Environmental Education Practice in Independent Curriculum: Science Teacher Perspective in Indonesia Junior High School

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Abstract

This study examines the implementation of environmental education (EE) in the independent curriculum of junior high schools in urban and rural areas of Bandung, Indonesia. The study employs a qualitative approach, using semi-structured interviews with seven urban and five rural teachers. The findings show that the new Indonesia National Curriculum (Merdeka Curriculum) flexibility enables participants to expand the scope of EE subjects in science lessons, such as digital waste and healthy eating. Participants have shifted away from traditional methods to student-centred approaches such as project-based and problem-based learning to enhance EE learning. Furthermore, incorporating EE into civic education through the student Project that called P5 Project allows us to see EE from various perspectives, such as science, social studies, art, and economics. The P5 Project also encourages students to take actual actions to address climate change, such as starting social media campaigns, participating in conservation activities, and creating recycled products. However, there is a need to investigate another impact of flexibility and interdisciplinary collaboration in the independent curriculum. Despite implementing transformative teaching approaches and activities, participants consider these efforts were insufficient to improve pro-environmental behavior among pupils. This is likely due to the many variables that influence environmental awareness.

Keywords: environmental education, teacher perspective, education and development

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Introduction

According to UNESCO (2020), In their "Background Paper for the Future of Education Initiative," stated that Education of Sustainable Development as the new form of Environmental Education (EE) approaches had failed. As our carbon emissions keep increasing worldwide, we face a climate trajectory of worsening floods, droughts, and fires (IPCC, 2018). Despite efforts, education prioritizes workforce supply for economic growth, perpetuating cartesian dualisms and the delusion that humans are separate from the world (Taylor & Pacini-Ketchabaw, 2018). This statement underlines not only the inadequacy of existing educational frameworks but also the imperative to reassess and reconceptualize the role of education in the face of pressing global challenges.

Despite the current climate crisis, curriculum amendments appear more responsive to developments in science, technology, and socio-cultural and economic conditions that influence learning implementation (Lin et al., 2017). However, a comprehensive approach to reorienting education is needed, one that goes beyond limited actions such as reducing, reusing, or recycling. Given the ineffective education approach to overcoming the climate crisis, it is crucial to evaluate and improve the quality of environmental education. There is a pressing need to provide environmental education literature that can serve as the foundation for global southern countries (Parker & Prabawa-Sear, 2020). This study aims to provide a global south perspective, specifically focusing on Indonesia.

Indonesia exemplifies these challenges as part of the Global South. Although Indonesia is a developing country, resource-rich, culturally diverse, and home to enormous biodiversity, it faces severe environmental issues due to exploitation, pollution, and rising population (Parker & Prabawa-Sear, 2020; UNDESA, 2015). In Indonesia, these drawbacks persist even after curricular reforms, with the transition from the "Kurikulum 2013" (2013 Curriculum) to "Kurikulum Merdeka" (Independent Curriculum) in 2020.

The purpose of this qualitative study is to interpret Indonesian junior high school (JHS) teachers' (Grade 7–9) perspectives regarding EE implementation during the independent curriculum, alignment between EE topics and current environmental conditions, challenges, and opportunities of EE in the independent curriculum. This perspective can be a reference for curriculum policymakers to maintain what is already good and improve the independent curriculum's implementation to align with the greening curriculum guideline. This study offers insights that can serve as reflections and guides for teachers facilitating learning based on their settings.

Literature Review

Complexity of Environmental Education in Global Practice

The Tbilisi Declaration in 1978 and Fensham (1979) emphasise that environmental education should include collaborative inquiry into real-life issues, from local to global. This approach requires students to be engaged in critical thinking and action, with a flexible curriculum and pedagogy that adapts to their social circumstances and decisions. Education must be the foundation for societal reforms to address global issues and build a more sustainable, peaceful, and equitable society (Tilaar, 2008).

