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Local Wisdom-Based Science and Environmental Education Management: Perspectives from the Bunggu Indigenous Community

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Abstract: Strengthening science and environmental education through local wisdom is a strategic approach to creating contextual, relevant, and sustainable learning, particularly within indigenous communities. This study aims to explore how the Bunggu Indigenous Community in Pasangkayu, Indonesia, integrates local wisdom values into the management of science and environmental education. Utilizing a qualitative case study approach, data were collected through in-depth interviews, participatory observations, and document analysis involving traditional leaders, educators, and educational stakeholders. The findings reveal that scientific concepts such as ecology, environmental conservation, natural resource management, and traditional technology are taught through culturally inherited practices. The community's education management combines local wisdom with formal curricula, resulting in adaptive and contextual strategies for science and environmental learning. These findings emphasize that integrating local wisdom into science and environmental education not only enriches the learning process but also strengthens ecological awareness, cultural identity, and community participation in environmental preservation. This study contributes to the development of an education management model that is more responsive to local cultural contexts and highlights the need for educational policies that support local wisdom-based learning.

Keywords: Conservation; Environmental education; Local wisdom; Science Education.

Introduction

Science and environmental education play a crucial role in shaping generations who not only understand scientific concepts but also possess ecological awareness and social responsibility towards environmental sustainability. In an era of globalization and increasingly evident climate change, education is required not only to transfer theoretical knowledge but also to instill values of environmental preservation that are relevant to students' daily lives (Asmayawati et al., 2024; Sayono et al., 2020). However, the approach to science and environmental education in various regions, particularly within indigenous communities, is still dominated by models that are disconnected from local socio-cultural contexts (Abubakar et al., 2022; Kisno et al., 2022; Wijaya & Yurnetti, 2023).

Indonesia, as a country rich in cultural diversity and natural resources, holds significant potential for developing science and environmental education based on local wisdom. The traditional knowledge inherited by indigenous communities encompasses various scientific concepts, such as ecosystem management, natural resource conservation, and simple, environmentally friendly technologies. Unfortunately, the formal education system has yet to fully utilize this

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wealth of local wisdom as a contextual and meaningful learning resource for students (Hawa et al., 2021; Mukhtar et al., 2021).

Local wisdom within indigenous communities functions not only as a cultural heritage but also embodies scientific principles that can be integrated into science and environmental education. Knowledge of sustainable farming practices, the use of medicinal plants, forest management, and water conservation methods is a clear example of applying ecological and biological concepts in daily community life. This approach aligns with the concept of Contextual Teaching and Learning (CTL), which emphasizes the importance of connecting learning materials to students' social and cultural environments.

The Bunggu Indigenous Community in Pasangkayu District is a clear example of how local wisdom serves as an integral part of environmental management and sustainable utilization of natural resources. However, these local practices, rich in scientific and environmental values, have not been fully accommodated within formal education management. There remains a gap between the standardized national curriculum and the learning needs rooted in local culture and environmental contexts (Fiharsono et al., 2024; Nggaruaka et al., 2022; Suwarno, 2020).

Local wisdom-based science and environmental education management offer a solution to bridge this gap (Nopriyasman et al., 2024; Ridwan Ali & Mulasi, 2023). By integrating cultural values into educational management strategies, the learning process becomes more adaptive, relevant, and capable of shaping students' character to be environmentally conscious and proud of their cultural identity. Moreover, this approach also encourages active community participation in supporting sustainable education (Boripis et al., 2024; Lubis, 2019; Nugroho et al., 2023)

Various studies have shown that environmental education based on local wisdom can enhance students' ecological awareness and strengthen their connection to the surrounding natural environment. However, research discussing how science and environmental education management are systematically organized based on local wisdom, particularly within indigenous communities such as Bunggu, remains very limited. In fact, effective management is the key to successfully integrating traditional knowledge with formal education systems.

Based on this background, this study aims to explore the practices of local wisdom-based science and environmental education management within the Bunggu Indigenous Community. The main focus of this research is to identify management strategies, challenges, and opportunities in integrating local cultural values into sustainable science and environmental learning.

Therefore, this study is expected to provide both theoretical and practical contributions to the development of contextual education management models, particularly in the field of science and environmental education rooted in local wisdom. Additionally, the findings of this research are intended to serve as a reference for policymakers and education practitioners in designing more inclusive, adaptive, and sustainability-oriented learning strategies that promote environmental preservation and cultural heritage.

Educational management is a structured process that encompasses planning, organizing, implementing, and supervising all educational resources to achieve educational objectives effectively and efficiently**.** According to Pereira & Viegas, educational management is not solely oriented towards administration but also involves strategic aspects in creating a conducive and adaptive learning environment. This concept emphasizes the importance of managerial roles in managing the dynamics of education, which continuously evolve in line with social and cultural changes within society.

In its development, the paradigm of educational management has shifted from a bureaucratic approach to a more participatory and contextual model. Modern education must focus not only on academic achievement but also on the development of students' character and competencies relevant to contemporary needs. Therefore, flexibility in educational management becomes a key factor in addressing the challenges of globalization and socio-cultural diversity (Hiziroglu, 2021; Mohamed et al., 2023).

