biology learning. *Narrative review* is suitable because the purpose of this research is to analyze concepts, theoretical frameworks, and theoretical relationships, not to make empirical measurements.

Population and Samples

In literature review-based research, the population refers to all scientific publications that discuss local wisdom, biology learning, coastal ecology, ethnoscience, and educational curriculum. The sample consists of articles or literature sources selected based on the following criteria: 1) published in the 2018-2025 range, 2) related to ethnopedagogical biology learning, local wisdom, or curriculum implementation, 3) accessible in full-text form, and 4) indexed in databases such as Google Scholar, SINTA Garuda, DOAJ, or other reputable publishers. Literature searches were conducted across Google Scholar, SINTA Garuda, and DOAJ databases using keywords such as manongkah kerang, local wisdom, ethnopedagogy, coastal biology, and Independent Curriculum. From the initial search results, a total of 37 articles published between 2018 and 2025 were selected based on relevance to the research focus and availability of full text, and used as the primary sources of analysis in this study. Thus, the research sample is in the form of relevant literature, not human subjects or empirical research objects.

Instruments

The instrument in this study is not a physical tool, but a literature analysis instrument consisting of a list of keywords for search as well as literature inclusion and exclusion criteria. The instrument is used to maintain consistency in the process of selection, organization, and analysis of library sources so that the results of the study remain systematic and accountable.

Procedures

The research procedure is carried out through four stages. First, the researcher identified the literature by searching for keywords related to local wisdom, manongkah keclam, ethnopedagogy, ethnoscience, biology learning, contextual learning, Independent Curriculum, and Duano through various scientific databases. Second, literature was selected based on the criteria of the year of publication, relevance of the topic, suitability of the research focus, and availability of *full text*. Third, the selected literature was analyzed using thematic coding to identify themes such as motion biomechanics, organism adaptation, coastal ecosystem dynamics, conservation value, and pedagogical relevance. Fourth, all findings are synthesized into a scientific narrative that connects the concept of biology with the context of ethnopedagogy and the Independent Curriculum.

Data Analysis

Data analysis in this study was carried out using a thematic analysis approach. Literature that has met the selection criteria is analyzed to identify the main patterns, concepts, and themes

related to biology learning based on local wisdom. The analysis process was carried out through coding by exploring themes such as motion biomechanics, organism adaptation, coastal ecosystem dynamics, conservation value, and the pedagogical relevance of the manongkah clam tradition in biology learning. All findings are then synthesized narratively to build a comprehensive understanding of the potential for the integration of the local wisdom of the manongkah clam in the Merdeka Curriculum.

RESULTS

Manongkah shellfish by the Duano Tribe contains local knowledge *(Indigenous science)* that is in harmony with concepts in scientific science as well as the value of environmental conservation (Ilhami et al. 2021). Reinforced by ethnoscientific studies by Yektyastuti et al (2024), this tradition can be used as a source of science learning through the integration of scientific and local values. The model of reconstruction of local knowledge into scientific science, as stated. Based on this, the following table presents a comparison between the indigenous science of the community and the scientific science in the Manongkah Kerang tradition, as well as relevant concepts in science learning.

Table 1. Indigenous science of society and scientific science in the Manongkah Kerang tradition, as well as relevant concepts in learning Biology.

Yes	Topics	Indigenous *science*	Scientific science	Biology Concepts
I	Manongkah Kerang Process	Virgin/blood shellfish *(Anadara granosa)* is the main catch of the community	Blood mussels *(Anadara granosa),* or blood clam, are so named because it contains hemoglobin in its blood so it is red. In contrast to most other mollusks that are blue (due to hemocyanin) or colorless (He et al. 2024).	Anatomy and Physiology of Mollusks, Biomolecules in marine organisms;
			Blood mussels *(Anadara granosa)* It contains 12.41% protein, 0.14% carbohydrates, 80.22% water, and 3.21% minerals. In addition, it contains phenol 1.07% as a bioactive compound. Therefore, blood mussels can be categorized as functional foods that are good for health (Diansyah and Agussalim 2023; Permata et al. 2023).	
		Manongkah is carried out in muddy sand areas because blood shells are found there	Blood mussels *(Anadara granosa)* It lives immersed in soft, fine sediments, such as mud, which makes burrowing easier, maintains body stability, and reduces energy to move. Mud provides detritus, microbes and nutrients that support the shellfish filter feeder feeding system, while protecting it from waves and currents, making it suitable for both juvenile and adult phases. The presence of hemoglobin allows blood mussels to survive in a muddy environment with low oxygen (Jaowatana, Yalc, and Satapornvanit 2024; Srisunont and Chayarat 2022; Su et al.	Coastal Ecosystems

