Environmental Education Implementation in Indramayu Vocational Schools: Lessons Learned from a Structure–Agency Perspective

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Abstract. This study examines how environmental awareness is internalised through Environmental Education (EE) practices in vocational secondary schools in Indramayu Regency, West Java, Indonesia, using Giddens' theory of the duality of structure as an analytical lens. A mixed-methods case study was conducted in two vocational schools implementing EE as local curriculum content at different grade levels. Quantitative data were collected through Likert-scale surveys (n = 202 students), complemented by interviews, classroom observations, and qualitative coding using ATLAS.ti. The findings indicate that EE implementation is largely shaped by institutional routines, administrative demands, and Adiwiyata programme indicators, which prioritise environmental aesthetics, documentation, and behavioural compliance. While students demonstrate basic ecological understanding, opportunities for reflective, dialogic, and participatory internalisation of environmental values remain limited. Differences between schools reveal how local context and pedagogical authority influence students' meaning-making processes and perceptions of EE relevance. This study contributes to environmental education research by conceptualising environmental awareness as a socially constructed outcome of continuous interaction between structure and agency, rather than as a direct result of curriculum delivery. The findings highlight the need for more contextual, dialogic, and transformative eco-pedagogical approaches to strengthen the depth and sustainability of environmental awareness in vocational education settings.

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1 Introduction

Environmental Education (EE) has been widely recognised as a strategic instrument for addressing contemporary environmental challenges, particularly those related to climate change, biodiversity loss, and unsustainable resource use [1]. Global environmental governance frameworks increasingly emphasise the role of education in shaping environmentally responsible behaviour, not only by transmitting knowledge but also by cultivating environmental awareness, values, and long-term commitment to sustainability [2]. However, despite the proliferation of EE programmes worldwide, questions remain regarding how far such initiatives genuinely contribute to the internalisation of environmental awareness among learners.

A growing body of research suggests that environmental awareness does not emerge automatically from curriculum exposure or participation in environmental activities [3], [4]. Instead, it is shaped through complex learning processes involving interpretation, interaction, and meaning-making within specific institutional and sociocultural contexts [5]. In many school-based EE programmes, learning activities tend to prioritise observable outcomes such as cleanliness, recycling practices, or green infrastructure while paying less attention to how students understand, reflect on, and internalise the ecological meanings behind these practices [6]. As a result, environmental awareness may be expressed as routine behaviour or symbolic compliance rather than as reflective ecological understanding.

This challenge is particularly relevant in the Indonesian context, where EE is often implemented through policy-driven programmes such as Adiwiyata, which emphasise school-level environmental management and performance indicators [6] [7]. While previous studies have demonstrated the positive contributions of Adiwiyata schools in promoting environmentally friendly behaviour, findings also reveal inconsfistencies across cognitive, affective, and participatory dimensions of environmental awareness [8]. Moreover, much of the existing research focuses on programme effectiveness or behavioural outcomes, with limited attention to how environmental awareness is constructed and negotiated by students and teachers within everyday learning practices.

In order to address this gap, the present study adopts Giddens' theory of the duality of structure as an analytical framework [9]. From this standpoint, educational practices are conceptualised as social phenomena that are produced and reproduced through the interaction between institutional structures (curriculum, rules, routines) and human agency (teachers and students). Consequently, environmental awareness is not regarded as a predetermined consequence of instruction, rather it is conceptualised as a dynamic process influenced by pedagogical interactions, the local context, and institutional expectations.

This article examines the internalisation of environmental awareness within EE practices in two vocational secondary schools in Indramayu Regency, West Java, Indonesia. By employing a mixed-methods case study approach, the study explores how institutional structures, pedagogical authority, and student agency interact in shaping the meanings attached to environmental learning. The findings contribute to environmental education scholarship by offering a structure–agency perspective on environmental awareness internalisation and by highlighting the importance of contextual, dialogic, and reflective pedagogical practices in vocational education settings.

2 Internalisation of Environmental Education: Institutional Action (Schools) for Environmental Conservation

The concept of internalisation in EE refers to the process through which environmental knowledge, values, and norms move beyond formal instruction and become embedded in learners' ways of thinking, acting, and interpreting environmental issues [10]. In educational

settings, internalisation does not occur solely through exposure to content, but through repeated interactions, routines, and symbolic practices that shape students' practical consciousness [9]. Schools, therefore, play a central role as institutional spaces where environmental meanings are produced, negotiated, and reproduced.