However, in many developing countries, including Indonesia, educational management systems are still dominated by a uniform, centralized approach. The national standards implemented often overlook local contexts, leading to a mismatch between educational policies and the socio-cultural realities at the community level. This condition has the potential to reduce the effectiveness of education, particularly in regions rich in cultural heritage, such as indigenous communities (Nieto et al., 2019; Salmon, 2024).

Therefore, an educational management approach that accommodates local cultural diversity is necessary. An inclusive and culture-based educational management concept offers a solution for creating a system that is not only administratively efficient but also socially and culturally relevant. This approach provides opportunities for integrating local wisdom into educational management, allowing education to function as a tool for community empowerment (Kenno et al., 2021; Manning, 2023)

Local wisdom is a collection of values, norms, and knowledge developed within a community as a result of its adaptation to the natural and social environment. Grossmann et al. (2020) states that local wisdom is a manifestation of living culture, passed down through generations, and serves as a guide in daily life. In the context of education, local wisdom plays a vital role as a source of values that can enrich the curriculum and shape students' character.

Education that integrates local wisdom creates a more contextual and meaningful learning process. Students not only acquire academic knowledge but also understand cultural values relevant to their social environment (Grossmann et al., 2020). Emphasize that education based on local wisdom can enhance a sense of ownership of one's own culture and encourage students to be more engaged with their communities.

Moreover, local wisdom in education serves as a tool for cultural preservation amid the tide of modernization, which tends to homogenize mindsets and global values. By incorporating local wisdom into the education system, communities can ensure that younger generations continue to recognize and appreciate their cultural identity. This is essential for maintaining cultural sustainability, particularly within indigenous communities that are vulnerable to the negative impacts of globalization (Glück, 2024; Glück & Weststrate, 2022; Zadworna & Ardelt, 2024).

However, the integration of local wisdom into education still faces various challenges, such as limited space within the formal curriculum and a lack of understanding among educators regarding local cultural values. Therefore, systematic efforts are needed to elevate local wisdom as an integral part of the educational process, rather than merely as supplementary or symbolic content (Eko & Putranto, 2019; Hatchimonji et al., 2020; Pike et al., 2021).

Local wisdom-based educational management is an approach that places local cultural values as the foundation for managing all aspects of education. This model focuses on integrating cultural principles with modern managerial practices to create an education system that is relevant to the needs of the local community. DeFrank et al. (2019) states that this approach not only enriches the educational process but also strengthens social cohesion within the community.

In practice, local wisdom-based educational management involves active participation from the community, traditional leaders, and parents in decision-making processes related to education. This creates a more democratic system that is responsive to local socio-cultural dynamics. Moreover, this approach enables the development of a more flexible and contextual curriculum, allowing students to engage in learning that is aligned with the realities of their daily lives (Forsdike et al., 2024; Kartal, 2021; Restrepo-Mieth et al., 2023).

Various studies have shown that the implementation of local wisdom-based educational management can enhance the effectiveness of education within indigenous communities. Edwards (2019) found that this model is capable of increasing community participation, strengthening students' character, and fostering sustainable education. However, the greatest challenge lies in the mismatch with national education regulations, which remain uniform and centralized.

Therefore, policies that support flexibility and recognize the richness of local cultural heritage within the education system are essential. Local wisdom-based educational management is not only a solution for indigenous communities but also an innovation that can be applied in various contexts to create a more inclusive, adaptive, and sustainable education system (Jeste et al., 2021; Sundstrom et al., 2024).

Several studies have highlighted the importance of local wisdom in educational systems within Indigenous communities. In their study of the Baduy community, they demonstrated that informal, tradition-based education is capable of shaping character and preserving cultural values without relying on the formal education system. This proves that local wisdom plays a central role in establishing a harmonious and sustainable social order.

A study of a community from one of the tribes in Africa found that integrating ancestral teachings into formal education can enhance students' environmental awareness and social solidarity. An educational model that combines local values with the national curriculum has proven to be more effective in shaping students with strong character and a deep sense of community engagement.

Nevertheless, there is still a significant lack of research specifically examining the practices of local wisdom-based educational management within particular indigenous communities, including the Bunggu Indigenous Community. Most studies tend to focus solely on learning approaches or curriculum development, without addressing how managerial processes and educational governance are conducted based on local cultural values.

This gap in the literature highlights the need for further research to enrich understanding of local wisdom-based educational management models. This study aims to contribute to filling that gap by offering both practical and theoretical insights into how local wisdom can be systematically integrated into educational management within indigenous communities.

Method

This study employs a qualitative approach with a case study design to explore in depth the practices of local wisdom-based educational management within the Bunggu Indigenous Community in Pasangkayu District, Indonesia. This approach was chosen as it allows the researcher to understand social and cultural phenomena in their original context and to uncover the meanings behind the application of local values in educational management (Druker-Ibáñez & Cáceres-Jensen, 2022; Manningtyas & Furuya, 2022). The case study design provides an opportunity to analyze dynamics, social interactions, and managerial practices that cannot be captured through quantitative methods (Ritchie & Phillips, 2023; Sandoval-Rivera, 2020; Zakharova et al., 2021).