			2025).	
		Manongkah is done during the north wind because shellfish are easier to find and the catch increases	North winds increase the movement of nutrients in coastal zones at certain periods, which can increase the abundance of shellfish (Rios-yunes et al. 2023). Conversely, southerly winds with large waves can sink shellfish deeper or reduce larval settlement resulting in decreased catch (Moulton et al. 2023; Nowacki et al. 2024).	
		Tongkah boards are used so that the feet are not injured by wood, stones, or shells in the mud	Blood clam shells *(Anadara granosa)* most of them are composed of calcium carbonate (CaCO3) of about 95-98% in the form of aragonite crystals that are dense and hard so that the shell is capable of injuring the skin. The aragonite structure makes the shell strong and sharp (Insani & Rahmatsyah, 2021).	Shell structure in mollusks
2	Specification of Tongkah	Tongkah boards are made from islandwood *(Alstonia scholaris)* and jelutung wood *(Dyera costulata)*	Wood Islands *(Alstonia scholaris)* It contains alkaloids, flavonoids, coumarins, tannins, saponins, and phenolic compounds that function to protect wood from microbes such as fungi and bacteria. In addition, this wood has anti-inflammatory, antimicrobial, and antioxidant properties, making it more resistant to damage caused by microorganisms (Chhajed et al. 2023). Jelutung Wood *(Dyera costulata)* It has a smooth texture, straight fibers, and a slightly glossy surface, with strength classes III-IV and durability V, meaning it is medium strength and not very resistant to natural decay. This wood can be grown in swampland or agroforestry systems, so that its use can be integrated into environmentally friendly cultivation practices. In addition, jelutung plants have the potential to be phytoremediators, able to absorb heavy metals from the soil (Martha et al., 2021; Sampang et al., 2025; Tata et al., 2015).	Secondary metabolites in plants
		The board of the barrel should be thick and strong	The principle of pressure and mass distribution on the soft surface, the wider the field (board), the less pressure it will be so that it does not sink in the mud. The human body adjusts the force and position of the feet when moving in the mud, this principle is similar to the use of a wooden plank to maintain mass distribution (Grant et al. 2024).	Biomechanics of human movement on soft substrates, physics of pressure and force

					on soft substrates

Furthermore, Table 2 presents the relationship between the tradition of manongkah keclam, learning outcomes, biological materials, learning models, examples of activities, and socio-cultural values in a systematic manner.

Table 2. Table of Integration of Manongkah Clams in Biology Learning

Aspects of Tradition	Learning Outcomes	Biology Material	Learning Model	Examples of Activities	Reflection on Values (Social/Cultural
The Tradition of Scallops	Explaining coastal ecosystems and the position of shellfish in the food chain	Coastal ecosystems, food chains	Inquiry-Based Learning/ simulasi	Simulation of coastal ecosystems using artificial mud/shells, or documentary videos	Respect environmental wisdom
Adaptation of blood shells	Identifying the morphological and physiological adaptations of blood shells	Mollusc/bivalve phylum: physiological anatomy, hemoglobin, adaptation to mud	Project-Based Learning (PjBL)	Observation of artificial shells or diagrams, making models of shellfish bodies	Awareness of the survival of organisms
Environmental changes	Applying contextual learning in biology	Concept of ecosystem and organism adaptation	Project-Based Learning / PjBL	Problem-based project/case study: impact of over-harvesting of shellfish, poster making	Improve observation, critical thinking, and environmental awareness skills

As part of the ethnopedagogical approach, Table 3 presents the values contained in the local potential of the manongkah shellfish tradition as a foundation for strengthening biology learning that is oriented towards character and environmental concern.

