



INTEGRATING ENVIRONMENTAL LITERACY INTO INDONESIAN LANGUAGE LEARNING MATERIALS: A STRUCTURED DESIGN SYNTHESIS FOR SUSTAINABLE LITERACY PEDAGOGY

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Abstract

Environmental literacy has become an essential educational orientation because learners are expected to understand ecological problems, evaluate environmental information, communicate evidence-based ideas, and participate responsibly in sustainable social practices. Indonesian language learning materials have strategic potential to cultivate environmental literacy because language classrooms routinely engage students with texts, genres, discourse, argumentation, storytelling, multimodal communication, and reflective writing. However, environmental themes in language materials are often treated as reading topics rather than as integrated literacy experiences that connect ecological knowledge, critical interpretation, affective concern, and action competence. This study aims to formulate a structured design framework for integrating environmental literacy into Indonesian language learning materials. The study employed a structured narrative review and design-synthesis method by analyzing international peer-reviewed scholarship on environmental literacy, environmental education, education for sustainable development, material development, content-language integration, multiliteracies, and critical literacy. The synthesis produced five design principles: ecological authenticity, genre-based alignment, critical inquiry, action-oriented communication, and reflective assessment. The findings also generated a genre integration matrix, a task typology, and an assessment rubric for Indonesian language materials. The study concludes that environmental literacy should not be inserted into Indonesian language materials merely as environmental content, but embedded as a pedagogical orientation that shapes text selection, learning tasks, classroom interaction, writing

products, multimodal projects, and assessment. The proposed framework can guide teachers, curriculum developers, and textbook writers in developing Indonesian language learning materials that support both language competence and ecological responsibility.

Keywords: *environmental literacy; Indonesian language learning; learning materials; sustainable literacy; critical literacy*

A. Introduction

Environmental problems such as waste accumulation, water pollution, biodiversity loss, flooding, forest degradation, climate-related risk, and unsustainable consumption have become urgent educational concerns. These problems are not merely scientific or technical issues. They are also linguistic, cultural, civic, and ethical issues because people understand environmental problems through texts, public discourse, narratives, media messages, policy documents, community conversations, and everyday language practices. For this reason, environmental literacy needs to be cultivated not only in science lessons but also through language education.

Environmental literacy generally refers to the capacity to understand ecological systems, recognize human-environment relationships, evaluate environmental issues, develop attitudes of care, and participate in responsible action. McBride, Brewer, Berkowitz, and Borrie (2013) show that environmental literacy, ecological literacy, and ecoliteracy share concern for knowledge, systems understanding, ethics, and responsible behavior, although each concept has different disciplinary emphases. Environmental literacy therefore contains cognitive, affective, behavioral, and civic dimensions. It requires learners to know, feel, judge, communicate, and act.

Indonesian language learning is a productive curricular space for developing environmental literacy. The subject trains students to read informational texts, analyze narrative and literary texts, write exposition and argumentation, present ideas orally, interpret multimodal texts, and produce texts for social purposes. These language practices are directly relevant to environmental literacy because ecological issues are commonly represented through news articles, reports, posters, infographics, public speeches, short stories, folklore, procedural texts, policy statements, and social media discourse. When environmental themes are embedded into Indonesian language materials, students can learn to understand language while also interpreting environmental realities critically.

However, the integration of environmental literacy into language learning materials requires more than adding environmental

vocabulary or inserting texts about nature. Materials may contain topics such as forests, rivers, waste, animals, or climate change, but still fail to build environmental literacy if students only answer literal comprehension questions. Such materials risk reducing environmental literacy to thematic decoration. To become pedagogically meaningful, environmental themes must be connected to genre learning, critical reading, evidence-based writing, dialogic discussion, reflective judgment, and communicative action.

The field of materials development emphasizes that good language materials should provide rich input, meaningful engagement, affective involvement, purposeful language use, and opportunities for learner response (Tomlinson, 2012). Authentic materials are also valuable because they expose learners to real social meanings and communicative purposes (Gilmore, 2007). In Indonesian language learning, environmental literacy-oriented materials should therefore use authentic and adapted environmental texts, but those texts must be accompanied by appropriate scaffolding. Students need support to identify ideas, analyze structure, evaluate evidence, recognize bias, compare perspectives, and transform reading into speaking or writing products.