In 1992, there was a shift from EE to Education for Sustainable Development (ESD), including local, national, and global efforts to integrate environmental, economic, and social factors to lead to sustainable development competencies (Ssosse et al., 2021). ESD has proven to be an alternative in reducing carbon emissions in some global north countries such as Finland, Sweden, Greece, Italy, Portugal, Luxembourg, Spain, and the UK (Ni et al., 2024). The positive impacts of ESD and the global north strategy may not necessarily apply to developing countries.

International guidelines and frameworks, such as UNESCO standards and the Sustainable Development Goals (SDGs), significantly influence environmental education (EE) and education for sustainable development (ESD) practices worldwide. However, the interpretation and implementation of these policies vary widely across national settings, particularly in developing countries, resulting in various outcomes and issues.

Post-colonial countries aim for equal prosperity and security in the Global North, leading to a global predicament marked by disparate responsibility for climate change and biodiversity loss, differing ability to pay for clean-up and sustainable economies, increased national sovereignty concerns due to transnational corporations, and unwavering commitments to economic growth (Parker & Prabawa-Sear, 2020). This shows that developing countries face complexity in determining priority problems to be resolved through formal education.

According to reports about EE practice in Indonesia's previous curriculum (2013 Curriculum), environmental education action activities were only carried out in response to natural disasters (e.g. Forest fire) (Darmawan & Dagamac, 2021). The Adiwiyata or Green School, which should be a program to promote environmental behaviour, became a competitive platform for gaining extra school funding (Parker & Prabawa-Sear, 2020). This situation shows that, like other developing countries, Indonesia might continue relying on outdated EE approaches and has not wholly integrated the broader goals of Education for Sustainable Development (ESD). The resistance to adopting more comprehensive ESD techniques may reflect the problems given by the Anthropocene, which requires more proactive and integrative educational initiatives to address complex environmental issues adequately.

Some arguments show that corporate intentions overshadow ESD development objectives, rendering it ineffective for future generations (UNESCO, 2020). Despite changing the title from environmental education to environmental sustainable development, no significant improvements have been observed in the results of EE practice so far.

Strategies in Environmental Education for Future Survival

In 2020, UNESCO presented a vision for education aimed at addressing the climate catastrophe by 2050. This vision advocates for a change away from traditional human-centred education and towards one that emphasises environmental awareness and justice. Proposed adjustments include transitioning from individual development to collective well-being, seeing humans as an integral part of the natural world, and moving toward learning through real-world environmental encounters.

As a response, in 2024, UNESCO produced a new guideline for transformational ESD regarding “what to learn.” This suggests that before selecting strategies, it is essential to consider cognitive, social, behavioural, and action-based projects (UNESCO, 2024). These

suggestions align with scholars who argue environmental education should focus on three areas: learning about, in, and through environmental experiences (Ko & Lee, 2003). A balanced curriculum incorporating cognitive and socio-emotional learning is urgent to minimise negative impacts like eco-anxiety and foster proactive behaviours (Leger-Goodes et al., 2022; Ojala & Lakew, 2017).

Indonesia's independent curriculum aligns with these goals by incorporating cognitive development and social learning. The Ministry of Education, Culture, Research, and Technology (MoECRT) emphasizes improving student competencies and character development based on the Pancasila learner profile (MoECRT, 2022). Science topics integrate EE by involving students in pollution prevention and climate change mitigation. Specifically, the "Science Learning Attainment Guidance 2020" directs teachers to integrate EE into topics like the Interaction of Living Things and Biotechnology. Furthermore, the P5 Project (Project in Strengthening Pancasila Learner Profile) promotes sustainable living and environmental attitudes (Saraswati et al., 2022), though it has not yet proven to address the emotional dimensions of eco-anxiety.

The second component is contextualisation. Indonesia's diverse settings allow the independent curriculum to give teachers flexibility to modify instruction with local knowledge. This helps developing nations take action towards decolonising education and makes learning more contextual. According to Dietz et al. (2020), developing climate resilience requires understanding social structure, culture, and micro-level decision-making.