The research location was determined purposively, specifically within the Bunggu Indigenous Community, which is known for preserving traditions and local wisdom across various aspects of life, including education. The research subjects included traditional leaders, educators from local educational institutions, community members, and representatives from the local Department of Education. Informants were selected using purposive sampling, targeting individuals deemed to have relevant knowledge and experience related to local wisdom-based educational management practices.

Data were collected using three primary techniques: in-depth interviews, participatory observations, and document analysis. Semi-structured interviews were conducted with key informants to gather information regarding cultural values applied in educational management. Participatory observation allowed the researcher to directly observe educational activities and social interactions within the community, providing a comprehensive understanding of the implementation of local wisdom. Additionally, document analysis was carried out by reviewing various records, such as traditional archives, educational activity reports, and relevant local policy documents.

The data analysis process was conducted inductively using thematic analysis. Data obtained from multiple sources were reduced and categorized based on emerging key themes, such as communal cooperation (gotong royong), respect for nature, and the role of ancestral teachings in educational management. The data were then presented in descriptive narrative form to identify patterns relevant to the research focus. Conclusions were drawn gradually by considering the interrelationships among the themes identified in the field (Braun & Clarke, 2023; Christou, 2024; McMahon et al., 2022).

To ensure data validity, this study employed source and method triangulation by comparing the results of interviews, observations, and document analyses to obtain consistent and reliable data. Additionally, member checking was conducted by seeking confirmation from key informants regarding the interpretation of the collected data, thereby minimizing researcher bias. The entire research process was carried out in accordance with ethical principles, including obtaining informed consent from participants prior to data collection and ensuring the confidentiality of respondents' identities (Kogen, 2024; Sun et al., 2025; Wiltshire & Ronkainen, 2021).

Result and Discussion

Integration of Local Wisdom Values in Science and Environmental Learning

The findings reveal that the Bunggu Indigenous Community practices various forms of local wisdom that inherently contain scientific and environmental concepts. Knowledge of forest management, sustainable agriculture systems, and the use of medicinal plants represents concrete applications of ecological, biological, and conservation principles in daily life. These values are passed down through generations via cultural activities, rituals, and social practices, which indirectly become part of an environmental-based science learning process (Chen & Wu, 2024; Redvers et al., 2020).

The educational management within this community utilizes local wisdom as a medium for contextual learning. Educators and traditional leaders collaborate to integrate traditional knowledge into science learning materials, although it is still conducted informally or outside the formal curriculum. For example, students are taken directly into the customary forest to study various medicinal plants, understand ecosystem functions, and recognize the importance of maintaining environmental balance. This approach aligns with the principles of Contextual Teaching and Learning (CTL), which connects scientific theory to students' real-life experiences within their surroundings (Kimmerer & Artelle, 2024; Ruwhiu et al., 2022).

Furthermore, the concept of conservation serves as one of the main themes in environmental education within the Bunggu Community. Through local wisdom, students are taught the importance of preserving natural resources as part of their social and spiritual responsibility. Practices such as prohibitions against indiscriminate land clearing (*pamali*), crop rotation management, and the protection of water sources represent forms of environmental education that have existed long before modern ecological concepts were introduced.

This educational management strategy places the community at the center of the learning process. The active involvement of parents, traditional leaders, and educators in designing nature-based learning activities makes science and environmental education more relevant to the students' real-life context. This approach contrasts with formal education models, which are often theoretical and disconnected from local socio-cultural realities.

However, the integration of local wisdom into science and environmental learning still faces challenges, particularly in aligning with the national curriculum. The formal education system has yet to accommodate the development of culturally-based learning materials fully, leaving these initiatives largely communal and not yet institutionalized. Nevertheless, the practices implemented by the Bunggu Community demonstrate significant potential in creating an adaptive, culturally-rooted, and environmentally-oriented science learning model.

These findings are consistent with previous studies that highlight the importance of local wisdom-based environmental education in enhancing students' ecological awareness and social responsibility. In addition to enriching the learning process, this integration also plays a vital role in cultural preservation and strengthening indigenous community identity amid the growing forces of globalization (Demssie et al., 2020; Lushombo, 2025).

Thus, local wisdom-based science and environmental education management in the Bunggu Indigenous Community can serve as an alternative model for developing contextual education in other regions. This approach is relevant not only for Indigenous communities but can also enhance the quality of science education that is more deeply rooted in local values and directly contributes to environmental preservation.

Science and Environmental Education Management Strategies in the Bunggu Indigenous Community

Educational management in the Bunggu Indigenous Community functions not only as administrative governance but also as a collective effort to preserve cultural values while instilling scientific and environmental concepts in younger generations. The primary strategy implemented is community-based participation, where traditional leaders, educators, and parents are actively involved in designing learning activities that integrate scientific theory with local wisdom practices (Datta, 2023; Jacob et al., 2024).

One key strategy is using the natural environment as an open learning space. Customary forests, rivers, and fields serve as natural laboratories where students learn concepts such as ecology, natural recycling, water conservation, and biodiversity. In this way, students not only understand science theoretically but also directly observe how these concepts are applied in daily life, aligned with their cultural practices.