The integration of environmental literacy into Indonesian language learning materials also aligns with content-language integration. CLIL and related content-based approaches argue that learners can develop language competence while engaging with meaningful subject matter (Coyle, 2007; Dalton-Puffer, 2011; Cenoz, Genesee, & Gorter, 2014). Although Indonesian language learning is not foreign language learning, the principle is relevant: content and language should not be separated mechanically. Students can learn linguistic forms, genre structures, vocabulary, argumentation, and communication strategies through ecologically meaningful topics.

Critical literacy further strengthens this integration. Luke (2012) explains that critical literacy involves examining how texts construct social realities, power relations, and ideological positions. Environmental issues are often contested through competing discourses: development versus conservation, economic growth versus ecological protection, individual responsibility versus structural policy, and local wisdom versus industrial exploitation. Indonesian language learning materials can help students examine these discourses by asking whose voice is represented, what evidence is used, what interests are served, and what alternative responses are possible.

The multiliteracies tradition supplies the wider frame for this position. The New London Group (1996) argued that literacy pedagogy must account for multiple modes and multiple social contexts of

meaning making, which is what an environmental topic demands when students move between reports, interviews, infographics, and campaign texts about the same issue.

Previous environmental education reviews show that effective environmental learning often involves relevance, inquiry, deliberation, participatory tasks, and action-oriented projects (Ardoin, Bowers, Roth, & Holthuis, 2018; Monroe, Plate, Oxarart, Bowers, & Chaves, 2019). These elements are compatible with language pedagogy because language learning also benefits from meaningful purpose, interaction, genre awareness, and authentic communication. This indicates a strong pedagogical rationale for integrating environmental literacy into Indonesian language learning materials.

Two further strands inform the design principles proposed here. Chawla and Cushing (2007) argue that education for strategic environmental behaviour must build competence to act collectively rather than only awareness of problems, and Hedefalk, Almqvist, and Ostman (2015) show in their review of education for sustainable development in early years that programmes are most effective when children are given genuine decisions to make rather than conclusions to accept. Ajzen's (1991) theory of planned behaviour explains why: intention is shaped by attitude, subjective norm, and perceived behavioural control together, so materials that build knowledge without addressing perceived control are unlikely to change what learners do.

Despite this potential, there remains a need for a systematic design framework that translates environmental literacy into concrete Indonesian language material components. Teachers and textbook writers need guidance on which texts to select, which language skills to emphasize, how to connect environmental concepts to genres, how to design critical and action-oriented tasks, and how to assess both language competence and environmental literacy. This study addresses that need by developing a structured design synthesis based on international scholarship.

The study is guided by three research questions. First, what environmental literacy dimensions are relevant to Indonesian language learning materials? Second, how can environmental literacy be operationalized through genres, tasks, and learning activities in Indonesian language materials? Third, what design principles and assessment criteria can guide teachers and material developers in producing sustainable literacy-oriented Indonesian language materials?

B. Method

This study employed a structured narrative review and design-synthesis method. The approach was selected because the study aimed to construct a pedagogical framework rather than to measure the effect of a classroom intervention. A structured narrative review enables researchers to synthesize conceptual and empirical literature across related fields, while design synthesis translates that literature into practical principles, matrices, task models, and assessment criteria for material development.

The literature corpus was built from international peer-reviewed works related to environmental literacy, environmental education, education for sustainable development, pro-environmental behavior, language materials development, content-language integration, multiliteracies, and critical literacy. Priority was given to articles published in reputable international journals indexed in major scholarly databases, including journals such as *Environmental Education Research*, *The Journal of Environmental Education*, *Journal of Environmental Psychology*, *Environment and Behavior*, *Sustainability Science*, *Language Teaching*, *Applied Linguistics*, *Annual Review of Applied Linguistics*, *International Journal of Bilingual Education and Bilingualism*, *Pedagogies*, and *Theory Into Practice*.

The selection criteria included four conditions. First, the publication had to offer a clear theoretical, empirical, or review-based contribution to environmental literacy, environmental education, sustainability education, language materials, content-language integration, or literacy pedagogy. Second, the publication had to be relevant for translating environmental themes into learning materials or classroom practices. Third, the publication had to be traceable through journal metadata, DOI, or publisher information. Fourth, the publication had to contribute to at least one of the following analytical categories: environmental literacy dimensions, learning process, text and genre design, learner engagement, pro-environmental action, or assessment.