Regarding "how should we learn," the first step is combining learner-centred, experiential, and reflective approaches (UNESCO, 2024). A green curriculum will not have a significant effect if it does not incorporate inquiry and critical thinking (Ni et al., 2024). When combined with a place-based approach, project-based learning (PjBL) and problem-based learning (PBL) are highly effective, engaging students in real-world problem-solving and community collaboration (Tibbitts et al., 2023; UNESCO, 2019).

The independent curriculum supports interdisciplinary collaboration through the P5 project, which allocates 100 hours of instruction. Collaboration between science and other subject teachers enables students to investigate many elements of climate change, filling gaps in the prior curriculum. This ensures students not only comprehend environmental concerns but also actively participate in addressing them.

However, science teachers' roles are influenced by their attitudes, self-efficacy, and perceived barriers (Ko & Lee, 2003). Additionally, distinct characteristics in urban and rural settings impact how EE is taught. Urban regions have easier access to resources but limited green spaces, while rural communities maintain stronger ties but often face limited facilities and training (Yulianti et al., 2019). Although Bandung ranks high for school facilities, disparities in resource distribution may still reveal similar problems (BPS, 2018).

Methodology

This study is a single case study that provides a thorough exploration of EE implementation in the Bandung area. A single case study investigates the links among numerous factors and how cause and effect evolve when other features of the scenario change (Creswell, 2009; Thomas, 2017). Bandung has a unique geographical setting that varies in rural and urban settings, for instance, industrial areas, mountains, rivers, reservoirs, and paddy fields, all of

which have the probability of affecting teachers' opinions on particular environmental issues. The urban areas in Bandung identified in this study include Cimahi City and Bandung City. The rural areas identified in this study include West Bandung Regency and Bandung Regency. Additionally, this study aimed to broaden views on implementing environmental education in rural and urban areas. This is considering the possibility of other external factors (e.g., social, community, facilities) that may influence EE learning practices.

This study use qualitative methods that allowed for a deep exploration of the lived experiences, attitudes, and beliefs of high school teachers in Indonesia (Creswell, 2009). This aligns with the interpretative paradigm, which values teachers' perspectives and emphasises what they interpret, think, and construct concepts about the world and their own constructed world (Thomas, 2017). This study takes a constructivist positioning framework by focusing on teacher experiences and factors that influence the implementation that will cause challenges and opportunities in EE implementation (Darmawan & Dagamac, 2021; Veselinovska & Osogovska, 2012).

The primary data was collected by doing in-depth interviews using convenience sampling methods. The participants were selected purposively based on their experience in teaching EE with an independent curriculum and their school settings (urban or rural). The semi-structured interview questions allowed participants to express their thoughts and experiences in their own words (Creswell, 2009).

This study choose purposive sampling to produce a relevant and comprehensive study (Creswell, 2009). This study selected teachers with at least one year of experience teaching EE using the independent curriculum. Furthermore, this study selected participants from public schools in Bandung, representing both urban and rural areas. The interactions and community involvement in rural schools, as opposed to the diverse resources and specialised teaching in urban schools, make it critical to investigate the differences in experiences of urban and rural teachers in implementing environmental education (Preston, 2012). Understanding these distinctions can assist in enhancing EE teaching quality and student outcomes in both contexts. In addition, this research considers it essential to see the perspective of teachers who teach in public schools. Examining the perspectives of science teachers in public schools can clarify how EE is implemented through the independent curriculum as the national standard.

Data Analysis

In this study, secondary data, as well as the CP and Pancasila Learner Project guidelines, will be referenced as literature to introduce the study. In this instance, the literature offers a helpful context for the problem or topic that has prompted the study, including who has written about it, who has researched it, and who has emphasised the significance of doing so (Creswell, 2009). Furthermore, this study used primary data collection by using open-ended questions in a semi-structured interviewing method with 30–60 minutes, which take place online using MS Teams and will be conducted based on Indonesian times. The interviews were conducted in Indonesian (Bahasa) to allow participants to share their experiences more easily. Darmawan and Dagamac (2021) employed semi-structured interviews to study the situation of EE in JHS in Indonesia based on the teacher's perspective.

