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Mapping the media-language-environment nexus in Indonesian language education: A systematic review of scopus-indexed empirical evidence, 2022–2026

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ABSTRACT

Digital media have expanded the pedagogical possibilities of language education, yet the empirical intersection between digital media, Indonesian language education, and students' environmental awareness remains weakly consolidated. This systematic review maps Scopus-indexed empirical evidence published between 2022 and 2026 to clarify how this media-language-environment nexus has been investigated. Guided by the SPIDER framework and reported in accordance with PRISMA 2020 principles, the review searched Scopus using Boolean combinations covering digital media, language or literacy learning, environmental awareness, educational participants or settings, and empirical design. The search identified 289 records; 115 articles were assessed at full-text stage, four studies met the criteria for thematic synthesis, and nine were retained as peripheral contextual evidence. A descriptive quality appraisal was conducted using domains adapted from the Mixed Methods Appraisal Tool. The synthesis identified four patterns of digital media integration: social media content for sustainability thinking, digital comics for ecoliteracy, digital teaching materials for environmental education in Indonesian language learning, and audiovisual narratives for eco-centric language tasks. The small included corpus does not support generalizable causal claims. Instead, it reveals a fragmented but theoretically meaningful research space that requires clearer construct operationalization, validated environmental-awareness instruments, and stronger classroom-based designs in Indonesian language education.

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Introduction

Environmental issues increasingly appear within students' daily literacy environments, not only in science lessons but also through news, social media, school assignments, family conversations, and audiovisual cultures (Burakgazi & Reiss, 2024; Christensen, 2022). Climate change, waste, pollution, biodiversity loss, and unsustainable consumption circulate as public narratives that students read, hear, watch, discuss, and sometimes reproduce. Within this context, Education for Sustainable Development positions learning as a process through which students develop knowledge, values, attitudes, and responsible forms of action. Environmental awareness, therefore, should not be reduced to factual knowledge. It includes cognitive understanding, affective concern, ethical orientation, responsibility, and where appropriate, an emerging disposition to act (UNESCO, 2020; Zwolinska et al., 2022).

Language education offers a distinctive, though still insufficiently theorized, pathway into this agenda. Rather than treating Indonesian language learning as a neutral training ground for grammar, reading, writing, speaking, and listening, recent scholarship suggests that language classrooms can function as spaces where students interpret public issues through texts, narratives, arguments, visual materials, and classroom discourse (Maulidiah et al., 2023). From this perspective, the connection between language learning and environmental awareness is not automatic. It depends on the selection of texts, the design of learning tasks, and the extent to which students are invited to examine how ecological problems are represented, valued, disputed, and translated into social action.

Two complementary frameworks help clarify this relationship. The first is the Education for Sustainable Development tradition, which emphasizes sustainability competences, environmental knowledge, attitudes, and action-oriented learning (UNESCO, 2020; van de Wetering et al., 2022). The second is literacy-based and discourse-oriented language pedagogy, which regards texts, multimodal materials, classroom interaction, and language teacher education as resources for developing social awareness and critical interpretation (Brown, 2024; Cordova, 2024; Kazazoglu, 2025; Kwee, 2021; Maijala et al., 2024; Yu et al., 2024). These frameworks overlap, but they are rarely synthesized in studies of Indonesian language education. The result is a pedagogical and theoretical gap: environmental education research tends to privilege science-oriented contexts, while language education research often treats sustainability themes as content rather than as measurable environmental-awareness constructs.

Digital media further complicate and enrich this intersection. Digital videos, social media content, learning management systems, digital comics, animation, virtual reality, games, and interactive teaching materials may make environmental issues more visible and more immediate for students (Chuang et al., 2025; Fauville et al., 2024; Garcia-Hernandez et al., 2023; Hajj-Hassan et al., 2024; Ricoy & Sanchez-Martinez, 2022; Tsai et al., 2025; Ying et al., 2024). Yet the pedagogical value of digital media does not reside simply in their technological form. A video about plastic waste, a digital comic derived from local folklore, or an online module containing environmental tasks becomes educationally meaningful only when it is connected to language activities such as reading, listening, discussion, argumentation, writing, and reflection. The media-language-environment nexus, therefore, requires analysis as a designed pedagogical relationship rather than as a presumed effect of technology.

Recent empirical work provides an initial basis for examining this nexus, although the evidence remains uneven. Ramadhan et al. (2023), for example, developed digital teaching materials containing environmental education for Indonesian language learning through task-based language learning. Their study employed questionnaires, observation sheets, interviews, validation sheets, and learning outcome tests, and reported high validity and practicality for the developed materials. Hudhana et al. (2025) examined digital comics of folktales as literacy media for strengthening elementary students' ecoliteracy, using an environmental care questionnaire adapted from ecocriticism-based indicators. In an audiovisual language-learning context, Thanya and Suganthan (2023) used task-based activities with the animated film Wall-E to support receptive skills and learners' understanding of eco-centric issues through pre-questionnaire, pre-test, post-test, and post-questionnaire procedures. These studies indicate that digital media, language learning, and environmental awareness have begun to intersect empirically, yet they also reveal inconsistent construct operationalization, uneven instrument reporting, and diverse contextual focuses.

