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Community-Based Ecological Learning through Indigenous Conservation

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ABSTRACT

The integration of indigenous knowledge into sustainability education has attracted increasing scholarly attention; however, existing studies mainly conceptualize indigenous traditions as sources of cultural values or contextual learning resources, providing limited explanation of the pedagogical mechanisms through which ecological responsibility develops within community life. This study investigates the Ngaruat Leuweung Titipan tradition in an indigenous community in Lebak Regency, Banten, Indonesia, to explain how indigenous conservation functions as a community-based ecological learning process. A qualitative educational ethnography design was employed using participant observation, semi-structured interviews, and document analysis involving customary leaders, community members, youth representatives, and a local teacher. Data were analysed through thematic analysis and mechanism synthesis. The findings identify four interconnected pedagogical mechanisms: ecological worldview formation, participatory ecological knowledge transmission, collective social regulation, and intergenerational ecological internalization. These mechanisms demonstrate that ecological responsibility is cultivated through sustained participation in culturally embedded conservation practices rather than formal instruction alone. The study extends ethnopedagogy, Traditional Ecological Knowledge, and Education for Sustainable Development by proposing indigenous conservation as a community-based pedagogical process that strengthens culturally responsive sustainability education.

Keywords:
Ethnopedagogy; Indigenous conservation; Traditional ecological knowledge; Sustainability education; Ecological learning.

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1. Introduction

The increasing frequency of climate change, biodiversity loss, ecosystem degradation, and deforestation has intensified global concern regarding the long-term sustainability of human–environment relationships. These interconnected challenges indicate that technological innovation and environmental policies alone are insufficient to ensure ecological sustainability. Instead, sustainable development increasingly depends on educational approaches capable of fostering ecological responsibility, ethical awareness, and active participation in environmental stewardship (Ardoin et al., 2020; Tang & Gavin, 2016; UNESCO, 2021; Wals et al., 2014). Consequently, education is expected not only to promote scientific understanding but also to cultivate the values, attitudes, and behaviours required to address complex socio-ecological challenges

(Monroe et al., 2019; Wals & Benavot, 2017). Education for Sustainable Development (ESD) has consequently evolved from knowledge-oriented environmental education toward transformative learning that integrates environmental understanding, social responsibility, and collective action. Rather than emphasizing classroom instruction alone, ESD promotes authentic learning experiences that connect environmental knowledge with local cultures, community participation, and real-world ecological practices (Ardoin et al., 2020; Duoblienė et al., 2023; Wals & Benavot, 2017). This development has strengthened interest in community-based learning, which views communities as active learning environments where ecological understanding is constructed through participation, collaboration, and shared social practice rather than through formal instruction alone (Krasny & Tidball, 2016). Within this perspective, ethnopedagogy has emerged as an important educational approach that integrates indigenous knowledge, local culture, and community practices into meaningful learning experiences. Ethnopedagogical approaches emphasize that learning becomes more relevant when educational experiences are grounded in learners' sociocultural contexts, enabling students to construct knowledge through interaction with their surrounding cultural environment(*Gay, G. (2000)*; Hutchison & McAlister-Shields, 2020). Previous studies further demonstrate that culturally responsive learning enhances student engagement, contextual understanding, and socially meaningful knowledge construction (Cheng et al., 2021; Ladson-billings, 2014; Paris & Alim, 2014). Nevertheless, existing ethnopedagogical research primarily focuses on what indigenous knowledge should be integrated into education rather than **how** indigenous community practices themselves function as pedagogical processes that cultivate ecological responsibility.

A similar tendency is evident in studies of Traditional Ecological Knowledge (TEK). TEK has been widely recognized as a valuable source of ecological understanding developed through long-term interactions between indigenous communities and their natural environments (Aikenhead & Ogawa, 2007; Berkes & Turner, 2010; Kim & Dionne, 2014; Zidny et al., 2020). Beyond environmental knowledge, TEK encompasses ecological practices, social norms, and collective experiences that support sustainable relationships between communities and ecosystems while strengthening environmental literacy and biodiversity conservation(Ardoin et al., 2020; Fernández-Llamazares et al., 2021). However, previous studies have predominantly conceptualized TEK as environmental knowledge that can be incorporated into science education, with comparatively limited attention devoted to explaining how ecological responsibility is socially produced, maintained, and transmitted through continuous community participation.