During interviews, this study documented information using MS Teams video recording and an aide-memoire. This study translated interview recordings from Indonesia into English by

the researcher itself. The transcription process checks conformity by looking at the recorded conversations and aide-memoire to clarify unclear voice or pronunciation.

This study applied thematic analysis driven by the specific research question (Braun & Clarke, 2006). This study's analysis procedure refers to Braun and Clarke's (2006) six-stage theoretical framework. Firstly, the transcript was manually reviewed and reread to become more comfortable with the facts. The researcher systematically utilised NVivo to code, categorise, and extract critical findings following the research questions. During the analysis process, this study generated themes. Braun and Clarke (2006) argued that researchers do not have rigid standards for defining a theme and emphasized that a theme is defined by its significance. The themes discovered were descriptive, describing data-related patterns relevant to the research issue.

In the fourth step, the concepts were examined, evolved, and elaborated further. This study refined the preliminary themes from Extract 1 during this phase. The fifth phase involved establishing themes by examining and weighing correlations and intercorrelations among sub-themes. Finally, the writing-up phase, where the researcher organised the discussion and conclusion of this study.

Results

The research findings, derived from 12 semi-structured interviews with science teachers in Bandung, are organized into two primary themes: the influence of the Independent Curriculum (*Kurikulum Merdeka*) on Environmental Education (EE) practice and the subsequent challenges and opportunities encountered during implementation. This chapter explores how teachers navigate the flexibility of the new curriculum to foster environmental literacy in both urban and rural settings.

To What Extent EE Topics Embedded in Independent Curriculum Influence EE Practice?

The findings indicate that teachers' initial engagement with EE is deeply rooted in their personal attitudes and self-efficacy, which were significantly bolstered by participation in Transformational ESD Workshops. These workshops provided the pedagogical confidence necessary to contextualize environmental issues within the science classroom. However, the extent of implementation varies based on grade-level requirements and teacher agency. While teachers in grade 7 typically adhere to established guidelines regarding ecology and biodiversity, those in higher grades utilize the curriculum's flexibility to innovate. Participant 04 noted, "*I include it in the ecosystem topics as directed in the guideline; it is similar to the previous curriculum*," representing a compliance-based approach. In contrast, Participant 03 demonstrated innovative integration by linking human activity and the digestive system to wise food consumption and methane emissions, highlighting how the curriculum allows teachers to tailor depth and relevance.

The pedagogical approach predominantly shifts toward student-centered models, specifically Project-Based Learning (PjBL) and Problem-Based Learning (PBL). In urban areas, teachers utilize ICT facilities to address modern issues like digital waste, with Participant 10 educating students on the carbon footprint of device production. Conversely, rural participants emphasize a close connection with the natural environment, utilizing nature observation and community-based solutions, such as tree planting and addressing illegal waste burning.

However, a critical observation emerged regarding "product-oriented" projects. While Participant 08 and Participant 03 encouraged creating recycled products like air filters or accessories, there is a recognized need to evaluate the environmental impact of the production process itself, such as the energy consumed in melting plastics to ensure that PjBL promotes sustainability rather than just creative consumption.

The implementation of the P5 Project (Projek Penguatan Profil Pelajar Pancasila) further facilitates interdisciplinary collaboration. In Bandung, urban schools often benefit from private sector partnerships, allowing students to explore complex topics like carbon footprints and fast fashion. Rural initiatives, such as the loquat tree conservation project led by Participant 02, demonstrate how EE can extend beyond the school walls. Participant 02 described a comprehensive community effort: "*I arranged the students and taught our local primary schools... This approach engaged the community through direct and online monitoring by WhatsApp.*" Such projects indicate that while the science subject ensures the delivery of theoretical EE, the P5 project provides the practical, interdisciplinary space necessary for community-level impact.