Table 3. Values Contained in the Local Potential of Manongkah Kerang

Yes	Aspects/Types of Values	Description of Values	Implementation in the Manongkah Kerang Tradition
1	Social Value	Activities are carried out together and involve close social relationships in the community	The preparation of the tongkah, going down to the muddy location, and the distribution of the proceeds is often acknowledged by family members or communities together (Ilhami et al., 2021; Vitasari et al., 2023).
2	Economic Value	This tradition became the main livelihood to meet the needs of the	Blood clam catch *(Anadara granosa)* which was captured sold as a source of income or consumed by the Duano

		family	household (Salmiah 2021).
3	Educational Value	Local knowledge is passed down from generation to generation through hands-on practice	Knowledge of manongkah techniques, tidal reading, and recognizing the location of shells is taught to the younger generation through hands-on practice with older family members (Ilhami et al. 2021).
4	Ecology/Conservation Value	Local knowledge to maintain the sustainability of coastal resources	Adjust the harvest time of the shellfish to natural conditions (tides and tides), and maintain the size of the shellfish so that regeneration occurs (Ilhami et al. 2021).
5	Cultural Values	Tradition as a symbol of tribal identity and cultural heritage	Manongkah is part of the Duano cultural festival and a symbol of the identity of the coastal community (Ilhami et al. 2021).

DISCUSSION

Based on the results of the study contained in Table 1-3, the manongkah kerang tradition not only represents the cultural practices of coastal communities, but also shows a form of socio-ecological adaptation that can be integrated into biology learning to help students understand the concept of coastal ecosystems, organism adaptation, and environmental change and conservation issues in an authentic and meaningful manner.

The manongkah scallop activity was initially the main livelihood of the Duano Tribe to meet the needs of life. This tradition then develops as environmental degradation occurs, which triggers biophysical changes, so that they can no longer sail the sea to catch fish. These conditions prompted the Duano Tribe to settle down and turn to looking for blood shells (*Anadara granosa*), which are abundant in the muddy area of Indragiri Hilir (Vitasari et al., 2023). These findings show that the tradition of manongkah clams is a form of community adaptation to changes in the coastal environment.

The results of the study show that in the tradition of manongkah clams, there are four species of animals found, and all of them belong to the Phylum Mollusca. The species that are most commonly found are *Anadara granosa* (Virgin Shell). In addition, it was also found that *Natica tigrina* (moon snail), which belongs to the class of Gastropods because it has a single shell, *Placuna popyracea* (senteng), which is included in the Bivalvia class, as well as *Strombus canarium* (snails), which also belong to the class Gastropoda (Kartika, Sriyati, and Sanjaya 2019).

The use of local potential in biology learning allows teachers to present a learning experience that is more authentic, contextual, and relevant to students' lives. The results of the study show that the integration of the local wisdom of the manongkah clam can enrich the learning process through improving observation skills, critical thinking, and environmental awareness. These findings are in line with Mensah (2021), who states that learning based on local contexts increases the meaning of biological concepts and students' closeness to the surrounding environment. This is also in line with the findings of Kasi et al (2024), which affirms that the integration of local science fosters cultural identity and ecological concern.

Coastal Ecosystems and Biotic-Abiotic Interactions

Based on the results of the analysis in Table 1 and the integration of learning in Table 2, the maneggkah tradition of shellfish provides a clear picture of the interaction of organisms with the muddy coastal environment. This activity is relevant to be used as a context for ecosystem learning,

especially in understanding the relationship between biotic and abiotic factors, food chains, and coastal ecosystem dynamics. Ilhami et al. (2021) show that the coastal area of Indragiri Hilir has unique ecological characteristics and has high potential as a source of environmental learning. This explanation strengthens the relevance of the use of shellfish in biology learning, especially to help students construct an understanding of ecosystems through observation, simulation, or *Inquiry-Based Learning* activities. The inquiry-based approach allows students to discover concepts independently, making learning more meaningful.

Morphological and Physiological Adaptation of Shellfish

Manongkah mussels also open learning opportunities related to organism adaptation, especially the adaptation of blood to muddy environments. The morphological structure of bivalves, such as gills, chiffons, and shells, plays an important role in survival strategies. The presence of hemoglobin in blood shells is also an interesting example of physiological adaptation to discuss. These findings are consistent with the biological literature that emphasizes the relationship between structure, function, and the environment. Research by Sriyati et al. (2022) shows that the use of local wisdom can improve students' environmental literacy and help them understand the concept of adaptation more contextually. Through *Project-Based Learning*, students can create anatomical models of shells or perform image analysis to understand the relationship between morphology and function.