Although previous studies consistently acknowledge the educational value of ethnopedagogy, Traditional Ecological Knowledge, and Education for Sustainable Development, limited attention has been devoted to explaining the pedagogical mechanisms through which indigenous conservation practices generate ecological learning within community life. Most studies continue to interpret indigenous conservation primarily as educational content rather than as a community-based learning process. Addressing this gap, the present study investigates the *Ngaruat Leuweung Titipan* tradition to explain how indigenous conservation practices cultivate ecological responsibility through sustained community participation and to reconstruct a conceptual framework of community-based ecological learning that contributes to contemporary sustainability education.

2. Methods

This study employed a qualitative educational ethnography design to examine how indigenous conservation practices function as community-based ecological learning processes. Educational ethnography was selected because it enables an in-depth understanding of how ecological knowledge, values, and social practices are constructed and transmitted through everyday interactions within a cultural community (Check & R. Schutt, 2012).

The research was conducted in the *Ngaruat Leuweung Titipan* tradition practiced by an indigenous agrarian community in Cibeber District, Lebak Regency, Banten Province, Indonesia. This setting provided a natural context for exploring how ecological knowledge is generated, negotiated, and reproduced through ritual participation, customary deliberation, and intergenerational engagement.

Participants were selected using purposive sampling based on their involvement in *Ngaruat Leuweung Titipan*, knowledge of customary environmental management, and roles in transmitting ecological values. Recruitment continued until information redundancy was achieved, indicating sufficient richness for qualitative interpretation (Saunders et al., 2018).

The participants included customary leaders, community members, youth representatives, and a local teacher, enabling the study to capture diverse perspectives on customary governance, community participation, ecological knowledge transmission, and educational relevance. Participant characteristics are presented in Table 1.

Table 1. Characteristics of Research Participants

Participant Group	Number	Selection Criteria	Primary Contribution
Customary leaders	2	Possess extensive knowledge of customary regulations and ritual practices	Explained indigenous conservation principles, customary governance, and ritual meanings
Community members	4	Actively involved in conservation activities	Described collective environmental management and everyday conservation practices
Youth representatives	3	Participated in customary activities since childhood	Explained intergenerational ecological learning and knowledge transmission
Local teacher	1	Familiar with contextual environmental education	Discussed educational relevance of indigenous conservation practices

As presented in **Table 1**, participants represented diverse social roles within the indigenous community, enabling the study to examine ecological learning from complementary perspectives, including customary governance, community participation, intergenerational knowledge transmission, and educational practice. This diversity enhanced data credibility and supported source triangulation by comparing perspectives across different community members.Data were collected through participant observation, semi-structured interviews, and document analysis. The integration of these methods enabled the exploration of indigenous conservation from both behavioural and interpretative perspectives while providing multiple sources of evidence to strengthen contextual understanding.

Participant observation was conducted during ritual ceremonies, community meetings, and environmental management activities associated with *Ngaruat Leuweung Titipan*. Semi-structured interviews explored participants' experiences, interpretations, and ecological responsibilities, whereas documentary evidence, including community archives, photographs, and field notes, was used to corroborate observational and interview data.**T**he iterative process of data collection and analysis. Evidence obtained from participant observation, interviews, and documentary sources was continuously compared to identify recurring patterns related to ecological participation, indigenous conservation, and knowledge transmission. The resulting themes were subsequently synthesized to develop the conceptual framework proposed in this study.

Data were analysed using thematic analysis through repeated examination of interview transcripts, field notes, and documentary materials. Codes representing ecological values, conservation practices, community participation, and knowledge transmission were systematically organized into broader conceptual categories, from which overarching themes were developed to explain how indigenous conservation functions as a community-based pedagogical process (Nowell et al., 2017).

Beyond thematic identification, the analysis proceeded through **mechanism synthesis**, integrating empirical themes into a coherent conceptual explanation of how ecological responsibility is socially reproduced through customary values, ritual participation, collective deliberation, and intergenerational engagement.

The trustworthiness of the findings was ensured through source and methodological triangulation, member checking, and maintaining an audit trail. Triangulation compared evidence across observations, interviews, and documentary sources, while member checking confirmed preliminary interpretations with selected participants. The audit trail documented analytical decisions and theme development, enhancing the credibility and dependability of the study.