Additionally, educational management in this community adopts the principle of curriculum flexibility, where learning materials are adjusted according to the traditional calendar and natural cycles. For example, during planting or harvest seasons, students participate in traditional farming activities, which simultaneously serve as a medium for learning about plant biology, the water cycle, and sustainable ecosystem principles. This approach makes science education more dynamic and meaningful.

A unique aspect of this management strategy is the significant role of traditional leaders as educational facilitators. These leaders not only uphold cultural norms but also contribute to transferring environmental knowledge and traditional technologies to students. The synergy between formal educators and traditional leaders creates a harmonious learning environment that bridges modern scientific knowledge with local wisdom.

In terms of resource management, the Bunggu Community utilizes local potential without relying entirely on modern facilities. Traditional tools used in daily activities become mediums for teaching basic physics concepts, such as levers, balance, and force. This demonstrates creativity in managing science learning using available resources while strengthening students' understanding of environmentally friendly technologies.

However, limitations in formal documentation and policy support pose challenges to expanding this strategy more broadly. Educational management within the community remains traditional and is not yet integrated into national education policies. As a result, the significant potential of local wisdom-based science and environmental education has yet to be fully recognized by external stakeholders.

Nevertheless, the strategies implemented by the Bunggu Community demonstrate that with a participatory and culture-based approach, science and environmental education management can function effectively even with limited resources. This model can serve as an example for other regions with similar characteristics in developing relevant, adaptive, and sustainable education.

Challenges and Opportunities in Developing Local Wisdom-Based Science and Environmental Education

The integration of local wisdom into science and environmental education faces various structural and cultural challenges. One of the main challenges is the misalignment between the standardized national

curriculum and the learning needs rooted in local cultural contexts. The formal curriculum tends to focus on global standards, offering little flexibility for indigenous communities to develop contextual learning materials (Howard et al., 2024; Tanyanyiwa, 2019).

In addition, there are limitations concerning educators who understand and can integrate local wisdom into science education. Teachers assigned to indigenous areas often lack background knowledge or a deep understanding of local culture, leading them to apply rigid teaching methods that are not relevant to the students' environment.

Resource constraints, both in terms of educational facilities and teaching materials suited to the local context, also pose significant challenges. The available science learning materials are generally standardized and fail to accommodate local knowledge, which is actually rich in scientific and environmental concepts. However, behind these challenges lies a great opportunity to develop a more adaptive and inclusive educational model. Local wisdom offers a unique perspective in science and environmental learning that focuses not only on cognitive aspects but also on character development, ecological awareness, and social responsibility.

With appropriate policy support, such as granting community-based educational autonomy and providing teacher training on the integration of local wisdom, this educational model can be expanded and incorporated into the national education system. Furthermore, collaboration between educational institutions, government bodies, and indigenous communities can strengthen the development of contextual curricula that combine modern science with traditional knowledge.

Another opportunity to be leveraged is the development of localized teaching materials and the documentation of local wisdom practices related to science and the environment. This would not only benefit education within the community but could also serve as a valuable source of knowledge for other regions and the global academic community (Datta & Marion, 2021; Li & Shein, 2023).

By maximizing this potential, local wisdom-based science and environmental education can become an innovative model for creating a sustainable and relevant education system that is capable of addressing global challenges without compromising local cultural identity.

The Role of Science and Environmental Education in Cultural and Ecological Preservation

Local wisdom-based science and environmental education in the Bunggu Indigenous Community serve not only as a means of transferring scientific knowledge but also play a vital role in preserving local culture and ecosystems. Through the integration of cultural values into learning, students are taught that protecting the environment is not merely an ecological obligation but also an integral part of their cultural identity and honor. This concept shapes a paradigm in which humans are seen as part of nature, not its masters, in accordance with the Bunggu community's philosophy of life (Chen & Wu, 2024; Lee et al., 2025).

The preservation of customary forests, water resource management, and environmentally friendly traditional farming practices serve as clear evidence of how the applied education system maintains a balance between human needs and environmental sustainability. Students learn about the importance of biodiversity, natural cycles, and the impact of human activities on the environment directly through cultural practices that have been tested over centuries.

Thus, science education in this community has been oriented towards sustainability long before the concept of sustainable development became recognized in the modern world. Local wisdom acts as a bridge between modern scientific knowledge and traditional conservation principles. This demonstrates that integrating science and environmental education with local culture can be an effective solution for addressing global issues such as climate change, environmental degradation, and biodiversity loss.

Moreover, this form of education serves as a cultural safeguard amid the currents of modernization and globalization, which tend to erode local values. The younger generation is encouraged not only to understand scientific concepts but also to appreciate and preserve their ancestral heritage. Through this approach, local wisdom-based science and environmental education foster a generation with ecological intelligence, strong cultural roots, and resilience to face global challenges with a solid sense of identity.

Contribution of Local Wisdom-Based Science and Environmental Education Management to Educational Innovation

The educational management model implemented by the Bunggu Indigenous Community makes a significant contribution to innovation in education, particularly in the development of contextual learning rooted in culture and the environment. Amidst the dominance of standardized, globally-oriented education models, this community-based approach offers a new perspective on how education can be adapted to local characteristics without compromising scientific integrity.