The novelty of this review lies in mapping how empirical studies position the media-language-environment nexus in relation to Indonesian language education, rather than in claiming that digital media directly enhance environmental awareness. Prior studies have examined digital language learning, environmental education, and ecoliteracy, but they have not sufficiently synthesized how digital media are integrated into Indonesian language or literacy learning when environmental awareness is treated as an educational concern. The present review addresses that gap by examining Scopus-indexed empirical evidence from 2022 to 2026 and by identifying what the small and fragmented evidence base can, and cannot, support.

Accordingly, this study adopts a systematic literature review design rather than an experimental, correlational, or field-based intervention design. Its purpose is not to measure a direct causal relationship between digital media and students' environmental awareness. Instead, it synthesizes empirical evidence concerning how digital media have been integrated into language or literacy learning, how environmental awareness and related constructs have been conceptualized and measured, and what methodological gaps remain. The review is guided by the SPIDER framework and reported using PRISMA 2020 principles to support transparency in identification, screening, eligibility assessment, and synthesis.

The review is guided by the following research questions:

RQ1. How has digital media been integrated into Indonesian language or literacy learning in studies that address students' environmental awareness?

RQ2. What dimensions of students' environmental awareness are conceptualized and measured in digitally mediated language or literacy learning studies?
RQ3. What does the current evidence reveal about methodological quality, research gaps, and future directions at the media-language-environment nexus?

Method

Review Design

A systematic literature review design was adopted to identify, screen, extract, appraise, and synthesize empirical studies relevant to the review questions. The SPIDER framework was used to structure the review question and eligibility logic because it is suitable for qualitative, quantitative, and mixed-methods evidence in educational research (Cooke et al., 2012). SPIDER was not treated as a substitute for PRISMA. Rather, SPIDER guided the conceptual formulation of the review, while PRISMA 2020 informed the reporting of the search, screening, eligibility, and inclusion process (Page et al., 2021a, 2021b). This distinction was necessary because the review did not estimate the effect size of a single intervention, but instead examined how digital media, language learning, and environmental awareness were connected across heterogeneous empirical studies.

Table 1. Operationalization of the SPIDER Framework in the Review

SPIDER element	Operational definition in this review
Sample	Students, learners, pupils, adolescents, teachers, classrooms, or school-based educational settings.
Phenomenon of Interest	Digital media integration in Indonesian language learning, language learning, literacy learning, or language-skill development.
Design	Empirical designs including experiment, quasi-experiment, survey, case study, classroom action research, mixed-methods research, development research, design-based research, and evaluation.
Evaluation	Environmental awareness as an umbrella construct, including environmental knowledge, concern, attitude, ecoliteracy, sustainability awareness, environmental responsibility, and pro-environmental orientation. These constructs were coded as related but not interchangeable.
Research type	Quantitative, qualitative, and mixed-methods empirical studies.

The environmental constructs were treated as related indicators within a broader awareness continuum rather than as synonyms. Environmental knowledge was coded as the cognitive dimension; concern and attitude as affective-evaluative dimensions; responsibility, participation, and pro-environmental behavior as action-oriented dimensions; and ecoliteracy or sustainability thinking as integrative constructs that combine knowledge, values, systems thinking, and situated interpretation. This coding choice helped reduce construct conflation while still allowing synthesis across studies that used different terminology.

Database and Search Strategy

Scopus was selected as the sole database because this review was designed as a bounded synthesis of internationally indexed empirical journal articles rather than as an exhaustive review of all possible literature. Scopus provides broad coverage of peer-reviewed journals in education, language learning, environmental science, psychology, social sciences, and sustainability studies. The single-database strategy was used to maintain consistency in bibliographic metadata and indexing standards, but it also limits comprehensiveness. This limitation is acknowledged explicitly in the interpretation of findings.