Ethical principles were observed throughout the research. Participation was voluntary and based on informed consent, participant confidentiality was protected, and all research activities respected local cultural values, customary regulations, and community norms.

Results and Discussion

Field observations, interviews, and documentary evidence consistently indicate that the indigenous community perceives *Leuweung Titipan* not merely as a forest ecosystem or economic resource but as an ancestral trust carrying collective moral obligations. This shared understanding positions environmental stewardship as a communal responsibility, embedding ecological responsibility within everyday life through reciprocal relationships among humans, nature, and future generations.

Interviews with customary leaders further revealed that forest protection is regarded as an inherited customary obligation rather than compliance with external environmental regulations. Community members consistently described conservation as an ethical responsibility entrusted by their ancestors and maintained through collective commitment. These findings suggest that ecological responsibility is socially institutionalized through shared cultural meanings before being expressed in conservation practices.

The principal themes identified through thematic analysis, together with their supporting empirical evidence and pedagogical meanings, are presented in **Table 2**.

Table 2. Themes, Empirical Evidence, and Pedagogical Meanings

Theme	Empirical Evidence	Pedagogical Meaning
Forest as ancestral trust	Community members perceive forests as collective moral responsibility	Formation of ecological worldview
Ritual participation	Community members participate collectively in conservation rituals	Experiential ecological learning
Collective deliberation	Environmental decisions are discussed through customary meetings	Social regulation of ecological responsibility
Youth participation	Young people actively engage in indigenous conservation practices	Intergenerational ecological learning

As presented in **Table 2**, the findings indicate that indigenous conservation extends beyond environmental protection by functioning as a community-based pedagogical process. The identified themes demonstrate that ecological responsibility develops through interconnected cultural practices that shape environmental understanding, participation, and collective responsibility across generations.

The findings further reveal that ecological knowledge is transmitted primarily through active participation rather than explicit instruction. Younger community members acquire ecological understanding by accompanying elders during customary rituals, observing conservation practices, and participating in forest management activities. Through these authentic experiences, ecological values become integrated into everyday social interaction, enabling environmental responsibility to develop through continuous participation and shared community practice rather than abstract environmental concepts.

Representative quotations further illustrate how community members construct and interpret ecological meanings within indigenous conservation practices. Selected quotations and their analytical interpretations are presented in **Table 3**.

Table 3: Representative Quotations and Analytical Interpretations

Theme	Representative quotation	Analytical interpretation
Ecological worldview	Forest is an ancestral trust	Ecological responsibility originates from shared moral commitments
Participatory learning	Children learn by accompanying elders	Ecological knowledge develops through participation rather than direct instruction
Collective responsibility	Environmental decisions are made together	Conservation is socially regulated within the community
Intergenerational learning	Youth participate in customary activities	Indigenous ecological knowledge is continuously reproduced across generations

The quotations presented in **Table 3** reinforce the thematic analysis by showing that participants consistently interpreted ecological responsibility through collective identity, customary obligations, and intergenerational continuity. Rather than viewing conservation solely as environmental protection, community members understood it as a shared cultural responsibility embedded in everyday life.

The findings further reveal that environmental management within the *Ngaruat Leuweung Titipan* tradition is sustained through collective deliberation involving customary leaders, community members, and younger generations. Decisions regarding forest use, customary regulations, and responses to environmental violations are reached through communal discussion, enabling ecological responsibilities to be collectively negotiated, communicated, and reinforced. These findings indicate that ecological stewardship is maintained primarily through community participation rather than external enforcement.

Another important finding concerns the continuous involvement of younger generations in indigenous conservation activities. Observations and interviews consistently show that children and adolescents participate in customary rituals, environmental activities, and community gatherings from an early age. Through sustained participation, they gradually acquire ecological knowledge, observe customary conservation practices, and assume increasing responsibilities within community life. This process supports the continuity of ecological knowledge across generations through shared experience rather than formal instruction.

Across all participant groups, ecological learning was consistently described as an ongoing process embedded in everyday community participation. The findings demonstrate that indigenous conservation simultaneously preserves environmental resources and facilitates the intergenerational transmission of ecological knowledge through sustained social interaction.