The core innovation of this model lies in its ability to integrate traditional knowledge with modern scientific concepts harmoniously. This creates a learning

experience that is not only theoretical but also practical and relevant to students' real lives. By utilizing the surrounding environment as a natural laboratory and local wisdom as a source of knowledge, education becomes more meaningful and effective.

Moreover, this model promotes community-based education, positioning the community as the primary actor in managing educational processes. This contrasts with the top-down approach often found in formal education systems. The participatory nature of this model has proven to increase community involvement, strengthen collective responsibility, and ensure that education aligns with local needs and aspirations.

Such an educational management concept can be replicated in other regions rich in cultural heritage and natural resources. With proper adaptation, this model has the potential to serve as an innovative solution for improving education quality in remote areas, indigenous communities, and regions facing geographical and social challenges.

Furthermore, this model is relevant in the global context, particularly in promoting sustainable and socially equitable education. Indonesia's integration of science, environmental awareness, and local culture represents a tangible contribution to the international discourse on sustainability-oriented education and cultural preservation.

Conclusion

This study concludes that the local wisdom-based science and environmental education management practiced by the Bunggu Indigenous Community is an effective model for creating contextual, relevant, and sustainable learning. The integration of local values, such as customary forest management, natural resource conservation, and traditional technologies, has proven to enrich science education while fostering ecological awareness and cultural preservation among students. The community-based management strategy, the use of the environment as a learning medium, and curriculum flexibility demonstrate that science education does not have to rely solely on uniform formal approaches. Instead, by leveraging local potential, the learning process becomes more adaptive to community needs and more meaningful for students. This model also enhances social engagement, reinforces cultural identity, and promotes collective responsibility for environmental stewardship. However, this study also identifies significant challenges in developing local wisdom-based science and environmental education, particularly regarding limited policy support, insufficient cultural understanding among educators, and rigid national curricula. Therefore, more flexible and culturally responsive policies and capacity-building are needed for educators to integrate traditional knowledge into science education effectively. This research offers both theoretical and practical contributions to the development of culturally and environmentally grounded educational management models. The findings are relevant not only for indigenous communities but also as a reference for contextual education development in other regions rich in cultural and natural resources. The integration of science, environment, and local wisdom presents an innovative solution for establishing a sustainable and socially just education system. As a recommendation, collaboration between government bodies, educational institutions, and indigenous communities is essential to develop contextual curricula that accommodate local wisdom in science and environmental education. Additionally, documenting and developing teaching materials based on local knowledge is crucial for broader application within formal education systems. Through these efforts, education can serve not only as a means of academic achievement but also as a pillar for cultural and environmental preservation**.**

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Author Contributions

P.A.L. contributed to the research, product development, data analysis, and manuscript writing; E.I. supervised the research activities through to manuscript completion; I.W. contributed to the conceptualization of the study.

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Conflicts of Interest

The authors declare no conflict of interest.

References

Abubakar, A., Aswita, D., Israwati, I., Ferdianto, J., Jailani, J., Anwar, A., Ridhwan, M., Saputra, D. H., & Hayati, H. (2022). The Implementation of Local Values in Aceh Education Curriculum. *Jurnal Ilmiah Peuradeun*, *10*(1), 165. https://doi.org/10.26811/peuradeun.v10i1.660

Asmayawati, Yufiarti, & Yetti, E. (2024). Pedagogical innovation and curricular adaptation in enhancing digital literacy: A local wisdom approach for sustainable development in the Indonesia context. *Journal of Open Innovation: Technology, Market, and Complexity*, *10*(1), 100233.

https://doi.org/10.1016/j.joitmc.2024.100233

Boripis, T., Pathak, S., Poungjinda, W., & Ling, J. C. Y. (2024). Community Participation Process for the Sustainable Business Development of Local Wisdom Learning Centers. *Journal of Human, Earth, and Future*, *5*(4), 660–673. https://doi.org/10.28991/HEF-2024-05-04-09

Braun, V., & Clarke, V. (2023). Is thematic analysis used well in health psychology? A critical review of published research, with recommendations for quality practice and reporting. *Health Psychology Review*, *17*(4), 695–718. https://doi.org/10.1080/17437199.2022.2161594

Chen, M.-K., & Wu, C.-C. (2024). Integrating Science, Technology, Engineering, and Mathematics (STEM) into Indigenous Education for Sustainability: The Development and Implementation of a Curriculum Based on Disaster Prevention for Young Children. *Sustainability*, *16*(21), 9186. https://doi.org/10.3390/su16219186

Christou, P. (2024). Thematic Analysis through Artificial Intelligence (AI). *The Qualitative Report*. https://doi.org/10.46743/2160-3715/2024.7046

Datta, R. (2023). Land-based environmental sustainability: a learning journey from an Indigenist researcher. *Polar Geography*, *46*(1), 3–17. https://doi.org/10.1080/1088937X.2022.2141905

Datta, R., & Marion, W. P. (2021). Ongoing Colonization and Indigenous Environmental Heritage Rights: A Learning Experience with Cree First Nation Communities, Saskatchewan, Canada. *Heritage*, *4*(3), 1388–1399. https://doi.org/10.3390/heritage4030076