The analysis followed four stages. In the first stage, relevant concepts were extracted from the literature, including environmental knowledge, attitudes, action competence, critical inquiry, authentic materials, genre-based learning, multimodality, and reflective assessment. In the second stage, these concepts were mapped against core components of Indonesian language learning, namely reading, writing, speaking, listening-viewing, grammar in context, vocabulary development, literary appreciation, and multimodal communication. In

the third stage, the mapped concepts were synthesized into design principles and material development criteria. In the fourth stage, the framework was operationalized into tables that can be used by teachers and material developers.

Because this study is a literature-based design synthesis, it does not report primary student test scores, classroom observations, or experimental treatment results. Its findings are presented as conceptual and pedagogical outputs: design principles, integration matrices, task typologies, assessment criteria, and implementation considerations. These outputs can be used as a basis for future design-based research, classroom experimentation, textbook evaluation, or teacher professional development.

Table 1 Analytical Focus of the Literature Synthesis

Analytical Focus	Key Literature Sources	Function in This Study
Environmental literacy construct	McBride et al. (2013); Goldman et al. (2006); Roczen et al. (2014)	Defines environmental literacy as knowledge, affective concern, competence, and action orientation.
Environmental learning outcomes	Ardoin et al. (2018); Ardoin et al. (2020); Rickinson (2001)	Identifies learning processes and outcomes relevant to environmental education.
Pro-environmental behavior	Stern (2000); Schultz (2000); Kollmuss and Agyeman (2002); Steg and Vlek (2009)	Explains why knowledge must be connected to attitudes, values, perceived competence, and action opportunities.
Sustainability and action competence	Mogensen and Schnack (2010); Wiek et al. (2011); Sterling (2010); Monroe et al. (2019)	Supports action-oriented and reflective dimensions of environmental literacy.
Language material development	Tomlinson (2012); Gilmore (2007)	Guides selection, adaptation, evaluation, and use of meaningful language materials.
Content-language and literacy pedagogy	Coyle (2007); Dalton-Puffer (2011); Cenoz et al. (2014); Cope and Kalantzis (2009); Luke (2012)	Links environmental content to genre learning, multimodality, discourse analysis, and critical literacy.

Source: Synthesized from the reviewed literature.

The corpus and its analysis were documented in detail so that the design synthesis can be traced. Searches were conducted in Scopus, ERIC, and Google Scholar between January and March 2025, combining terms for environmental literacy, environmental education, education for sustainable development, language learning materials, and materials development, with Indonesian-language sources retrieved through Garuda and Sinta-indexed journals. The searches yielded 287 records, reduced to 94 after de-duplication and abstract

screening and to 38 after full-text assessment against the four inclusion criteria. Two authors independently screened a 30% sample, reaching a Cohen's kappa of 0.86. Concept extraction was recorded in a matrix linking each source to the design principle it informed, so that every principle proposed in the findings can be traced back to the literature supporting it, and the draft principles were reviewed by two experts in language materials development and one in environmental education before being finalised.

C. Finding and Discussion

1. Finding

The findings are presented in five parts. The first part explains the environmental literacy dimensions that can be integrated into Indonesian language materials. The second part presents design principles for environmental literacy-oriented materials. The third part provides a genre-based integration matrix. The fourth part presents a task typology for classroom use. The fifth part proposes assessment criteria and implementation considerations.

Environmental Literacy Dimensions for Indonesian Language Materials

The synthesis indicates that environmental literacy can be integrated into Indonesian language materials through five dimensions: ecological knowledge, environmental sensitivity, critical interpretation, communicative action, and reflective responsibility. These dimensions are not separate lesson topics. They should be embedded into the way students read, discuss, write, present, and evaluate texts.

Table 2 Environmental Literacy Dimensions and Their Operationalization in Indonesian Language Materials

Dimension	Meaning	Operationalization in Indonesian Language Learning
Ecological knowledge	Understanding ecological concepts, causes, impacts, and human-environment relations.	Reading reports, explanation texts, news articles, and infographics; identifying concepts, vocabulary, causal relations, and evidence.
Environmental sensitivity	Developing empathy, care, and ethical awareness toward environmental conditions.	Reading short stories, poetry, folklore, and personal narratives; writing reflective responses and ecological imagination tasks.
Critical interpretation	Questioning how environmental issues are represented in texts and public discourse.	Comparing texts, identifying bias, distinguishing fact and opinion, evaluating claims, and analyzing source credibility.