From a structural perspective, schools function as formal institutions that translate environmental policies into concrete practices through curriculum design, learning routines, assessment systems, and extracurricular activities. In Indonesia, this institutional role is strongly shaped by the Adiwiyata programme, which positions schools as agents of environmental conservation through indicators such as environmentally friendly infrastructure, waste management systems, and documented environmental activities [6] [7]. These indicators provide schools with clear operational guidelines and evaluation criteria, enabling environmental initiatives to be implemented in a structured and measurable manner.

However, institutional action for environmental conservation often emphasises visible and assessable outcomes, such as school cleanliness, green spaces, and project documentation. While these practices contribute to improving the physical environment of schools, they may also shape how environmental education is interpreted by teachers and students. When environmental learning is closely tied to institutional assessment and administrative routines, environmental awareness risks being internalised as compliance with rules rather than as reflective ecological understanding [3] [11].

Within the framework of the duality of structure, such institutional practices both enable and constrain agency [9]. Teachers operate as key agents who mediate institutional expectations through their pedagogical choices, classroom interactions, and interpretations of environmental curriculum objectives. Similarly, students engage with environmental education not as passive recipients, but as agents who interpret learning activities based on their experiences, motivations, and local environmental realities. Internalisation, therefore, emerges through the continuous interplay between institutional rules and individual meaning-making processes.

Previous studies on school-based environmental education indicate that students may demonstrate pro-environmental behaviour without fully understanding the ecological significance of their actions [5] [8]. This condition reflects a form of partial internalisation, where environmental practices are performed as routine or symbolic acts rather than as consciously meaningful engagements with environmental issues. Such findings suggest that institutional action alone is insufficient to ensure deep environmental awareness unless it is accompanied by pedagogical practices that encourage reflection, dialogue, and contextual engagement.

3 Methodological Approach in Examining the Dynamics of Environmental Education Structure-Agent in Indramayu Regency

This study employed a mixed-methods case study approach to examine how EE practices are shaped through the interaction between institutional structures and human agency in vocational secondary schools. A case study design was selected to enable an in-depth exploration of everyday pedagogical practices, learning routines, and meaning-making processes within their real institutional and socio-environmental contexts [4]. The mixed-methods approach allowed quantitative and qualitative data to be used complementarily, providing both descriptive patterns and interpretative insights into environmental awareness internalisation.

The research was conducted in two vocational secondary schools in Indramayu Regency, West Java, Indonesia: SMKN 1 Losarang and SMKN 2 Indramayu. These schools were purposively selected due to their implementation of Environmental Education as local curriculum content at different grade levels and their engagement in the Adiwiyata

programme. SMKN 1 Losarang delivers EE to Grade 10 students as part of introductory vocational education, while SMKN 2 Indramayu offers EE to Grade 12 students, positioning environmental learning within a more advanced and practice-oriented educational phase. This contrast enabled an examination of how institutional structure and pedagogical authority operate across different stages of vocational education.

Quantitative data were collected through a Likert-scale survey administered to a total of 202 students, consisting of 123 Grade 10 students from SMKN 1 Losarang and 79 Grade 12 students from SMKN 2 Indramayu. The survey captured students' perceptions of EE learning experiences, including clarity of instruction, relevance of learning activities, and perceived alignment between learning expectations and actual classroom practices. Descriptive statistics were used to identify patterns in students' responses and to support comparative interpretation between the two schools.

Qualitative data were gathered through classroom observations and semi-structured interviews conducted over one week in each school. Classroom observations focused on instructional strategies, teacher–student interactions, and the use of environmental symbols and routines in learning activities. Semi-structured interviews involved eight students, five teachers, and school management representatives, allowing multiple perspectives on EE implementation to be captured. Interview questions explored participants' interpretations of environmental education, perceived learning objectives, and experiences with environmental practices at school.

Qualitative data were transcribed and analysed using ATLAS.ti software. The coding process followed an inductive–interpretive approach, identifying recurring themes related to pedagogical routines, institutional expectations, student participation, and environmental meaning-making. Codes were subsequently grouped into broader analytical categories reflecting key dimensions of the structure–agency relationship, including institutional rules, pedagogical authority, student agency, and reflexive engagement. Quantitative and qualitative findings were integrated at the interpretation stage to explain how institutional structures and agency jointly shape the internalisation of environmental awareness [9] [4].

Ethical considerations were addressed by ensuring voluntary participation, informed consent, and anonymity of all participants. School and individual identities were anonymised, and data were used solely for research purposes. This methodological design enabled a nuanced examination of Environmental Education not merely as a curriculum programme, but as a socially constructed practice embedded in everyday school life.