DeFrank, M., Bivona, M., Chiaraluce, B., & Kahlbaugh, P. (2019). The Language of Wisdom Understood Through an Analysis of Wise Quotes. *Journal of Language and Social Psychology*, *38*(3), 376–389. https://doi.org/10.1177/0261927X19831743

Demssie, Y. N., Biemans, H. J. A., Wesselink, R., & Mulder, M. (2020). Combining Indigenous Knowledge and Modern Education to Foster Sustainability Competencies: Towards a Set of Learning Design Principles. *Sustainability*, *12*(17), 6823. https://doi.org/10.3390/su12176823

Druker-Ibáñez, S., & Cáceres-Jensen, L. (2022). Integration of indigenous and local knowledge into sustainability education: a systematic literature review. *Environmental Education Research*, *28*(8), 1209–1236. https://doi.org/10.1080/13504622.2022.2083081

Edwards, D. B. (2019). Shifting the perspective on community-based management of education: From systems theory to social capital and community empowerment. *International Journal of Educational Development*, *64*, 17–26. https://doi.org/10.1016/j.ijedudev.2018.11.004

Eko, B. S., & Putranto, H. (2019). The Role of Intercultural Competence and Local Wisdom in Building Intercultural and Inter-religious Tolerance. *Journal of Intercultural Communication Research*, *48*(4), 341–369. https://doi.org/10.1080/17475759.2019.1639535

Fiharsono, A., Carey, M., Hyde, M., Beazley, H., & Yektiningtyas-Modouw, W. (2024). Culturally based learning needs of Korowai students in a lowland-remote area of Indonesian Papua: school physical environment and building design. *The Australian Educational Researcher*, *51*(2), 611–629. https://doi.org/10.1007/s13384-023-00615-x

Forsdike, N. J., Baxter, L. F., & Town, J. S. (2024). Rescuing the Princess: How phronetic wisdom was learned and deployed on Britain's railways. *Management Learning*. https://doi.org/10.1177/13505076241259132

Glück, J. (2024). Wisdom and aging. *Current Opinion in Psychology*, *55*, 101742. https://doi.org/10.1016/j.copsyc.2023.101742

Glück, J., & Weststrate, N. M. (2022). The Wisdom Researchers and the Elephant: An Integrative Model of Wise Behavior. *Personality and Social Psychology Review*, *26*(4), 342–374. https://doi.org/10.1177/10888683221094650

Grossmann, I., Dorfman, A., & Oakes, H. (2020). Wisdom is a social-ecological rather than person-centric phenomenon. *Current Opinion in Psychology*, *32*, 66–71. https://doi.org/10.1016/j.copsyc.2019.07.010

Grossmann, I., Weststrate, N. M., Ardelt, M., Brienza, J. P., Dong, M., Ferrari, M., Fournier, M. A., Hu, C. S., Nusbaum, H. C., & Vervaeke, J. (2020). The Science of Wisdom in a Polarized World: Knowns and Unknowns. *Psychological Inquiry*, *31*(2), 103–133. https://doi.org/10.1080/1047840X.2020.1750917

Hatchimonji, D. R., Linsky, A. C. V., Nayman, S. J., & Elias, M. J. (2020). Spiral Model of Phronesis Development: Social-emotional and character development in low-resourced urban schools. *Journal of Moral Education*, *49*(1), 129–142. https://doi.org/10.1080/03057240.2019.1626703

Hawa, N. N., Zakaria, S. Z. S., Razman, M. R., & Majid, N. A. (2021). Geography Education for Promoting Sustainability in Indonesia. *Sustainability*, *13*(8), 4340. https://doi.org/10.3390/su13084340

Hiziroglu, M. (2021). The change in environmental perception in strategic plans: the case of local governments in Turkey. *International Journal of Public Sector Management*, *34*(5), 546–567. https://doi.org/10.1108/IJPSM-04-2020-0109

Howard, M., Alexiades, A., Schuster, C., & Raya, R. (2024). Indigenous Student Perceptions on Cultural Relevance, Career Development, and Relationships in a Culturally Relevant Undergraduate STEM Program. *International Journal of Science and Mathematics Education*, *22*(1), 1–23. https://doi.org/10.1007/s10763-023-10360-3

Jacob, M. M., Sabzalian, L., Springer, S., & Simmons, K. (2024). Centering Indigenous Brilliance in "The Stories We Tell" ☆. *Rural Sociology*, *89*(S1), 602–619. https://doi.org/10.1111/ruso.12517

Jeste, D. V., Thomas, M. L., Liu, J., Daly, R. E., Tu, X. M., Treichler, E. B. H., Palmer, B. W., & Lee, E. E. (2021). Is spirituality a component of wisdom? A study of 1,786 adults was conducted using the expanded San Diego Wisdom Scale (Jeste-Thomas Wisdom Index). *Journal of Psychiatric Research*, *132*, 174–181. https://doi.org/10.1016/j.jpsychires.2020.09.033

Kartal, G. (2021). Book Review: Culturally Inclusive Instructional Design: A Framework and Guide to Building Online Wisdom Communities. *The International Review of Research in Open and Distributed Learning*, *22*(3), 159–161. https://doi.org/10.19173/irrodl.v22i3.5193