The search strategy combined five keyword clusters: digital media, language or literacy learning, environmental awareness, educational participants or settings, and empirical research design. The complete Boolean search string used in Scopus is provided below to support reproducibility:

```
(
 YouTube OR "YouTube video" OR "YouTube media" OR "online video" OR "digital video" OR
"educational video" OR "video-based learning" OR "video assisted learning" OR "audio visual
media" OR "audiovisual media" OR "social media" OR "digital media"
)
AND
(
 "Indonesian language learning" OR "Indonesian language teaching" OR "Bahasa Indonesia" OR
"language learning" OR "language teaching" OR "language education" OR "literacy learning" OR
"reading skill" OR "writing skill" OR "speaking skill" OR "listening skill" OR "critical
literacy"
)
AND
(
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 "environmental awareness" OR "environmental consciousness" OR "environmental literacy" OR
"ecological awareness" OR "sustainability awareness" OR "environmental education" OR
"education for sustainable development" OR "sustainability education" OR "environmental
attitude" OR "environmental concern" OR "environmental knowledge" OR "environmental behavior"
OR "pro-environmental behavior" OR "green behavior" OR "environmental responsibility"
)
AND
(
 student* OR learner* OR pupil* OR adolescent* OR teacher* OR classroom OR school OR "junior
high school" OR "middle school" OR "lower secondary school" OR "secondary school" OR "primary
school" OR "elementary school"
)
AND
(
 empiric* OR experiment* OR intervention OR survey OR questionnaire OR interview OR
observation OR "case study" OR "classroom action research" OR "mixed method" OR "mixed
methods" OR qualitative OR quantitative OR evaluation
)
AND NOT
(
 "systematic literature review" OR "systematic review" OR "literature review" OR "scoping
review" OR "meta analysis" OR "meta-analysis" OR bibliometric
)
```

The search was restricted to English-language journal articles published between 2022 and 2026. Additional filters were applied for source type, document type, publication stage, and open access status. Only final journal articles were retained. The selected subject areas were Psychology, Environmental Science, Multidisciplinary, Earth and Planetary Sciences, and Agricultural and Biological Sciences. The search yielded 289 records for screening.

Eligibility Criteria

Eligibility criteria were developed from the SPIDER framework and applied consistently during screening. The criteria were deliberately specific because the review focused on the intersection of digital media, language or literacy learning, and environmental awareness. This specificity increased conceptual precision but also narrowed the final corpus.

Table 2. Inclusion and Exclusion Criteria Applied in the Screening Process

Criterion type	Criteria applied in screening
Inclusion	Empirical journal articles published in English between 2022 and 2026; studies involving students, learners, teachers, classrooms, or educational settings; studies addressing digital media or digitally mediated learning; studies connected to language, literacy, Indonesian language learning, or language-skill development; and studies addressing environmental awareness, environmental education, ecoliteracy, sustainability awareness, environmental attitude, environmental concern, environmental responsibility, or related constructs.
Exclusion	Reviews, conceptual papers, bibliometric studies, editorials, commentaries, non-final publications, non-journal sources, studies outside 2022-2026, studies without digital media or video-related media, studies without language or literacy relevance, studies without environmental or sustainability constructs, and studies outside structured educational settings.

Screening and Selection Process

All records retrieved from Scopus were screened using the predefined eligibility criteria. At the title and abstract stage, each record was assessed for five core elements: digital media or digitally mediated learning, language or literacy relevance, environmental-awareness or sustainability construct, student or educational setting, and empirical design. Records that clearly failed to meet these elements were excluded, while records with insufficient information were retained for full-text assessment.

During full-text screening, each article was classified as included, excluded, or peripheral evidence. Articles were included when they provided empirical evidence connecting digital media, language or literacy learning, and environmental awareness. Articles were retained as peripheral evidence when they addressed only part of the review focus, such as digital environmental learning without a clear language-learning component or language learning with ecological content but limited digital media integration. Articles were excluded when they did not meet the eligibility criteria after full-text examination.

The screening was conducted by a primary reviewer using a structured decision matrix and subsequently checked for consistency against the review questions and eligibility criteria. Uncertain cases were revisited before

final classification. Because the screening process was not conducted by two fully independent blinded reviewers from the beginning, Cohen's kappa was not calculated. This limits statistical demonstration of inter-rater reliability and is reported as a methodological limitation rather than being replaced by unsupported agreement statistics.

The study selection process is summarized in Figure 1. The Scopus search yielded 289 records after database filtering. Title and abstract screening excluded 174 records and retained 115 articles for full-text eligibility assessment. Full-text screening excluded 102 articles, retained nine studies as peripheral evidence, and included four studies in the final thematic synthesis.