Environmental Change and Conservation

Another aspect of the mussels manongkah tradition that is relevant in biology learning is the issue of environmental change. Uncontrolled shellfish harvesting activities can lead to population decline and disrupt the balance of coastal ecosystems. This can be used as a basis for *problem-based learning* or case studies. Nur et al. (2025) showed that the integration of local issues in biology learning can improve students' attitudes of caring for the environment and critical thinking skills. By analyzing the impact of shellfish exploitation, students learn about the conservation of natural resources and the importance of sustainable ecosystem management. This activity is in line with the Pancasila Student Profile, especially the dimension of critical thinking and global diversity.

Conformity with the Independent Curriculum

The integration of the manongkah kerang tradition in biology learning is in line with the principles of the Independent Curriculum, which emphasizes flexible, contextual, and issue-based learning on local, national, and global issues. The integration of manongkah shellfish into biology learning is in line with the learning outcomes of phase E, where students are required to be able to create solutions to environmental problems based on biodiversity, ecosystems, and environmental change. Previous studies (Laamena & Laurens, 2021; The Ministry of Education and Culture, 2022) also emphasized that the integration of local wisdom supports the development of soft skills, analytical skills, and the formation of ecological character. Thus, learning based on the mango manongkah tradition not only strengthens the understanding of biological concepts but also fosters local identity and a sense of responsibility for the environment.

CONCLUSION

This study shows that the manongkah shellfish tradition contains local knowledge that is in harmony with biological concepts such as coastal ecosystems, organism adaptation, biomechanics of motion, and environmental conservation values. The integration of this local potential in biology learning has proven to be relevant to improve students' conceptual understanding as well as provide contextual and meaningful learning experiences. Through the application of inquiry-based and

project-based learning models, students not only understand scientific concepts but also develop critical thinking skills, observation skills, and awareness of environmental conservation. In addition, the integration of local wisdom is in line with the principles of the Independent Curriculum, which emphasizes context-based learning, character development, and strengthening the Pancasila Student Profile. This tradition also plays a role in fostering local identity, cultural values, and ecological concerns that are important for the sustainability of the coastal environment. Thus, the use of the manongkah kerang tradition as a source of biology learning not only has pedagogical value but also contributes to cultural preservation and strengthening students' relationships with their natural and social environment. The results of this study are expected to be a reference for biology teachers in designing contextual learning based on local potential, encouraging the development of a curriculum that is responsive to local wisdom, and opening up opportunities for further empirical research related to the effectiveness of integrating shell manongkah in biology learning in the classroom.

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REFERENCES

Annisha, D. (2024). Integrasi Penggunaan Kearifan Lokal (Local Wisdom) dalam Proses Pembelajaran pada Konsep Kurikulum Merdeka Belajar. *Jurnal Basicedu*, *8*(3), 2108–2115. https://doi.org/10.31004/basicedu.v8i3.7706

Bani, E. A. S. (2021). Kebudayaan dalam Konsep Pedagogik Berbasis Kearifan Lokal. *Jurnal Pendidikan Tambusai*, *5*, 1605–1612.

Chhajed, M., Jain, A., Pagariya, A., Dwivedi, S., Jain, N., & Taile, V. (2023). *Alstonia scholaris Linn . R . Br .: An Assessment of its Botany, Conventional Utilizaton , Phytochemistry and Pharmacology*. *17*(33), 184–203. https://doi.org/10.5530/097627870302

Christina M. Laamena, T. L. (2021). *Development of Integer Number Learning Devices Using Moluccas Local Wisdom*. *10*(1), 60–70.

Diansyah, G., & Agussalim, A. (2023). *Phytochemical composition , total phenolic content and antioxidant activity of Anadara granosa (Linnaeus , 1758) collected from the east coast of South Sumatra , Indonesia Abstract :* 1–8.