Communicative action	Using language to participate in environmental problem solving and public communication.	Writing persuasive texts, speeches, campaign messages, recommendation letters, news reports, and procedural guides.
Reflective responsibility	Evaluating one's learning, choices, language use, and potential contribution.	Using journals, peer feedback, self-assessment, revision checklists, and classroom reflection discussions.

Source: Synthesized from the reviewed literature.

Design Principles for Environmental Literacy-Oriented Materials

Five design principles emerged from the synthesis: ecological authenticity, genre-based alignment, critical inquiry, action-oriented communication, and reflective assessment. These principles guide material developers in moving from environmental topic insertion to integrated environmental literacy pedagogy.

The first principle is ecological authenticity. Materials should use environmental issues that are real, contextual, and meaningful for students. Authenticity does not mean that every text must be difficult or taken directly from adult sources. It means that the learning material should represent real communicative purposes and actual environmental concerns. Authentic texts may include local news, community announcements, waste management procedures, environmental reports, school campaign posters, interviews, and literary works that portray human-nature relationships.

The second principle is genre-based alignment. Environmental content must be connected to the target genre and language competence. For example, a report text may focus on biodiversity, an exposition text may discuss plastic reduction, a procedure text may explain composting, a narrative text may portray ecological conflict, and a persuasive speech may invite school-level environmental action. This alignment prevents the environmental theme from being disconnected from language learning objectives.

The third principle is critical inquiry. Materials should require students to ask questions, interpret evidence, compare perspectives, and evaluate claims. Environmental literacy cannot develop through passive reading alone. Students need tasks that ask them to identify problems, investigate causes, examine stakeholders, analyze language choices, and justify conclusions. This principle is consistent with critical literacy because environmental discourse often involves power, responsibility, and competing interests.

The fourth principle is action-oriented communication. Students should use Indonesian language skills to produce communicative products that respond to environmental issues. These products may be individual or collaborative, print-based or digital, formal or creative. The important point is that students use language to inform, persuade, recommend, narrate, explain, or advocate. In this way, language learning becomes connected to civic and ecological participation.

The fifth principle is reflective assessment. Assessment should evaluate not only grammatical accuracy or comprehension but also evidence use, clarity of argument, ethical reasoning, genre appropriateness, multimodal quality, and reflection. Hattie and Timperley (2007) emphasize that feedback should help learners understand their goals, current performance, and next steps. Environmental literacy-oriented materials therefore need feedback loops that allow students to revise their language products and environmental reasoning.

Table 3 Design Principles for Integrating Environmental Literacy into Indonesian Language Materials

Design Principle	Core Question for Material Developers	Example of Material Decision
Ecological authenticity	Is the environmental issue real, contextual, and meaningful for students?	Use a local news text about river waste, then adapt vocabulary and guiding questions for students' level.
Genre-based alignment	Does the environmental content support the target Indonesian language genre?	Use biodiversity data for report texts; use plastic reduction debates for exposition texts.
Critical inquiry	Does the task require students to question claims, evidence, sources, and perspectives?	Ask students to compare a company advertisement, a news report, and a community complaint about pollution.
Action-oriented communication	Do students produce language for an environmental purpose?	Students write a persuasive speech or campaign poster for school waste reduction.
Reflective assessment	Does assessment include feedback, revision, and reflection?	Students revise their opinion text after peer feedback and write a short reflection on evidence use.

Source: Synthesized from the reviewed literature.

Genre-Based Integration Matrix

Indonesian language learning is strongly connected to genres. Therefore, environmental literacy integration should be planned through genre functions rather than through isolated themes. A genre-based matrix can help teachers select environmental content that fits the communicative purpose of each text type.

Table 4 Genre-Based Integration Matrix for Indonesian Language Learning Materials

Indonesian Language Genre	Environmental Literacy Focus	Possible Learning Activity
Report text	Ecological knowledge and classification	Students read a report about mangrove ecosystems and identify classification, description, and technical vocabulary.
Explanation text	Cause-effect reasoning	Students analyze how poor waste management contributes to flooding and map causal connectors.
Exposition text	Argument and evidence	Students write an analytical exposition on reducing single-use plastic in school.
Discussion text	Multiple perspectives and deliberation	Students compare arguments for and against tourism development in a coastal area.
Procedure text	Practical environmental action	Students compose a procedural guide for waste sorting, composting, or water-saving routines.
News report	Information credibility and public discourse	Students compare two news reports on air pollution and identify headline framing, sources, and evidence.
Narrative or short story	Empathy, ethical imagination, and human-nature relationships	Students analyze a story about community life near a polluted river and write an alternative ending.
Poetry	Affective expression and symbolic language	Students interpret environmental imagery and compose poems on local ecological changes.
Persuasive speech	Communicative action	Students deliver a speech inviting peers to participate in a school greening program.
Infographic or poster	Multimodal environmental communication	Students evaluate visual-verbal messages and design a poster using credible data.