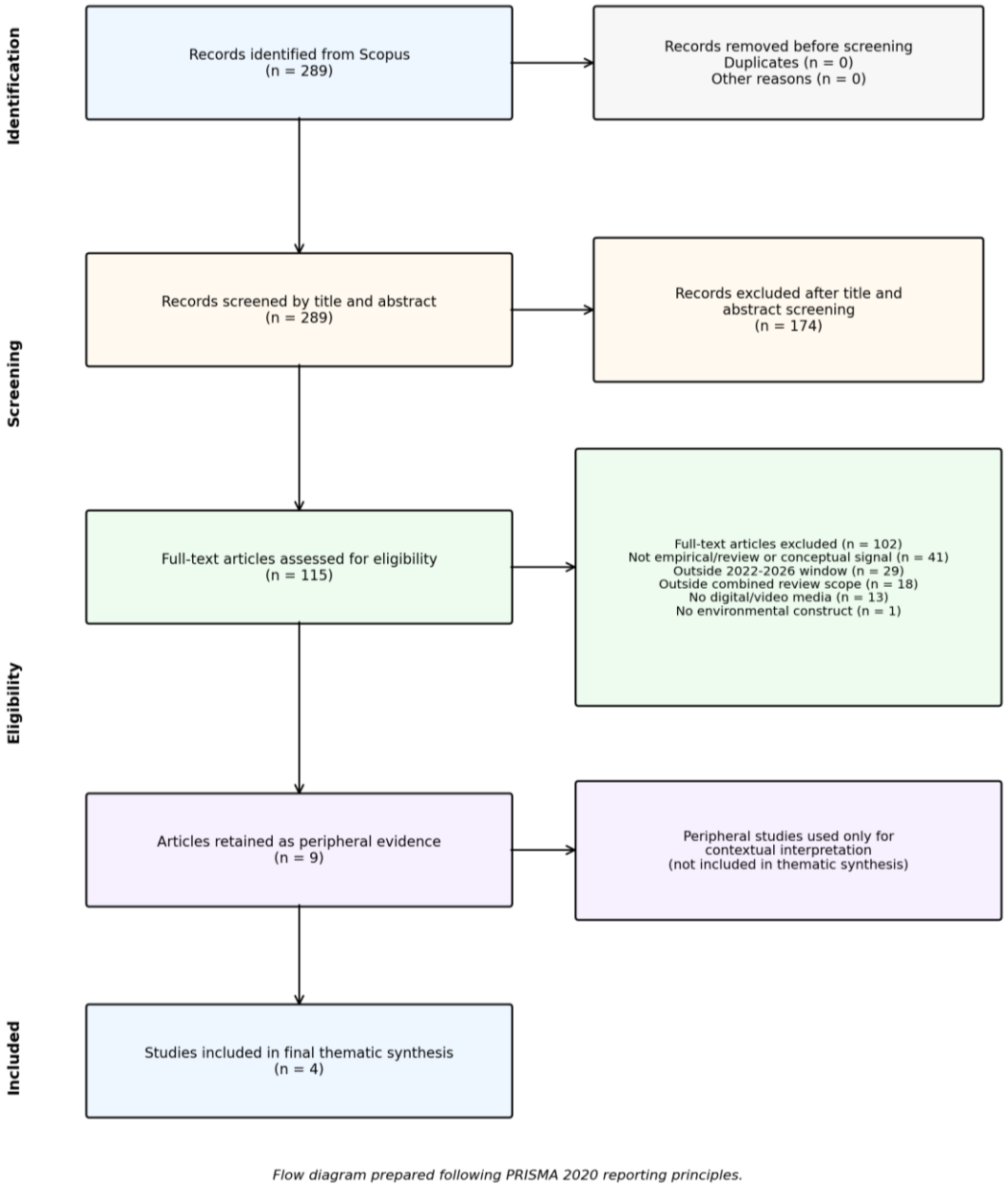

Figure 1. PRISMA flow diagram of the study selection process

Table 3. Reasons for Exclusion During Full-Text Screening

Full-text exclusion reason	Number of articles
Not an empirical primary study or had review/conceptual signal	41
Outside the 2022-2026 publication window or year not identified	29
Outside the combined review scope	18
No clear digital, video, audiovisual, or social media learning component	13
No environmental-awareness, education, literacy, sustainability, or related construct	1
Total full-text exclusions	102

Data Extraction Protocol

Data extraction was conducted using a structured extraction matrix. The extracted information included citation, year, DOI, country or setting, participants, educational level, language-learning context, media or technology used, relevance to digital media, environmental focus, dimensions of environmental awareness, research design, instruments or data sources, analytical approach, main findings, evidence strength, limitations, relevance to each research question, and reviewer notes. The extraction matrix made it possible to compare studies using the same categories before thematic synthesis.

The four studies included in the final synthesis were Saimon et al. (2023), Hudhana et al. (2025), Ramadhan et al. (2023), and Thanya and Suganthan (2023). These studies represented social media content, digital comics, digital teaching materials, online learning platforms, and animated film. Nine additional studies were retained only as peripheral evidence to contextualize the narrowness of the core corpus; they were not used as evidence for the final thematic claims.

Quality Appraisal and Risk-of-Bias Considerations

Methodological quality was appraised descriptively using domains adapted from the Mixed Methods Appraisal Tool (MMAT), which is suitable for heterogeneous empirical designs such as development research, surveys, design-based research, and pre-experimental studies (Hong et al., 2018). Because the included studies differed substantially in design, outcome measures, and analytical procedures, the appraisal was not converted into a numerical score. Instead, it informed the interpretation of evidence strength and the caution attached to each claim.