Kenno, S., Lau, M., Sainty, B., & Boles, B. (2021). Budgeting, strategic planning, and institutional diversity in higher education. *Studies in Higher Education*, *46*(9), 1919–1933. https://doi.org/10.1080/03075079.2019.1711045

Kimmerer, R. W., & Artelle, K. A. (2024). Time to support Indigenous science. *Science*, *383*(6680), 243–243. https://doi.org/10.1126/science.ado0684

Kisno, K., Wibawa, B., & Khaerudin, K. (2022). Development of Digital Storytelling Based on Local Wisdom. *WISDOM*, *4*(3), 65–74. https://doi.org/10.24234/wisdom.v4i3.834

Kogen, L. (2024). Qualitative Thematic Analysis of Transcripts in Social Change Research: Reflections on Common Misconceptions and Recommendations for Reporting Results. *International Journal of Qualitative Methods*, *23*. https://doi.org/10.1177/16094069231225919

Lee, J. S., Lowell, J. L., Whitewater, K., Roane, T. M., Miller, C. S., Chan, A. P., Sylvester, A. W., Jackson, D., & Hunter, L. E. (2025). Monitoring environmental microbiomes: Alignment of microbiology and computational biology competencies within a culturally integrated curriculum and research framework. *Molecular Ecology Resources*, *25*(2). https://doi.org/10.1111/1755-0998.13867

Li, W.-T., & Shein, P. P. (2023). Developing a sense of place through a place-based Indigenous education for sustainable development curriculum. *Environmental Education Research*, *29*(5), 692–714. https://doi.org/10.1080/13504622.2022.2098933

Lubis, T. (2019). Learning Nandong in schools as a medium to inform the Simeuluenese local wisdom: An anthropolinguistics approach. *Studies in English Language and Education*, *6*(2), 262–272. https://doi.org/10.24815/siele.v6i2.14066

Lushombo, L. W. (2025). Ecological Sustainability for "Life on Land": Wellspring of Indigenous Knowledge. *Religions*, *16*(3), 311. https://doi.org/10.3390/rel16030311

Manning, S. R. (2023). Strategic Planning in Emergency Management: Highlighting the Critical Role (and Impacts) of the Planning Process. *Journal of Homeland Security and Emergency Management*, *20*(3), 209–238. https://doi.org/10.1515/jhsem-2022-0011

Manningtyas, R. D. T., & Furuya, K. (2022). Traditional Ecological Knowledge versus Ecological Wisdom: Are They Dissimilar in Cultural Landscape Research? *Land*. https://doi.org/10.3390/land11081123

McMahon, K., Clark, I. N., Stensæth, K., Odell-Miller, H., Wosch, T., Bukowska, A., & Baker, F. A. (2022). Exploring Shared Musical Experiences in Dementia Care: A Worked Example of a Qualitative Systematic Review and Thematic Synthesis. *International Journal of Qualitative Methods*, *21*. https://doi.org/10.1177/16094069221127509

Mohamed, M., Altinay, F., Altinay, Z., Dagli, G., Altinay, M., & Soykurt, M. (2023). Validation of Instruments for the Improvement of Interprofessional Education through Educational Management: An Internet of Things (IoT)-Based Machine Learning Approach. *Sustainability*, *15*(24), 16577. https://doi.org/10.3390/su152416577

Mukhtar, J., Yunus, Y., & Nugroho, I. (2021). Integrasi Kegiatan Masyarakat Budaya Lokal dan Lembaga dalam Pendidikan Toleransi. *Al-Izzah: Jurnal Hasil-Hasil Penelitian*, 43. https://doi.org/10.31332/ai.v0i0.2676

Nggaruaka, T., Priyatni, E. T., Suwignyo, H., & Siswanto, W. (2022). Ethno-Pedagogical Expressions in the Ndambu Culture of the Kimaima Community, Papua. *The Qualitative Report*. https://doi.org/10.46743/2160-3715/2023.5771

Nieto, Y., Gacia-Diaz, V., Montenegro, C., Gonzalez, C. C., & Gonzalez Crespo, R. (2019). Usage of Machine Learning for Strategic Decision Making at Higher Educational Institutions. *IEEE Access*, *7*, 75007–75017. https://doi.org/10.1109/ACCESS.2019.2919343

Nopriyasman, N., Asnan, G., Fauzi, A., Hastuti, I. P., Ritonga, A. H., Kurniawan, V., & Mairiska, R. (2024). Reading indigenous signs: The wisdom of nagari communities toward natural disaster in Pasaman Barat. *International Journal of Disaster Risk Reduction*, *107*, 104497. https://doi.org/10.1016/j.ijdrr.2024.104497

Nugroho, H. Y. S. H., Sallata, M. K., Allo, M. K., Wahyuningrum, N., Supangat, A. B., Setiawan, O., Njurumana, G. N., Isnan, W., Auliyani, D., Ansari, F., Hanindityasari, L., & Najib, N. N. (2023). Incorporating Traditional Knowledge into Science-Based Sociotechnical Measures in Upper Watershed Management: Theoretical Framework, Existing Practices and the Way Forward. *Sustainability*, *15*(4), 3502. https://doi.org/10.3390/su15043502