Grant, B. F., Charles, J. P., D'Août, K., Falkingham, P. L., & Bates, K. T. (2024). Human walking biomechanics on sand substrates of varying foot sinking depth. *Journal of Experimental Biology*, *227*(21). https://doi.org/10.1242/jeb.246787

Haka, N. B., Anggoro, B. S., Hamid, A., Novitasari, A., Handoko, A., & Puspita, L. (2020). The Development of Biology Module Based on Local Wisdom of West Lampung: Study of Ecosystem Material. *Journal of Physics: Conference Series*, *1467*(1). https://doi.org/10.1088/1742-6596/1467/1/012013

He, X., Liao, Y., Yu, G., Wang, S., & Bao, Y. (2024). Genome-wide association study reveals the underlying regulatory mechanisms of red blood traits in Anadara granosa. *BMC Genomics*, *25*(1). https://doi.org/10.1186/s12864-024-10857-3

Ilhami, A., Diniya, D., Susilawati, S., Sugianto, R., & Ramadhan, C. F. (2021). Analisis Kearifan Lokal Manongkah Kerang di Kabupaten Indragiri Hilir, Riau sebagai Sumber Belajar IPA

Berbasis Etnosains. *Sosial Budaya, 18*(1), 20. https://doi.org/10.24014/sb.v18i1.12723

Insani S, P. M., & Rahmatsyah, R. (2021). Analisis Pola Struktur Kalsium Karbonat (CaCO3) Pada Cangkang Kerang Darah (Anadara granosa) Di Bukit Kerang Kabupaten Aceh Tamiang. *Jurnal Teori Dan Aplikasi Fisika, 9*(1), 23–32. https://doi.org/10.23960/jtaf.v9i1.2717

Jaowatana, N., Yalc, S., & Satapornvanit, K. (2024). *Characteristics of minerals and oxide compounds in sediment collected from blood cockle culture areas at Bandon Bay , Thailand*. https://doi.org/10.1371/journal.pone.0305061

Kartika, Sriyati, S., & Sanjaya, Y. (2019). *Pengembangan Bahan Ajar Berbasis Kearifan Lokal Menongkah Kerang Suku Duano Provinsi Riau Untuk Meningkatkan Kemampuan Klasifikasi dan Literasi Lingkungan Siswa pada Konsep Moluska*. Universitas Pendidikan Indonesia.

Kasi, Y. F., Widodo, A., Samsudin, A., Riandi, R., & Novia, N. (2024). *Integrating Local Science and School Science : The Benefits for Preserving Local Wisdom and Promoting Students ' Learning*. *27*(1), 24–36. https://doi.org/10.20961/paedagogia.v27i1.83925

Kemendikbudristek RI. (2022). *Dimensi , Elemen , dan Subelemen Profil Pelajar Pancasila*.

Kristianus Jevrino Mozes, & Zega, Y. K. (2025). Optimalisasi Website untuk Promosi dan Pelestarian Budaya Kampung Adat Tradisional. *Jurnal Ilmiah Multidisiplin, 3*(1), 15–24. https://doi.org/10.62282/juilmu.v3i1.15-24

Martha, R., Mubarok, M., Darmawan, W., Sya, W., & Dumarcay, S. (2021). *Biomolecules of Interest Present in the Main Industrial Wood Species Used in Indonesia-A Review*. https://doi.org/10.32604/jrm.2021.014286

Mensah, F. M. (2021). CulturallyRelevant and Culturally Responsive: Two Theories of Practice for Science Teaching. *National Science Teaching Association, 58*(4), 2009–2012.

Moulton, M., Suanda, S. H., Garwood, J. C., Kumar, N., Fewings, M. R., & Pringle, J. M. (2023). *Exchange of Plankton , Pollutants , and Particles Across the Nearshore Region*. 167–202.

Nowacki, D. J., Stevens, A. W., Takesue, R. K., & Grossman, E. E. (2024). Fluvial Delivery and Wave Resuspension of Sediment in a Sheltered , Urbanized Pacific Northwest Estuary. *Estuaries and Coasts, 47*(1), 32–47. https://doi.org/10.1007/s12237-023-01256-0

Nur, A., Oktapianur, I., & Ramdiah, S. (2025). *Eksplorasi pandangan siswa SMA Negeri 8 Banjarmasin mengenai integrasi kearifan lokal dalam pembelajaran biologi*. 398–402.

Permata, Y. M., Liesna, A. T., Rangkuti, F. M., & Dayanti, Y. (2023). *Indonesian Journal of Pharmaceutical and Proximate composition of ndara granosa and Paphia undulata*. *06*(01), 1–5.

Philia, I. T., Sembiring, T., Siahaan, R. Y., & Pratama, D. E. (2025). *Dampak Modernisasi Terhadap Dinamika Kebudayaan Masyarakat di Indonesia*.

Purnawibawa, A. G., Sembiring, S., & Wirawan, I. G. M. A. S. (2021). *Peluang dan Tantangan Digitalisasi Warisan Budaya Benda dan Tak Benda sebagai Upaya Pelestarian Budaya Indonesia*. *October*.