The appraisal considered five aspects: clarity of research questions, appropriateness of the research design, adequacy of data collection, coherence between data and interpretation, and relevance of the evidence to the review questions. The review did not conduct a formal meta-analytic risk-of-bias assessment or publication-bias test because the final corpus was too small and methodologically heterogeneous for statistical aggregation.

Table 4. Methodological Appraisal of Included Studies

Study	Design	Main methodological strengths	Main validity limitations	Interpretive use in synthesis
Saimon et al. (2023)	Design-based research	Iterative pedagogical model; multiple qualitative data sources; strong relevance to sustainability-oriented digital media use.	Small voluntary sample; higher-education setting; not Indonesian language learning; environmental awareness embedded in sustainability thinking.	Used as broad evidence for digital media as reflective sustainability content.
Hudhana et al. (2025)	Questionnaire survey	Large student sample; explicit ecoliteracy dimensions; Indonesian literacy context through folktales.	Self-report design; no control group; not a YouTube or intervention study; effectiveness claims require caution.	Used mainly for environmental-awareness dimensions and ecoliteracy coding.
Ramadhan et al. (2023)	Research and development with field testing	Closest match to Indonesian language learning; structured digital materials; validation and	Senior high school context; online pandemic setting; environmental awareness not	Used as strongest evidence for Indonesian language digital materials with

Study	Design	Main methodological strengths	Main validity limitations	Interpretive use in synthesis
		practicality evidence; experimental comparison in effectiveness stage.	measured as a standalone outcome.	environmental education.
Thanya & Suganthan (2023)	One-group pre-experimental design	Clear task-based audiovisual language-learning intervention; pre-test and post-test evidence.	No control group; higher-education context; English rather than Indonesian; short-term outcomes.	Used cautiously as evidence for audiovisual language tasks with eco-centric themes.

Synthesis Strategy

A thematic synthesis was used because the included studies differed in design, participants, educational level, media type, instruments, and outcomes. Meta-analysis was not conducted because the studies did not provide comparable effect sizes, used different constructs, and addressed different educational contexts. The synthesis proceeded in three steps. First, studies were coded according to how digital media were used in language or literacy learning. Second, environmental-awareness dimensions were coded using the awareness continuum described above. Third, findings were interpreted in light of methodological quality, evidence strength, and the degree of fit with the review questions.

Given the small included corpus, the synthesis was treated as an exploratory evidence map with thematic interpretation rather than a basis for generalizable causal conclusions. Claims about pedagogical possibility were therefore framed cautiously and linked to the internal validity limitations identified during quality appraisal.

Results and Discussions

The Scopus search returned 289 records after database filtering. Title and abstract screening identified 115 articles for full-text screening. The full-text review resulted in four included studies, nine peripheral studies, and 102 excluded studies. The high attrition rate should be interpreted carefully. It does not show that digital media are ineffective for environmental learning, nor does it imply that language education has no environmental relevance. Rather, it indicates that studies explicitly connecting all three domains--digital media, language or literacy learning, and environmental awareness--remain rare within the Scopus-indexed empirical literature selected for this review.

Part of this scarcity is methodological. The inclusion criteria were deliberately restrictive because the review sought evidence at a three-way intersection rather than studies addressing only one or two domains. Yet the pattern also appears conceptually meaningful. Adjacent research shows considerable activity in digital environmental education, especially through games, virtual reality, gamification, digital tools, and technology-enhanced environmental literacy (Chuang et al., 2025; Fauville et al., 2024; Garcia-Hernandez et al., 2023; Hajj-Hassan et al., 2024; Harker-Schuch et al., 2020; Janakiraman et al., 2021; Ricoy & Sanchez-Martinez, 2022; Sun et al., 2022; Tsai et al., 2025; Ying et al., 2024; Zhang et al., 2024). A parallel body of language-based sustainability research has developed around English language teaching, transformative language teaching, hidden curriculum, ecocritical literacy, digital storytelling, and SDG-oriented language and literature pedagogy (Brown, 2024; Cordova, 2024; Karmakar, 2024; Kazazoglu, 2025; Kwee, 2021; Maijala et al., 2024; Ribó, 2024; Sabari & Hashim, 2023; Sarica, 2023; Yilmaz Findik et al., 2021; Yu et al., 2024). What remains less developed is the explicit integration of digital media, Indonesian language pedagogy, and measurable environmental-awareness constructs. The small corpus is therefore best understood as both an artifact of a focused review boundary and an indication of conceptual fragmentation in the field.