4 Environmental Education and Reflections on Environmental Management

EE practices in vocational secondary schools in Indramayu Regency demonstrate how environmental management is translated into everyday learning activities through institutional routines and pedagogical interaction. In both schools, EE is formally positioned as a space for developing environmental awareness, however, the ways in which environmental management is enacted reveal a strong orientation toward procedural implementation rather than reflective ecological engagement.

4.1. Students' Perceptions of Environmental Education Practices

The initial investigation into students' perceptions of EE implementation was conducted through the utilisation of a Likert-scale survey, which was employed to gather data regarding their experiences with regard to instructional clarity, learning support, and the perceived relevance of environmental assignments. As illustrated in Table 1, the following data set

comprises students' responses from SMKN 1 Losarang. In Table 2, the responses from SMKN 2 Indramayu are summarised.

Table 1. Likert-scale responses on students' perceptions of Environmental Education learning at SMKN 1 Losarang.

Question	**I understand (able to map) the Environmental Studies material presented by the teacher (a)**	**Before carrying out the environmental education learning project assignment, I was introduced to one example of a previous project assignment (b)**		**The results of environmental education projects can be viewed and displayed to the general public, including employers and industry representatives (c)**	
Variable	**Communication**	**Reality**	**Expectations**	**Reality**	**Expectations**
strongly disagree	0	1,6%	0,8%	0	0,8%
disagree	2,4%	4,1%	5,7%	6,5%	4,1%
agree	80,5%	81,3%	73,2%	73,2%	78,8%
strongly agree	17,1%	13%	20,3%	20,3%	16,3%
Total Response (100%)	123	123	123	123	123

Table 2. Likert-scale responses on students' perceptions of Environmental Education learning at SMKN 2 Indramayu.

Question	**I understand (able to map) the Environmental Studies material presented by the teacher (a)**	**Before carrying out the environmental education learning project assignment, I was introduced to one example of a previous project assignment (b)**		**The results of environmental education projects can be viewed and displayed to the general public, including employers and industry representatives (c)**	
Variable	**Communication**	**Reality**	**Expectations**	**Reality**	**Expectations**
strongly disagree	0	1%	8%	4%	5%
disagree	1%	13%	9%	8%	13%
agree	78%	72%	73%	77%	70%
strongly agree	20%	14%	10%	11%	13%
Total Response (100%)	79	79	79	79	79

Tables 1 and 2 show that most students in both schools could understand the environmental education material. High proportions of "agree" and "strongly agree" responses indicate that communication and explanations were adequate. This suggests that EE learning objectives were successfully conveyed.

However, closer examination reveals differences between students' expectations and their learning experiences. SMKN 1 Losarang exhibited positive gaps in relation to the visibility of environmental project outputs, indicating students valued tangible outcomes. SMKN 2 Indramayu exhibited smaller or negative gaps, reflecting inconsistencies between expected instructional support and classroom practices. These findings suggest that, while EE is present in both schools, its pedagogical effectiveness varies depending on how learning activities are structured.

4.2. Pedagogical Interaction and Meaning-Making Processes

To understand how students and teachers interpret and internalise environmental education practices beyond survey responses, qualitative interview data were analysed using ATLAS.ti. The resulting coding networks are illustrated in Figure 1 for SMKN 1 Losarang and Figure 2 for SMKN 2 Indramayu.

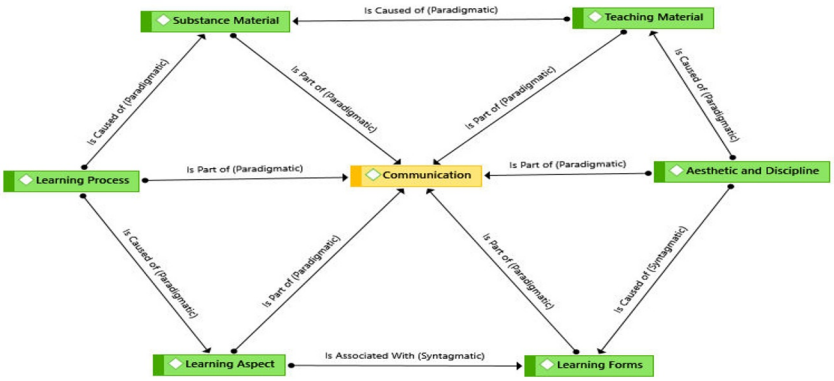

Figure 1. ATLAS.ti coding network illustrating dominant themes in Environmental Education practices at SMKN 1 Losarang.