What Are the Teachers' Challenges and Opportunities in Delivering EE During the Independent Curriculum Era?

Teachers identified a persistent friction between the curriculum's transformative goals and the practical realities of the Indonesian education system. A primary challenge is student resistance to the autonomy required by PBL and PjBL, often attributed to the legacy of the "banking concept" of education. Participant 13 observed, "*Initially, I struggled... because the students lacked the courage to share their opinions [due to] the former curriculum system.*" Furthermore, teachers face difficulties in measuring cognitive growth through projects compared to standardized tests, alongside a systemic lack of segregated facilities (e.g., waste bins) that undermines practical lessons on waste management.

Despite these barriers, the Independent Curriculum offers significant opportunities for pedagogical growth. The formal inclusion of climate change in the learning outcomes serves as a mandate for environmental advocacy. The following table summarizes the key tensions identified by participants:

Table 1
Key Tension of Opportunities and Challenges

Dimension	Primary Challenges	Emerging Opportunities
Pedagogy	Resistance to self-directed learning; "banking concept" legacy.	Increased student engagement through PjBL and PBL.
Assessment	Difficulty in quantifying cognitive depth via projects.	Differentiated assessment allows for diverse learning styles.
Infrastructure	Lack of physical resources (e.g., segregated bins).	Use of ICT and digital tools for global environmental visualization.
Teacher Role	Disparities in commitment and workload distribution.	Autonomy to tailor content to local and community-specific issues.

Ultimately, participants agreed that while habit formation remains inconsistent across the student body, the curriculum provides the necessary support for science education to support environmental change. The move toward interdisciplinary synergy and the legitimization of climate change as a core topic represent significant steps forward in the quality of environmental education in Indonesia.

Discussion

This study aimed to explore how science teachers in Bandung navigate Environmental Education (EE) within the framework of the Independent Curriculum. The research problem centered on the tension between decentralized curriculum flexibility and the practicalities of classroom implementation. The major finding reveals that while the curriculum provides significant space for transformation particularly through interdisciplinary P5 project, the transition from theoretical knowledge to pro-environmental habit formation is hindered by a digital-physical gap and systemic infrastructural limitations. In this case, curricular autonomy is a necessary but insufficient condition for transformative EE; it must be supported by institutional commitment and consistent physical facilities.

The results indicate a clear transition from curricular compliance in Grade 7 to pedagogical innovation in Grades 8 and 9. This shift is significant because it demonstrates that when teachers are granted autonomy, they move beyond biological facts toward frameworks of climate justice and community resilience, as seen in the integration of food waste and digital carbon footprints into science lessons. Contextualizing these findings with UNESCO's (2020) objectives, the P5 project framework successfully balances environmental, economic, and social orientations (Purvis et al., 2019). However, a critical interpretation of these results reveals a tension in product-oriented recycling. Aligning with Fang et al. (2022), there is a risk that focusing on marketable goods inadvertently encourages adverse consumerism. Therefore, the findings underscore that the value of the P5 framework lies in critic towards the economic growth rather than just the creation of recycled artifacts.

The challenges identified, specifically student resistance and the lack of facilities contradict the expectation that a flexible curriculum itself would trigger immediate engagement. This

study explains this unexpected resistance through the lens of the banking concept of education; students accustomed to passive learning struggle to adopt the agency required for Problem-Based Learning (PBL). This aligns with Tharayil et al. (2018), who suggest that facilitation strategies are required to bridge this psychological gap. Furthermore, the absence of segregated waste bins at schools (Participant 12 creates a hidden curriculum where students learn that environmental actions are not a priority in daily life. This confirms that the digital activism students display online support finding that aligns with Coelho et al. (2017) findings that state that student often fails to translate into physical habits because the school's infrastructure does not reinforce the classroom's theoretical message.