Rios-yunes, D., Grandjean, T., Primio, A., Tiano, J., Bouma, T. J., Oevelen, D. Van, & Soetaert, K. (2023). *Sediment resuspension enhances nutrient exchange in intertidal mud fl ats*. *March*, 1–15. https://doi.org/10.3389/fmars.2023.1155386

Rummar, M. (2022). kearifan lokal dan penerapannya di sekolah Marthen. *Syntax Tranformation, 3*(12).

Salmiah. (2021). Peran ' Menongkah ' Tradisi Mencari Kerang Sebagai Upaya Peningkatan Pendapatan Ekonomi Keluarga Pada. *EKLEKTIK: Jurnal Pendidikan Ekonomi Dan Kewirausahaan, 4*, 61–69.

Sampang, Bayu Saputro, R. O. (2025). *Pola agroforestry Berbasis Jelutung Rawa dan Balangeran* (Pertama). KPSHK Konsorsium Pendukung Sistem Hutan Kerakyatan.

Sari, H. D., Riandi, R., & Surtikanti, H. K. (2024). Bahan Ajar Digital Bermuatan Potensi Lokal

Untuk Meningkatkan Pemahaman Konsep dan Motivasi Belajar Pada Materi Bioteknologi Konvensional. *Jurnal Basicedu*, *8*(1), 263–276. https://doi.org/10.31004/basicedu.v8i1.6503

Sofya, N.D., Esabella, S., E, E., & Yunanri., W. (2025). Digitalisasi Sebagai Sarana Pelestarian Kebudayaan Lokal. *Jurnal Pengabdian Rekayasa Sistem*.

Srisunont, T., & Chayarat, S. (2022). *Potential at Klong Khone , Samut Songkharm Province and Bang*. *22*(4), 1–21. https://doi.org/10.55003/cast.2022.04.22.008

Sriyati*, S., Marsenda, P. H., & Hidayat, T. (2022). Pemanfaatan Kearifan Lokal Orang Rimba di Jambi Melalui Pengembangan Bahan Ajar Untuk Meningkatkan Literasi Lingkungan Siswa. *Jurnal Pendidikan Sains Indonesia*, *10*(2), 266–278. https://doi.org/10.24815/jpsi.v10i2.23548

Su, F. A., Sahari, M. S. I., Razali, N. A. M., Nor, M. M., Abdullah, S., Jaafar, N. S. N., & Omar, W. B. W. (2025). *The abundance of blood cockle (Anadara cornea) and its sediment grain size preferences at Setiu Wetlands lagoon , east coast of Peninsular Malaysia*. *18*(4), 1643–1649.

Subrata, I. M., & Rai, I. G. A. (2023). Pembelajaran biologi berbasis etnopedagogi dalam peningkatan literasi sains dan karakter peserta didik 1,2. *Prosiding Seminar Nasional Penelitian*, *57*.

Tasya, I., Raihan, M., Luren, L., & Sapitri, W. (2023). *Analisis Pengaruh Arus Globalisasi Terhadap Budaya Lokal (Indonesia) " Analisis Dampak Globalisasi Terhadap Kebudayaan Lokal di Era Digital .". 3*(2), 40–47.

Tata, H. L., Bastoni, Sofiyuddin, M., Mulyoutami, E., Perdana, A., & Janudianto. (2015). *Jelutung Rawa Teknik Budidaya dan Prospek Ekonominya*. World Agroforestry Centre (ICRAF) Southeast Asia Regional Program.

Vitasari, Viktor Amrivo, Khodijah Ismail, T. E. Y. (2023). Perkembangan Livelihood Menongkah Suku Duano menjadi Festival Budaya Masyarakat Indragiri Hilir. *Jurnal Ekologi, Masyarakat Dan Sains*, *4*, 38–43.

Yektyastuti, R., Muzzazinah, M., Erlangga, S. Y., & Usgianti, R. (2024). Kajian Etnosains dalam Aktivitas Manongkah Kerang di Kabupaten Indragiri Hilir Riau sebagai Sumber Belajar Ilmu Pengetahuan Alam. *Social, Humanities, and Educational Studies (SHES): Conference Series*, *7*(3), 1502–1514. https://doi.org/10.20961/shes.v7i3.92114