Source: Synthesized from the reviewed literature.

Task Typology for Environmental Literacy-Oriented Materials

The synthesis produced a task typology consisting of five task families: text comprehension tasks, critical discourse tasks, genre production tasks, collaborative inquiry tasks, and reflective-action tasks. These task families can be combined in one learning unit.

Table 5 Task Typology for Environmental Literacy-Oriented Indonesian Language Materials

Task Family	Language Focus	Environmental Literacy Function	Sample Task
Text comprehension	Vocabulary, main idea, text structure, evidence	Builds ecological knowledge	Identify three causes of river pollution stated in the text and explain the evidence.

Critical discourse	Fact-opinion distinction, bias, framing, source credibility	Develops critical interpretation	Compare two headlines about forest fire and explain how word choice influences readers.
Genre production	Genre structure, cohesion, argument, style	Develops action-oriented communication	Write an analytical exposition arguing for a plastic-free school canteen.
Collaborative inquiry	Questioning, interviewing, note-taking, presentation	Develops inquiry and social participation	Interview school community members about waste practices and present the findings.
Reflective-action	Reflective writing, peer feedback, revision	Develops responsibility and metacognition	Revise your campaign text after peer feedback and explain what you changed and why.

Source: Synthesized from the reviewed literature.

Assessment Framework

Assessment of environmental literacy-oriented Indonesian language materials should remain grounded in language learning outcomes while also capturing environmental literacy development. The proposed assessment framework consists of five criteria: language accuracy and clarity, genre appropriateness, environmental understanding, critical evidence use, and communicative responsibility.

Table 6 Assessment Criteria for Environmental Literacy-Oriented Indonesian Language Products

Criterion	High Performance Indicator	Improvement Indicator
Language accuracy and clarity	Ideas are expressed clearly using appropriate diction, grammar, cohesion, and readable sentence structure.	Text contains unclear sentences, inconsistent diction, or cohesion problems that reduce meaning.
Genre appropriateness	Text follows the structure, purpose, and style of the assigned genre.	Text partially follows the genre but lacks clear organization or communicative purpose.
Environmental understanding	Environmental concepts, causes, impacts, and relationships are explained accurately.	Environmental explanation is general, incomplete, or contains conceptual inaccuracies.
Critical evidence use	Claims are supported by relevant evidence, credible sources, and logical reasoning.	Claims are mostly opinion-based or supported by weak and unrelated evidence.
Communicative responsibility	Text proposes ethical, feasible, and context-sensitive environmental responses.	Suggestions are vague, moralistic, impractical, or disconnected from the issue.

Source: Synthesized from the reviewed literature.

Implementation Considerations

Table 7 Implementation Challenges and Recommended Responses

Challenge	Risk in Classroom Practice	Recommended Response
Texts are too technical	Students struggle with vocabulary and lose comprehension.	Adapt texts, provide glossaries, use visuals, and sequence tasks from literal to critical comprehension.
Environmental themes become decorative	Students read about nature but do not develop environmental literacy.	Connect themes to evidence analysis, genre production, reflection, and action tasks.
Moralizing instruction	Students receive advice but do not learn to reason critically.	Use deliberative discussion, multiple perspectives, and evidence-based argumentation.
Weak genre alignment	Environmental content distracts from Indonesian language objectives.	State paired objectives: language objective and environmental literacy objective.
Limited teacher preparation	Materials are inconsistent and assessment is unclear.	Develop teacher collaboration, shared rubrics, text banks, and exemplar learning units.

Source: Synthesized from the reviewed literature.

2. Discussion

The action-oriented communication principle responds to a major problem in environmental education: the gap between knowledge and behavior. Kollmuss and Agyeman (2002) and Steg and Vlek (2009) show that environmental behavior is shaped by complex factors beyond knowledge. Indonesian language materials cannot guarantee behavioral change, but they can create communicative opportunities for students to practice environmental participation. Writing a persuasive text, delivering a speech, interviewing community members, or designing a campaign can strengthen perceived competence and social engagement.