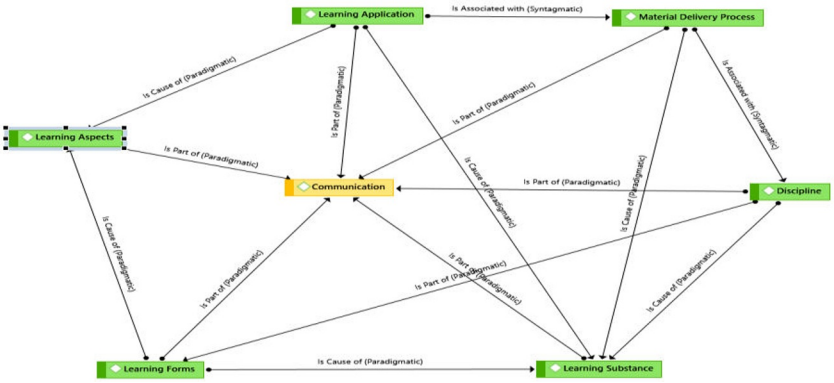

Figure 2. ATLAS.ti coding network illustrating dominant themes in Environmental Education practices at SMKN 2 Indramayu.

Figure 1 shows that environmental awareness at SMKN 1 Losarang is predominantly constructed through symbolic practices such as school cleanliness, project completion, and environmental aesthetics. Students and teachers frequently associate environmental responsibility with maintaining physical order and producing visible outputs aligned with school expectations. These symbolic practices function as routine indicators of environmental management and reinforce shared norms regarding appropriate environmental behaviour.

Conversely, Figure 2 demonstrates that EE practices at SMKN 2 Indramayu are more significantly influenced by discipline, routine compliance, and institutional regulation. The concept of environmental awareness is often associated with adherence to established rules, scheduled activities, and behavioural control mechanisms that are embedded within the school culture. While these practices contribute to behavioural consistency, they also limit

opportunities for dialogic engagement and critical reflection on broader environmental issues.

From the perspective of the duality of structure, these patterns illustrate how institutional rules and pedagogical authority simultaneously enable and constrain agency. Teachers act as mediators of institutional expectations, translating curriculum guidelines and programme indicators into classroom routines. Students, in turn, internalise environmental awareness primarily through participation in prescribed activities rather than through active involvement in shaping learning content or problem-solving processes.

4.3. Environmental Management as Institutional Routine

The integration of survey data and qualitative findings highlights that environmental management in both schools operates largely as an institutional routine. Environmental activities are closely aligned with documentation, evaluation, and performance indicators associated with the Adiwiyata programme. Project portfolios, visual displays, and behavioural compliance serve as key markers of environmental success, reinforcing the perception that effective environmental education is demonstrated through visible performance.

This institutional orientation shapes how environmental awareness is internalised. Rather than emerging through reflective engagement with ecological challenges, awareness is often reproduced as routine behaviour embedded in school life. Nevertheless, interview data also reveal moments in which students' express interest in applying environmental knowledge beyond the school context, particularly when learning activities are connected to local environmental issues. These moments suggest that environmental awareness deepens when pedagogical practices allow space for contextual interpretation and dialogue.

Overall, the findings demonstrate that Environmental Education functions as a socially constructed practice in which environmental management is shaped by continuous interaction between institutional structures and human agency. Tables 1 and 2, together with Figures 1 and 2, illustrate how environmental awareness is internalised not simply through curriculum delivery, but through the everyday routines, symbols, and power relations embedded within school practices.

5 Lessons Learned from Environmental Education Implementation in Indramayu Vocational Schools: A Structure–Agency Perspective

The present study aims to examine the implementation of EE in vocational secondary schools in Indramayu Regency, and the insights that can be learnt from this implementation when analysed through a structure-agency perspective. The integration of quantitative evidence (Tables 1 and 2) and qualitative insights (Figures 1 and 2) has enabled the demonstration of the fact that the implementation of EE is not determined solely by curriculum design or policy intentions, but rather by the interaction between institutional structures and human agency in everyday school practices.

The primary lesson learned is that EE implementation in vocational schools tends to be operationalised through institutional routines that prioritise environmental management, documentation, and behavioural compliance. While these structures enable schools to demonstrate environmental commitment, they also shape how environmental awareness is internalised by students. Environmental learning is frequently experienced as a set of prescribed actions such as maintaining cleanliness, completing projects, and adhering to rules rather than as a reflective process of ecological understanding.