It is important to acknowledge the limitations of this study, notably the small sample size of 12 teachers and the specific focus on the Bandung region, which may not reflect the diverse educational landscapes of other Indonesian provinces. These constraints suggest that the results should be interpreted as a deep qualitative snapshot rather than a nationwide generalization. However, a primary strength of this research is its high-level critique of product-based EE and the identification of the digital-physical gap. By focusing on the quality of teacher-student interactions and the legitimacy of teacher-made modules, this study adds significant novelty to the literature on the independent curriculum, which often focuses solely on administrative implementation.

The practical implications of these findings are direct: school leadership must align the physical school environment (e.g., waste management facilities) with the curriculum to prevent sending mixed messages to students. Additionally, the government should implement a peer-review mechanism for the flexible learning modules to prevent scientific misconceptions. For future actions, this study proposes a comprehensive analysis to track whether the pro-environmental awareness fostered in the P5 projects persists as long-term behavioral change after students graduate. Actionable studies could also examine the impact of mentorship programs on reducing student resistance to active learning models.

In conclusion, while the Independent Curriculum has successfully legitimized EE and climate change as core scientific mandates in Indonesia, its effectiveness is currently hampered by a lack of systemic support. The transition to transformative environmental education requires a nuanced approach that balances pedagogical autonomy with physical infrastructure. Only by bridging the gap between digital advocacy and physical practice can the curriculum achieve its goal of fostering a truly sustainable and responsible generation.

Conclusion

The independent curriculum is a stepping stone to realizing transformational ESD. There is no significant difference between urban and rural participants regarding the influence of the independent curriculum on EE learning strategies. The independent curriculum provides flexibility for teachers to develop and contextualize each topic through inquiry-based science learning attainment guidelines. Carrying out environmental education learning that upholds transformational ESD values and student-centred learning opens opportunities such as increasing student motivation and participation.

In addition, the P5 project in the independent curriculum is a new beginning for teachers to carry out interdisciplinary collaboration in viewing environmental issues. Students can be directly involved in collective action and choose to run projects based on their learning preferences, showing the principle of differentiation in assessment. In terms of the P5 project,

the initiative carried out by one participant in a rural area demonstrates how these projects can take place sustainably within the community.

Furthermore, the use of technology and social media presents an opportunity to amplify the impact of EE projects. While this approach is relevant to the current generation, it is crucial to maintain oversight to ensure that students' online advocacy aligns with their real-life actions. Messaging platforms also offer an alternative means of engaging with the community. Ultimately, transformational ESD practices enable children to learn not just about the environment, but also within and through it.

However, transitioning from traditional lecture-based methods to student-centred learning faces student resistance, posing a significant challenge. It is crucial to implement practical strategies, such as explanation and facilitation methods, to overcome this barrier. Additionally, the development of government learning modules and the need for systematic evaluation of credible information underscore the importance of accurate content. Addressing inadequate facilities for waste sorting and integrating climate change into the curriculum can further enhance student engagement. The cases presented here highlight how limited resources and external factors, such as the family and community environment, can influence the implementation of transformational ESD. Further analysis is needed on the effectiveness of EE learning on environmental behavior changes, as it remains difficult to see a significant impact on environmentally conscious behaviour in students at this stage.

Future studies should consider providing a broader overview by incorporating participants from various educational levels and settings. Given Indonesia's different environments, providing a fair perspective on EE implementation in urban, rural, and remote areas is critical. Furthermore, future research should include perspectives from students to gain a clearer understanding of the curriculum's impact.

Expanding the potential of the transformational ESD approach, student-centered methods, and innovative assessment will increase the relevance of environmental education. Thus, we can prepare future generations who are aware of environmental problems threatening all living things in a broader context.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The author declares that Grammarly, an AI-assisted writing software, was used in proofreading and refining the language used in the manuscript. The usage was limited to correcting grammatical and spelling errors and rephrasing statements for accuracy and clarity. The author further declares that, apart from Grammarly, no other AI or AI-assisted technologies have been used to generate content in writing the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

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