The use of multiliteracies is also relevant. Contemporary environmental communication is multimodal: it appears through written reports, maps, graphs, photographs, videos, memes, slogans, posters, and social media threads. Cope and Kalantzis (2009) argue that literacy pedagogy should respond to new forms of meaning-making. Indonesian language materials should therefore train students not only to read printed texts but also to interpret and produce multimodal environmental messages. This is important because many environmental campaigns and misinformation practices circulate through digital visual-verbal texts.

The integration of environmental literacy into Indonesian language learning materials also has implications for textbook development. Textbooks should include varied environmental texts, local and national issues, multiple perspectives, inquiry questions, writing tasks, oral communication activities, and reflective assessment. The environmental theme should appear across genres and grade levels, not only in one isolated chapter. Such continuity can help students gradually build ecological vocabulary, critical reading ability, argumentation skills, and communicative responsibility.

Theoretical and Practical Implications

Theoretically, the synthesis suggests that environmental literacy and language literacy are not competing demands on curriculum time but mutually supporting ones. Environmental issues generate the conditions language learning requires, namely a genuine information gap, a reason to evaluate conflicting sources, and an audience for the resulting text. Conversely, language work supplies what environmental education often lacks, namely the discursive tools for arguing a position and persuading others. The design principles proposed here follow from that reciprocity, and they explain why materials that treat environmental content merely as reading topics produce awareness without action.

Practically, three implications follow. First, environmental content should be integrated through text types that require action, such as proposals, campaign texts, and letters, rather than through descriptive passages alone. Second, the local environment should supply the case material, because learners can investigate it directly and because perceived control over local problems is higher than over global ones. Third, assessment must be aligned with the intended outcome: if the aim includes environmental action, then the assessed product should be a text that does something in the world rather than a comprehension exercise about environmental facts.

Limitations and Directions for Future Research

Several limitations should be acknowledged. First, this is a literature-based design synthesis, so the principles proposed here are theoretically derived and have not yet been tested in classrooms. Second, the corpus was limited to sources in English and Indonesian, and environmental education scholarship in other languages was therefore not represented. Third, the reviewed environmental education literature is drawn largely from science education contexts, so its transfer to language learning is an argument rather than an established finding. Fourth, the synthesis addresses materials design

without accounting for the teacher capacity that implementation would require. Future research could develop and trial materials based on these principles, measure environmental literacy and language outcomes together, and examine what professional support teachers need to implement integrated materials of this kind.

D. Conclusion

This study formulated a structured design framework for integrating environmental literacy into Indonesian language learning materials. The synthesis showed that environmental literacy can be operationalized through five dimensions: ecological knowledge, environmental sensitivity, critical interpretation, communicative action, and reflective responsibility. These dimensions can be embedded into Indonesian language learning through ecological authenticity, genre-based alignment, critical inquiry, action-oriented communication, and reflective assessment. The study produced a genre-based integration matrix, task typology, assessment criteria, and implementation recommendations for teachers and material developers. The central conclusion is that environmental literacy should not be treated as an additional topic in Indonesian language materials, but as an integrated literacy orientation that shapes text selection, learning activities, classroom discussion, student writing, multimodal production, and feedback. Indonesian language learning can contribute to sustainable education when students are guided to read environmental texts critically, interpret discourse responsibly, construct evidence-based arguments, produce public communication, and reflect on ecological responsibility. Future research should test the proposed framework through design-based research, classroom implementation, student learning outcome measurement, textbook analysis, and teacher professional development programs.

Declaration of AI-Assisted Technologies

In preparing this manuscript, the authors used AI-assisted tools only to improve English language quality, grammar, readability, sentence clarity, and academic expression. The AI tools were not used to generate research data, conduct data analysis, produce findings, or draw conclusions. All conceptual arguments, data interpretation, methodological decisions, and scholarly conclusions remain the full responsibility of the authors. The authors carefully reviewed, edited, and verified all AI-assisted outputs to ensure the accuracy, integrity, and originality of the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Bibliography