The themes reported in this study emerged through an iterative analytical process rather than from isolated observations. Initial empirical codes derived from participant observations, interviews, and documentary evidence were progressively synthesized into broader conceptual categories before being consolidated into four overarching themes describing indigenous ecological learning. This analytical development provides a transparent foundation for the theoretical interpretation presented in the subsequent Discussion section, where the relationships among these themes are examined to explain the pedagogical mechanisms underlying indigenous conservation practices.

Discussion

The synthesis of the empirical findings demonstrates that *Ngaruat Leuweung Titipan* should not be interpreted merely as an indigenous conservation tradition or a cultural ceremony maintained by the local community. Instead, the interaction among ecological beliefs, ritual participation, collective deliberation, and intergenerational engagement forms an integrated learning mechanism through which ecological responsibility is continuously developed and reproduced within community life. The findings suggest that environmental learning emerges from sustained participation in culturally meaningful social practices rather than from

isolated instructional activities. This perspective provides a more comprehensive explanation of how indigenous conservation contributes to sustainability learning beyond the boundaries of formal education.

The empirical evidence indicates that ecological learning develops through four interconnected mechanisms. First, community members collectively construct an ecological worldview by interpreting the forest as an ancestral trust that must be preserved for future generations. This shared understanding establishes a moral foundation that shapes subsequent conservation behaviour. Second, ritual participation enables ecological knowledge to be experienced directly through repeated social interaction rather than transmitted solely through verbal explanation. Third, collective deliberation institutionalizes ecological responsibility by embedding conservation values within community decision-making processes. Finally, continuous participation of younger generations ensures that ecological responsibility is reproduced across generations through everyday social practice. Together, these mechanisms explain how indigenous conservation simultaneously functions as environmental management and community-based ecological learning.

Unlike descriptive interpretations that portray indigenous traditions primarily as cultural heritage, the present findings reveal that conservation practices themselves operate as pedagogical processes. Learning occurs because community members repeatedly participate in conservation activities where ecological meanings are collectively interpreted, negotiated, and reinforced. Consequently, ecological responsibility becomes embedded within community identity through participation rather than individual instruction alone. This interpretation provides an analytical explanation of why indigenous conservation practices remain sustainable despite the absence of formal educational structures.

The interaction among the four empirical themes identified in this study is synthesized into a conceptual framework presented in Figure 4. The framework illustrates how indigenous conservation practices generate ecological learning through interconnected social mechanisms operating within community life.

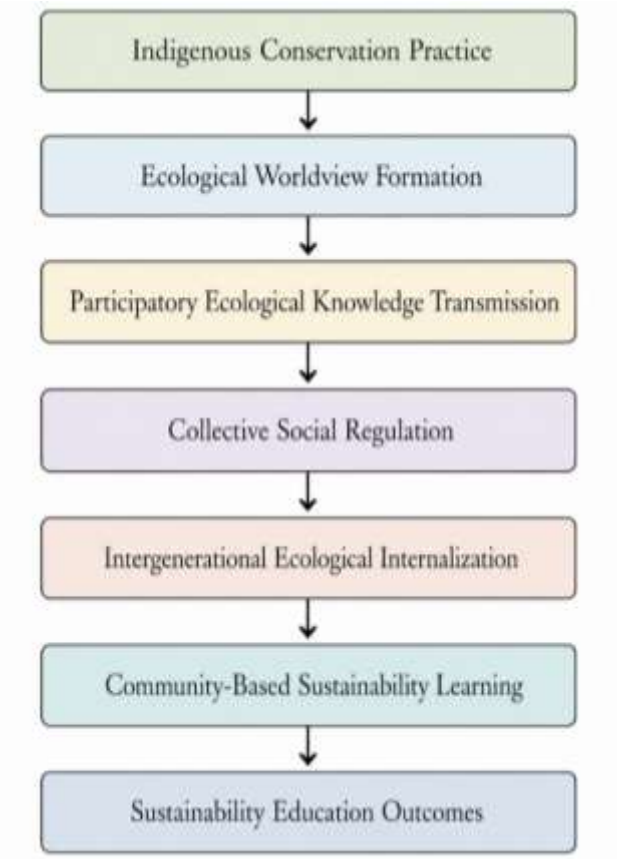

Figure 4. Conceptual Framework of Community-Based Ecological Learning Derived

Figure 4 illustrates that indigenous conservation functions as an interconnected pedagogical mechanism rather than a series of independent cultural activities. Ecological learning develops through the interaction of ecological worldview formation, participatory experience, collective social regulation, and intergenerational engagement, ultimately fostering sustainability-oriented behaviour. This framework demonstrates how community participation continuously reproduces ecological responsibility and extends the interpretation of indigenous conservation beyond environmental protection toward a community-based ecological learning process (Wals et al., 2014; Zidny et al., 2020).