This broader comparison also clarifies why the four included studies should not be treated as weak evidence for a mature field, but as early indicators of a still-forming research nexus. In digital environmental education, the construct of environmental literacy is often measured through knowledge, attitude, intention, or behavior-oriented indicators, whereas in language education the environmental dimension is frequently mediated through text interpretation, narrative, discourse, and learner reflection (Gibson et al., 2025; Maijala et al., 2024; Wheaton et al., 2024; van de Wetering et al., 2022). In Indonesian language education, however, these two methodological traditions have not yet been joined consistently through validated instruments and classroom-based digital learning designs. This explains why the present synthesis emphasizes mapping, construct clarification, and methodological appraisal rather than effect-size estimation.

The four included studies were published between 2023 and 2025. Two were conducted in Indonesia, one in Tanzania, and one in India. Their educational contexts ranged from elementary school to higher education, and their media forms included social media content, digital comics, digital teaching materials, online learning platforms, and animated film. Table 1 summarizes the included studies.

Table 5. Characteristics of Included Studies

Study	Context and participants	Digital media	Language/literacy focus	Environmental focus	Design
Saimon et al. (2023)	Tanzania; college classroom; 2 tutors and 20 students	Social media content	Integrated mathematics, language, arts, and technology	3D sustainability thinking	Design-based research
Hudhana et al. (2025)	Indonesia; elementary schools; 199 students	Digital comics of folktales	Folktale-based literacy learning	Ecoliteracy and environmental care	Questionnaire survey
Ramadhan et al. (2023)	Indonesia; senior high school; 60 students in field testing	Digital teaching materials using i-Spring and Edmodo	Indonesian language learning with task-based language learning	Environmental education	Research and development
Thanya & Suganthan (2023)	India; higher education; 36 participants in intervention	Animated film Wall-E	Receptive skills: reading and listening	Eco-centric issues	Pre-experimental design

RQ1: Digital Media Integration in Language and Literacy Learning

The first research question examined how digital media have been integrated into language or literacy learning when environmental awareness is addressed. Four patterns emerged from the synthesis.

The first pattern involves the use of digital media as authentic sustainability content. Saimon et al. (2023) developed a model for using social media content to promote 3D thinking on sustainability in integrated mathematics, language, arts, and technology classrooms. Music videos, news, football clips, and other digital materials were not treated as decorative visual aids. They became catalysts for discussion, reflection, analysis, and interdisciplinary meaning-making. This pattern suggests that digital media can support language-related sustainability learning when students are guided to interpret environmental, social, and economic meanings within media texts.

The second pattern concerns digital visual narratives that strengthen ecoliteracy. Hudhana et al. (2025) examined students' perceptions of digital comics of folktales as learning media. Folktale-based digital comics may convey ecological values through narrative, visual representation, cultural memory, and local wisdom. This pattern is relevant to Indonesian language education because folktales, narratives, and local stories are already part of language and literature learning. Digital comics may therefore enable teachers to introduce environmental values without detaching them from literacy practices.

The third pattern refers to structured digital teaching materials. Ramadhan et al. (2023) developed digital teaching materials containing environmental education through task-based language learning. The materials were created with i-Spring and integrated with Edmodo. Unlike studies in which digital media function only as supplementary content, this study positioned digital media as part of instructional design. The materials included learning objectives, tasks, environmental themes, activities, and assessment components. This makes the study particularly relevant because it demonstrates how environmental education can be embedded within Indonesian language learning through a designed digital learning sequence.

The fourth pattern is the use of audiovisual narratives to support ecological understanding and language-skill development. Thanya and Suganthan (2023) used the animated film Wall-E to improve learners' receptive skills and understanding of eco-centric issues. Task-based activities guided learners to develop reading and listening skills while engaging with problems such as air pollution, deforestation, climate change, trash pollution, and sustainability. This pattern shows that audiovisual media can link language comprehension with ecological interpretation, although the evidence is limited by the study's one-group design and higher-education context.

Taken together, these studies indicate that digital media functioned as content sources, narrative environments, instructional materials, and prompts for reflection. Their pedagogical value depended less on the presence of technology itself than on how media were integrated into reading, listening, discussion, writing, task completion, and interpretation. This pattern is consistent with recent digital learning and environmental education studies showing that technology is more consequential when it is embedded in structured inquiry, narrative engagement, and reflective tasks rather than used as a stand-alone motivational device (Chuang et al., 2025; Garcia-Hernandez et al., 2023; Hajj-Hassan et al., 2024; Herlanti et al., 2025; Ricoy & Sanchez-Martinez, 2022; Tsai et al., 2025; Ying et al., 2024). This finding supports the shift from a narrow YouTube-assisted framing toward a broader review of digital media integration.

RQ2: Dimensions of Environmental Awareness

The second research question examined which dimensions of environmental awareness were conceptualized and measured. Seven dimensions were identified: environmental knowledge, environmental concern, ecoliteracy, sustainability thinking, environmental attitude, environmental responsibility, and participation. These dimensions appeared with different labels and levels of measurement across studies.