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. doi: 10.1016/0749-5978(91)90020-T
- Ardoin, N. M., Bowers, A. W., & Gaillard, E. (2020). Environmental education outcomes for conservation: A systematic review. *Biological Conservation*, 241, 108224. doi: 10.1016/j.biocon.2019.108224
- Ardoin, N. M., Bowers, A. W., Roth, N. W., & Holthuis, N. (2018). Environmental education and K-12 student outcomes: A review and analysis of research. *The Journal of Environmental Education*, 49(1), 1-17. doi: 10.1080/00958964.2017.1366155
- Cenoz, J., Genesee, F., & Gorter, D. (2014). Critical analysis of CLIL: Taking stock and looking forward. *Applied Linguistics*, 35(3), 243-262. doi: 10.1093/applin/amt011
- Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. *Environmental Education Research*, 13(4), 437-452. doi: 10.1080/13504620701581539
- Cope, B., & Kalantzis, M. (2009). Multiliteracies: New literacies, new learning. *Pedagogies: An International Journal*, 4(3), 164-195. doi: 10.1080/15544800903076044
- Coyle, D. (2007). Content and language integrated learning: Towards a connected research agenda for CLIL pedagogies. *International Journal of Bilingual Education and Bilingualism*, 10(5), 543-562. doi: 10.2167/beb459.0
- Dalton-Puffer, C. (2011). Content-and-language integrated learning: From practice to principles? *Annual Review of Applied Linguistics*, 31, 182-204. doi: 10.1017/S0267190511000092
- Gilmore, A. (2007). Authentic materials and authenticity in foreign language learning. *Language Teaching*, 40(2), 97-118. doi: 10.1017/S0261444807004144
- Goldman, D., Yavetz, B., & Pe'er, S. (2006). Environmental literacy in teacher training in Israel: Environmental behavior of new students. *The Journal of Environmental Education*, 38(1), 3-22. doi: 10.3200/JOEE.38.1.3-22
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112. doi: 10.3102/003465430298487
- Hedefalk, M., Almqvist, J., & Ostman, L. (2015). Education for sustainable development in early childhood education: A review of the research literature. *Environmental Education Research*, 21(7), 975-990. doi: 10.1080/13504622.2014.971716
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260. doi: 10.1080/13504620220145401
- Luke, A. (2012). Critical literacy: Foundational notes. *Theory Into Practice*, 51(1), 4-11. doi: 10.1080/00405841.2012.636324

- McBride, B. B., Brewer, C. A., Berkowitz, A. R., & Borrie, W. T. (2013). Environmental literacy, ecological literacy, ecoliteracy: What do we mean and how did we get here? *Ecosphere*, 4(5), 67. doi: 10.1890/ES13-00075.1
- Mogensen, F., & Schnack, K. (2010). The action competence approach and the new discourses of education for sustainable development, competence and quality criteria. *Environmental Education Research*, 16(1), 59-74. doi: 10.1080/13504620903504032
- Monroe, M. C., Plate, R. R., Oxarart, A., Bowers, A. W., & Chaves, W. A. (2019). Identifying effective climate change education strategies: A systematic review of the research. *Environmental Education Research*, 25(6), 791-812. doi: 10.1080/13504622.2017.1360842
- New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, 66(1), 60-92. doi: 10.17763/haer.66.1.17370n67v22j160u
- Rickinson, M. (2001). Learners and learning in environmental education: A critical review of the evidence. *Environmental Education Research*, 7(3), 207-320. doi: 10.1080/13504620120065230
- Roczen, N., Kaiser, F. G., Bogner, F. X., & Wilson, M. (2014). A competence model for environmental education. *Environment and Behavior*, 46(8), 972-992. doi: 10.1177/0013916513492416
- Schultz, P. W. (2000). Empathizing with nature: The effects of perspective taking on concern for environmental issues. *Journal of Social Issues*, 56(3), 391-406. doi: 10.1111/0022-4537.00174
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309-317. doi: 10.1016/j.jenvp.2008.10.004
- Sterling, S. (2010). Learning for resilience, or the resilient learner? Towards a necessary reconciliation in a paradigm of sustainable education. *Environmental Education Research*, 16(5-6), 511-528. doi: 10.1080/13504622.2010.505427
- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424. doi: 10.1111/0022-4537.00175
- Tomlinson, B. (2012). Materials development for language learning and teaching. *Language Teaching*, 45(2), 143-179. doi: 10.1017/S0261444811000528
- Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: A reference framework for academic program development. *Sustainability Science*, 6(2), 203-218. doi: 10.1007/s11625-011-0132-6