From a structure–agency perspective, this pattern highlights the dual role of institutional structures. Curriculum frameworks, Adiwiyata programme indicators, and assessment mechanisms function as enabling resources that provide legitimacy and direction for EE practices. At the same time, these structures constrain pedagogical space by reinforcing performance-oriented interpretations of environmental education. Teachers, as key agents, tend to align their instructional practices with institutional expectations, while students internalise environmental awareness primarily through routine participation rather than critical engagement.

Nevertheless, the study also reveals that environmental awareness is not entirely reducible to institutional compliance. When pedagogical practices connect environmental learning to local contexts and allow space for interpretation and dialogue, students demonstrate deeper engagement and a stronger sense of relevance. These moments indicate that agency can reshape structural conditions, suggesting that EE implementation has transformative potential when institutional routines are accompanied by reflective and dialogic pedagogies.

Overall, the lessons learned from EE implementation in Indramayu vocational schools emphasise that effective environmental education depends on how structure and agency are enacted in practice. EE should therefore be understood not merely as programme implementation, but as a socially constructed learning process in which environmental meaning is continuously negotiated within institutional settings.

5.1 Theoretical Lessons Learned: Understanding Environmental Education through Structure–Agency Dynamics

From a theoretical standpoint, this study makes a contribution to the field of EE research by demonstrating the analytical value of a structure-agency perspective in examining the implementation of EE. The development of environmental awareness does not emerge as a direct consequence of curriculum delivery, rather it is an outcome of routine social practices that are embedded within institutional contexts. This finding serves to reinforce the relevance of structuration theory for understanding how educational practices are produced and reproduced through everyday interaction.

A fundamental theoretical tenet is that agency in EE is structurally constrained. Teachers' agency is largely exercised in mediating institutional demands, often resulting in pedagogical practices that emphasise order, compliance, and task completion. Conversely, students' agency is shaped by these pedagogical arrangements, which limit opportunities for active meaning-making and critical ecological reasoning. It is evident that environmental awareness is often internalised as a symbolic and performative practice rather than as a transformative ecological consciousness.

This study also extends theoretical discussions on environmental awareness internalisation by highlighting the dominance of symbolic environmental practices within school settings. Cleanliness, environmental displays, and documented activities function as socially recognised indicators of environmental success. While such symbols support institutional legitimacy, they may also obscure deeper questions about ecological relationships, power, and responsibility unless accompanied by reflective pedagogical engagement.

By conceptualising EE implementation as a dynamic interaction between structure and agency, this study emphasises that theoretical analyses of environmental education must extend beyond effectiveness metrics and behavioural indicators. It is imperative that attention be directed towards the manner in which institutional conditions influence pedagogical action, and how agents interpret, reproduce or challenge these conditions in practice.

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5.2 Methodological and Practical Lessons Learned: Directions for Future Environmental Education Research and Practice

In addition to theoretical insights, this study offers methodological and practical lessons for future research and implementation in the field of EE. Methodologically, the findings demonstrate the value of mixed-methods designs that integrate perception-based surveys with qualitative analyses of classroom interaction and meaning-making processes. Such approaches enable researchers to capture not only what students do, but also how they understand and interpret environmental learning.

Future research in this area would benefit from the implementation of longitudinal designs, which would facilitate the tracking of the development of environmental awareness across different stages of vocational education. A study of the manner in which institutional routines and pedagogical practices give shape to learning trajectories over time would provide a more profound understanding of the sustainability of environmental awareness, extending beyond short-term behavioural outcomes..

The research findings from the vocational schools in Indramayu indicate that the enhancement of environmental education is contingent upon the realignment of institutional frameworks and organisational structures. While environmental management and programme indicators provide necessary organisational support, pedagogical practices must intentionally create space for dialogue, contextual interpretation, and student participation. The integration of environmental education with local ecological concerns and students' personal experiences has been demonstrated to enhance the relevance of the curriculum and facilitate more profound internalisation of environmental concepts.

Consequently, it is essential that future research and practice explore alternative evaluation indicators that are capable of capturing the affective, ethical and interpretive dimensions of environmental awareness. Reflective writing, student narratives, and community-based projects may offer richer insights into how EE contributes to long-term ecological understanding and responsibility.

When considered as a whole, these lessons learned serve to reinforce the notion that the implementation of EE is most effective when institutional structures provide support rather than substitute for the development of reflective and active agency. The employment of a structure-agency perspective within the context of EE provides a robust framework for the advancement of both theory and practice in the domain of vocational secondary education.

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