The findings contribute to ethnopedagogical scholarship by extending current perspectives on the educational role of indigenous culture. Previous studies have primarily viewed local wisdom as contextual learning content for strengthening cultural identity and culturally responsive pedagogy (Gay, 2000; Hutchison & McAlister-Shields, 2020; Paris & Alim, 2017). In contrast, this study demonstrates that indigenous conservation functions as a pedagogical process in which ecological responsibility is developed through ritual participation, collective deliberation, and intergenerational interaction. Consequently, ethnopedagogy is interpreted not only as the integration of cultural knowledge into formal education but also as the study of learning processes embedded in community life.

The findings also broaden current understandings of indigenous conservation within educational research. Existing studies have largely interpreted indigenous conservation as environmental management, cultural heritage, or local ecological wisdom (Aikenhead & Ogawa, 2007; Kim & Dionne, 2014; Zidny et al., 2020). This study proposes an alternative perspective by conceptualizing indigenous conservation as a **community-based ecological learning process** through which ecological responsibility is socially constructed and sustained. Rather than emerging primarily from individual cognitive acquisition, ecological learning develops through sustained participation in customary practices, collective decision-making, and shared environmental responsibility. This interpretation highlights indigenous communities as living learning environments where ecological knowledge, environmental ethics, and collective responsibility evolve simultaneously.

The study further contributes to Traditional Ecological Knowledge (TEK) by complementing existing interpretations of indigenous ecological knowledge. While previous research has emphasized TEK as accumulated environmental knowledge supporting biodiversity conservation and sustainable resource management (Kim & Dionne, 2014; Zidny et al., 2020; Berkes, 2018), the present findings demonstrate that its continuity depends on recurring community participation. Ecological knowledge is maintained not only because communities possess environmental expertise but also because they sustain participatory social structures through which ecological learning is continuously interpreted, reinforced, and transmitted across generations. Accordingly, TEK is understood not only as indigenous ecological knowledge but also as a socially organized pedagogical process that strengthens sustainability learning within community life.

The theoretical contributions derived from these findings are summarized in **Table 4**, which compares prevailing perspectives in ethnopedagogy, Traditional Ecological Knowledge, and sustainability education with the conceptual advances proposed in this study.

Table 4. Theoretical Contributions of the Present Study

Theoretical Perspective	**Dominant Perspective in Previous Studies**	**Contribution of the Present Study**
Ethnopedagogy	Local culture as contextual learning content	Indigenous conservation functions as a community-based pedagogical process
Traditional Ecological Knowledge	Ecological knowledge as environmental expertise	Ecological knowledge is sustained through participatory learning mechanisms

Sustainability Education	Sustainability learning mainly occurs within formal educational settings	Sustainability learning is continuously reproduced through community participation
Community Learning	Participation supports collaborative learning	Community participation institutionalizes ecological responsibility across generations

As summarized in Table 4, the principal contribution of this study lies not in introducing an entirely new theoretical framework but in extending established educational perspectives through empirical evidence derived from indigenous conservation practices. Rather than replacing existing theories, the findings enrich current understandings by demonstrating that ecological learning develops through the interaction of cultural participation, collective responsibility, and intergenerational engagement. This integrative interpretation provides a stronger conceptual foundation for future investigations examining the educational dimensions of indigenous conservation across diverse sociocultural contexts.

The findings of this study offer several important implications for educational practice by demonstrating that indigenous conservation practices may function as authentic ecological learning environments capable of complementing formal sustainability education. Rather than positioning local wisdom merely as supplementary instructional content, the reconstructed pedagogical mechanism indicates that community participation itself constitutes an educational process through which ecological responsibility develops through repeated social interaction. This perspective encourages educators to move beyond the conventional integration of cultural examples toward designing learning experiences that actively engage students with local environmental practices and community knowledge systems (Wals et al., 2014).