Environmental knowledge appeared in studies that introduced learners to ecological problems. Thanya and Suganthan (2023), for instance, used Wall-E to help learners understand air pollution, deforestation, climate change, trash pollution, and ecological imbalance. In this case, environmental knowledge was embedded in audiovisual comprehension rather than presented as science content alone.

Environmental concern and ecoliteracy were most visible in Hudhana et al. (2025). Their ecoliteracy indicators included care for flora and fauna, ecosystem awareness, the physical environment, nature as a center of life, responsibility toward the environment, and participation in environmental care. This evidence is valuable because it shows how a literacy medium can carry environmental values. Even so, the reliance on self-report questionnaire data means that ecoliteracy was assessed mainly through perceived response rather than observed behavior.

Sustainability thinking was central in Saimon et al. (2023). Their concept of 3D thinking asked students to relate environmental, social, and economic dimensions simultaneously. This expands environmental awareness beyond individual care for nature and places it within systems thinking. Environmental attitude and eco-awareness appeared in Thanya and Suganthan (2023), where task-based audiovisual learning improved learners' motivation and understanding of eco-centric issues.

Responsibility and participation appeared less consistently. Hudhana et al. (2025) included these as part of ecoliteracy, while Saimon et al. (2023) implied action-oriented sustainability thinking through student engagement with social media content. Across the corpus, however, no study used a dedicated and validated environmental-awareness instrument specifically designed for digitally mediated Indonesian language learning. This inconsistency weakens direct comparison across studies and supports the need for future instrument development, especially because environmental literacy and awareness are increasingly conceptualized as multidimensional constructs that combine knowledge, affective orientation, systems thinking, civic responsibility, and situated action (Fischer et al., 2025; Gibson et al., 2025; Guerrero & Sjostrom, 2024; Hasibuan et al., 2025; van de Wetering et al., 2022; Wheaton et al., 2024; Zwolinska et al., 2022).

RQ3: Evidence Strength, Research Gaps, and Theoretical Contribution

The evidence base offers pedagogical indications rather than generalizable proof. Ramadhan et al. (2023) provided the strongest evidence for Indonesian language learning because the study developed digital teaching materials containing environmental education and reported validity, practicality, and learning-outcome evidence. Self-validation reached 93.12%, expert validation 93.18%, teacher practicality 93.54%, student practicality 80.62%, and student learning activity 93.33%. The experimental class also obtained higher learning outcomes than the control class. However, environmental awareness was not measured as a standalone construct, which limits the extent to which the study can support claims about awareness development.

Hudhana et al. (2025) provided useful evidence for digital narrative media and ecoliteracy. Students responded positively to digital comics of folktales, and the study identified concrete ecoliteracy dimensions. Yet the design was perception-based and did not include a control group. Saimon et al. (2023) contributed a pedagogical model for social media content and sustainability thinking, but the study was conducted in a Tanzanian higher-education setting and was not specific to Indonesian language learning. Thanya and Suganthan (2023) showed improvement in receptive language skills and eco-centric understanding after audiovisual task-based activities, but the one-group pre-experimental design limits internal validity.

The main theoretical contribution of this review is not a claim that digital media reliably enhance environmental awareness. Such a conclusion would exceed the evidence. Rather, the review clarifies how the

media-language-environment nexus is currently distributed across partially connected bodies of research. Digital environmental education studies often prioritize environmental or science-learning outcomes; language-based sustainability studies often emphasize discourse, literacy, hidden curriculum, ecocritical interpretation, or classroom integration; and digital language learning studies often focus on engagement, autonomy, or learning achievement (Brown, 2024; Cordova, 2024; Karmakar, 2024; Kazazoglu, 2025; Maijala et al., 2024; Pratiwi & Waluyo, 2023; Ribó, 2024; Sabari & Hashim, 2023; Sarica, 2023; Yu et al., 2024). The four included studies occupy the overlap among these domains, but they do so unevenly. This mapping provides a conceptual basis for future research by showing which components are present, which constructs are under-measured, and which methodological designs remain weak.

Compared with broader adjacent evidence, the small included corpus is not surprising. Hajj-Hassan et al. (2024), Garcia-Hernandez et al. (2023), and Chuang et al. (2025) show that digital tools, games, and technology-enhanced learning have been actively studied in sustainability and environmental literacy education, while van de Wetering et al. (2022) synthesized environmental education effects on children and adolescents more broadly. In language education, Yu et al. (2024), Kazazoglu (2025), Cordova (2024), Brown (2024), Maijala et al. (2024), and Kwee (2021) position sustainability as a curricular, discursive, and teacher-education concern. Ramadhan et al. (2023) and Hudhana et al. (2025) move closer to the Indonesian context through digital teaching materials and folktale-based ecoliteracy. This comparison suggests that the scarcity found here is not simply a technical artifact of the search strategy. It reflects a research field in which digital media, language learning, and environmental awareness are often studied in pairs, but rarely as an integrated triadic problem.