Pereira, J. M. C. D., & Viegas, V. M. R. (2021). Balanced Scorecard: A Powerful Method to Improve the Management of Educational Institutions. *European Journal of Teaching and Education*, *3*(4), 1–7. https://doi.org/10.33422/ejte.v3i4.706

Pike, M. A., Hart, P., Paul, S.-A. S., Lickona, T., & Clarke, P. (2021). Character development through the curriculum: teaching and assessing the understanding and practice of virtue. *Journal of Curriculum Studies*, *53*(4), 449–466. https://doi.org/10.1080/00220272.2020.1755996

Redvers, N., Schultz, C., Vera Prince, M., Cunningham, M., Jones, R., & Blondin, B. (2020). Indigenous perspectives on education for sustainable healthcare. *Medical Teacher*, *42*(10), 1085–1090. https://doi.org/10.1080/0142159X.2020.1791320

Restrepo-Mieth, A., Perry, J., Garnick, J., & Weisberg, M. (2023). Community-based participatory climate action. *Global Sustainability*, *6*, e14. https://doi.org/10.1017/sus.2023.12

Ridwan Ali, & Mulasi, S. (2023). Transformasi Kurikulum Merdeka: Pengembangan Muatan Lokal untuk Meningkatkan Identitas Budaya. *ISTIFHAM: Journal Of Islamic Studies*, 219–231. https://doi.org/10.71039/istifham.v1i3.35

Ritchie, J., & Phillips, L. G. (2023). Learning with Indigenous wisdom in a time of multiple crises: embodied and emplaced early childhood pedagogies. *Educational Review*, *75*(1), 54–73. https://doi.org/10.1080/00131911.2021.1978396

Ruwhiu, D., Arahanga-Doyle, H., Donaldson-Gush, R., Bragg, C., & Kapa, J. (2022). Enhancing the sustainability science agenda through Indigenous methodology. *Sustainability Science*, *17*(2), 403–414. https://doi.org/10.1007/s11625-021-01054-2

Salmon, M. (2024). Representation of the academic workforce in English university strategy-making: an exploratory study. *Higher Education*, *88*(6), 2107–2121. https://doi.org/10.1007/s10734-024-01203-3

Sandoval-Rivera, J. C. A. (2020). Environmental education and indigenous knowledge: Towards the connection of local wisdom with international agendas in the framework of the Sustainable Development Goals (SDGs). *Diaspora, Indigenous, and Minority Education*, *14*(1), 14–24. https://doi.org/10.1080/15595692.2019.1652588

Sayono, J., Jauhari, N., Ayundasari, L., & Sulistyo, W. D. (2020). Development of Projo Bale Model Based on Android Application in History and Local Wisdom Studies of Malang. *International Journal of Emerging Technologies in Learning (IJET)*, *15*(07), 4. https://doi.org/10.3991/ijet.v15i07.13219

Sun, Y., Hsieh, J., & Gao, X. (Andy). (2025). Integrating Qualitative Comparative Analysis With Reflexive Thematic Analysis in Theme Development. *International Journal of Qualitative Methods*, *24*. https://doi.org/10.1177/16094069251318749

Sundstrom, B., Hayes, N., DuBose-Morris, R., Dempsey, A., Guille, C., Montgomery, K., Richardson, K., & Lazenby, G. B. (2024). Evaluating the WISE (Women in the South-East) Telehealth Network: A Model of Healthcare and Health Promotion at Rural Libraries. *American Journal of Health Promotion*, *38*(7), 992–1003. https://doi.org/10.1177/08901171241246316

Suwarno, B. (2020). Acquisition Planning for Regional Indigenous Heritage Languages in Indonesia. *Sage Open*, *10*(3). https://doi.org/10.1177/2158244020948843

Tanyanyiwa, V. I. (2019). Indigenous Knowledge Systems and the Teaching of Climate Change in Zimbabwean Secondary Schools. *Sage Open*, *9*(4). https://doi.org/10.1177/2158244019885149

Wheeler, H., & Root-Bernstein, M. (2020). Informing decision-making with Indigenous and local knowledge and science. *Journal of Applied Ecology*. https://doi.org/10.1111/1365-2664.13734

Wijaya, M. N., & Yurnetti, Y. (2023). Development Of Integrated Science Teaching Materials Model Problem-Based Learning (PBL) Local Wisdom Class VII SMP. *Universe*, *4*(1), 32–37. https://doi.org/10.24036/universe.v4i1.235

Wiltshire, G., & Ronkainen, N. (2021). A realist approach to thematic analysis: making sense of qualitative data through experiential, inferential, and dispositional themes. *Journal of Critical Realism*, *20*(2), 159–180. https://doi.org/10.1080/14767430.2021.1894909

Zadworna, M., & Ardelt, M. (2024). The mediating role of health-related behavior in the relationship between wisdom and depressive symptoms in

older Polish adults. *Aging & Mental Health*, *28*(7), 1029–1040. https://doi.org/10.1080/13607863.2024.2302313

Zakharova, O. V., Suvorova, L. G., Bogdanova, M. V, Zakharov, A. V., Permyakov, A., & Malykh, I. Y. (2021). Environmental Education: Ecological Wisdom of Indigenous Peoples in Western Siberia. *Sustainability*, *13*(7), 4040. https://doi.org/10.3390/su13074040