For classroom practice, the findings suggest that contextual environmental learning may be strengthened through learning activities that combine observation, community participation, reflective dialogue, and collaborative problem-solving. Indigenous conservation practices such as *Ngaruat Leuweung Titipan* provide opportunities for students to experience ecological concepts within authentic social contexts where environmental knowledge is inseparable from cultural responsibility and collective action. Such learning experiences have the potential to strengthen environmental literacy while simultaneously fostering social responsibility and sustainability awareness (Cheng et al., 2021; Zidny et al., 2020).

The reconstructed pedagogical mechanism also provides practical guidance for curriculum developers seeking to integrate local ecological knowledge into sustainability education. Rather than presenting indigenous knowledge as isolated cultural information, curriculum design may incorporate learning sequences that encourage students to investigate local environmental issues, participate in community activities, reflect upon ecological values, and collaboratively formulate conservation actions. Such an approach aligns with contemporary sustainability education, which emphasizes experiential learning, contextual understanding, and learner participation as essential components of transformative education (Wals et al., 2014).

Beyond formal schooling, the study highlights the strategic role of partnerships between educational institutions and indigenous communities. Sustainable collaboration between schools and local communities may expand learning opportunities by allowing students to engage directly with indigenous ecological practices while simultaneously supporting the preservation of local knowledge systems. Consequently, indigenous communities should be recognized not only as custodians of cultural heritage but also as educational partners capable of enriching sustainability learning through authentic community participation.

While the findings contribute to expanding current understandings of ethnopedagogy, Traditional Ecological Knowledge, and sustainability education, their interpretation should be considered within the contextual boundaries of the present study. The research was conducted within an agrarian indigenous community in Cibeber District, Lebak Regency, Banten Province, where *Ngaruat Leuweung Titipan* remains an integral component of community life. Accordingly, the pedagogical mechanisms identified in this study should be interpreted as context-dependent rather than universally applicable across all educational settings.

The proposed framework is expected to be particularly relevant for educational contexts characterized by strong community participation, locally embedded environmental practices, and sustained interaction between schools and surrounding communities. Conversely, educational environments lacking comparable cultural traditions or community engagement may require contextual adaptation before applying the proposed pedagogical mechanisms. Recognizing these boundary conditions is important to avoid overgeneralization while supporting the transferability of the conceptual framework to other indigenous or community-based educational contexts.

Several limitations should also be acknowledged. First, the study focused on a single indigenous community, limiting the diversity of sociocultural contexts represented within the findings. Second, although the reconstructed framework provides a theoretically informed interpretation of indigenous ecological learning, it has not yet been implemented or evaluated within formal classroom practice. Third, the qualitative ethnographic design prioritizes contextual understanding rather than statistical generalization. Future research may therefore examine the applicability of the proposed framework across different indigenous communities, educational levels, and geographical regions while investigating its effectiveness in strengthening students' environmental literacy, sustainability competencies, and ecological responsibility through empirical classroom implementation.

Conclusion

This study demonstrates that *Ngaruat Leuweung Titipan* represents more than an indigenous conservation tradition or a cultural heritage practice. The findings indicate that indigenous conservation functions as a community-based ecological learning process through which ecological responsibility is continuously developed by means of ecological worldview formation, participatory knowledge transmission, collective social regulation, and intergenerational ecological internalization. These interconnected mechanisms illustrate that environmental learning emerges through sustained participation in community life, where ecological knowledge, cultural values, and collective responsibility are simultaneously constructed and reproduced. The study contributes to educational scholarship by extending existing perspectives on ethnopedagogy, Traditional Ecological Knowledge, and Education for Sustainable Development. Rather than positioning indigenous culture primarily as contextual educational content, the findings demonstrate that indigenous conservation practices operate as pedagogical mechanisms capable of sustaining ecological learning beyond formal educational institutions. This interpretation broadens current understandings of community participation by emphasizing its role in supporting the long-term reproduction of ecological responsibility within indigenous communities.

The reconstructed framework proposed in this study provides a conceptual reference for developing culturally responsive sustainability education that integrates indigenous ecological knowledge, community participation, and contextual environmental learning. Although the framework emerged from the specific sociocultural context of *Ngaruat Leuweung Titipan*, its conceptual principles may inform future educational research investigating community-based ecological learning in other indigenous and local contexts. Further empirical studies are recommended to examine the transferability and educational effectiveness of the proposed framework across different learning environments and cultural settings.

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