Three research gaps follow from this interpretation. First, no included study directly examined digitally mediated Indonesian language learning and students' environmental awareness as a complete empirical object. Second, environmental awareness was conceptualized through diverse constructs such as ecoliteracy, sustainability thinking, environmental education, eco-awareness, and environmental care, making cross-study comparison difficult. Third, methodological strength varied considerably, and few studies used validated instruments capable of capturing multiple dimensions of environmental awareness in language-learning contexts.

Implications

The findings should be translated into pedagogical recommendations with caution. Digital media may be useful for integrating environmental issues into Indonesian language learning, but the evidence does not justify broad causal generalization. What can be recommended is a design principle: digital media should be selected and organized around explicit language skills, environmental-awareness dimensions, and reflective learning tasks.

Indonesian language teachers may integrate environmental issues into reading comprehension, listening tasks, oral presentations, persuasive and argumentative writing, critical literacy activities, and project-based learning. A video, digital comic, social media post, or digital module should not function merely as attractive content. It should invite students to interpret environmental messages, analyze language use, discuss values, and connect textual meaning with local ecological realities, a principle that resonates with recent work on SDG-oriented language teaching, ecocritical literacy, and digital storytelling (Cordova, 2024; Karmakar, 2024; Maijala et al., 2024; Ribó, 2024; Sabari & Hashim, 2023).

Future learning materials may benefit from combining local and global environmental issues. Local folktales, community waste problems, school greening activities, river pollution, and urban ecological challenges can make environmental awareness more contextual. Global issues such as climate change, biodiversity loss, and sustainable consumption can extend students' ecological understanding beyond their immediate environment.

For researchers, the most pressing implication concerns measurement. Environmental awareness should be operationalized through multiple but clearly distinguished dimensions, including environmental knowledge, concern, attitude, responsibility, self-efficacy, intention, participation, and behavior. Instruments should be validated according to students' age level, cultural context, and learning setting. Stronger designs, including quasi-experimental studies, mixed-methods research, longitudinal observation, online lesson study, and classroom-based design research, are needed before firmer claims can be made about instructional effectiveness (Fischer et al., 2025; Guerrero & Sjostrom, 2024; Hasibuan et al., 2025; Herlanti et al., 2025; Idoiaga Mondragon et al., 2023; van de Wetering et al., 2022; Wheaton et al., 2024).

Limitations

Several limitations should be acknowledged. First, this review used Scopus as the only database. Although Scopus offers broad coverage of international peer-reviewed journals, relevant Indonesian studies may be indexed in Web of Science, ERIC, DOAJ, Garuda, SINTA, Google Scholar, or institutional repositories. The findings should therefore be interpreted as Scopus-indexed evidence rather than a comprehensive account of all published and unpublished studies.

Second, the review was limited to English-language journal articles published between 2022 and 2026. This decision increased international comparability but may have excluded Indonesian-language studies and grey literature. Because grey literature was not searched, publication bias cannot be ruled out. Formal publication-bias analysis, such as funnel-plot inspection, was not conducted because the final corpus was too small and no meta-analysis was performed.

Third, the included studies were heterogeneous in educational level, country, method, media type, and outcome measures. The synthesis was therefore thematic rather than statistical. Fourth, only four studies were included in the main synthesis, while nine were retained as peripheral evidence. This small corpus is appropriate for identifying an emerging research gap, but it is not sufficient for generalizable claims about the effectiveness of digital media. Finally, Cohen's kappa was not calculated because the screening was not conducted by two fully independent blinded reviewers at the initial stage. This limits the statistical reproducibility of study selection decisions.

Conclusions

This systematic review mapped Scopus-indexed empirical evidence on the media-language-environment nexus in Indonesian language education from 2022 to 2026. The synthesis of four included studies indicates that digital media have been used as authentic sustainability content, digital visual narratives, structured digital teaching materials, and audiovisual prompts for eco-centric language tasks. These findings point to pedagogical possibilities, but they do not establish generalizable causal effects. Environmental awareness was represented through several dimensions, including environmental knowledge, concern, ecoliteracy, sustainability thinking, environmental attitude, responsibility, and participation. These dimensions were not measured consistently across the included studies, and no dedicated validated instrument was found for assessing environmental awareness in digitally mediated Indonesian language learning. The heterogeneity of constructs and methods was handled through thematic synthesis and descriptive quality appraisal rather than meta-analysis. The theoretical contribution of this review is a clarification of the field's fragmentation. Existing studies show that digital media can support language and literacy activities around environmental themes, but the three-way integration of digital media, Indonesian language pedagogy, and multidimensional environmental-awareness measurement remains insufficiently developed. Future studies should not simply replicate digital media use. They should design and test Indonesian language learning models that explicitly connect environmental themes, language skills, local ecological contexts, validated instruments, and stronger classroom-based research designs.

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