

Systematic Review

The Development of Sustainability and Education Research in Indonesia: A Systematic Literature Review

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Abstract

The future of the planet depends largely on human beings, who currently occupy a dominant position among living species. This condition highlights the importance of global efforts to ensure that the sustainability of life on Earth remains a central priority, as articulated in the Sustainable Development Goals (SDGs). This paper investigates how sustainability and education have been represented in research publications in Indonesia. This study reviews the development of sustainability and education research in Indonesia using a systematic literature review (SLR) supported by structured content analysis and descriptive mapping. A total of 362 documents were retrieved from the Scopus database using specific keywords. The systematic review reveals an upward trend in publications over the past nine years, with universities in Java playing a dominant role, and a significant acceleration in knowledge production during the last five years. This increase is accompanied by growing diversity in research topics, domains, keywords, and methodological approaches. One of the most notable findings is the prominence of service-based learning (SBL), which appears to be a distinctive feature of higher education pedagogy in Indonesia.

Keywords: SDGs; Indonesian higher education; SLR; education and sustainability; service-based learning

1. Introduction

Complex challenges facing the world in the twenty-first century led the United Nations, in 2015, to initiate a global consensus known as the Sustainable Development Goals (SDGs) (United Nations General Assembly, 2015). This initiative is a continuation of the environmental movement of the 1970s, which alerted the world that these issues also include social and economic problems that can have an impact on the global population with regard to their quality of life. Recovering the ecosystem and sustaining it for the prosperity of future generations then became the main agenda of the SDGs, which consist of 17 interconnected objectives.

One of the main goals in the SDGs is in the education sector (SDG 4), where the issue of sustainability has become the central agenda for many countries to undertake educational reform and efforts to transform their institutions (UNESCO, 2012, 2017). Education is closely related to societal prosperity, including gender equality, social inclusion, and poverty alleviation, which can significantly contribute to sustainable development



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(UNESCO, 2021). Skills in critical thinking, problem solving, and interdisciplinary collaboration can be enhanced in educational establishments across the world, equipping students not only with subject knowledge but also with competencies and attitudes that facilitate sustainability (Narong & Hallinger, 2024). As such, developing an innovative curriculum and implementing pedagogical experimentation that enables students to understand the challenges, acting appropriately and ethically, is the goal to be achieved within the SDGs.

Indonesia, as one of the developing countries in Southeast Asia, faces complex challenges with regard to its development status. Indonesia is a late comer to industrialisation (Nielsen, 2003), and has experienced turbulent political stability, which has impacted educational administration and performance (Sumintono et al., 2023a), as well as complex environmental problems and their rehabilitation (Groot et al., 2007). These conditions make the transition towards sustainability particularly challenging and underscore the importance of examining how sustainability has been addressed within the Indonesian educational context.

Despite the increasing attention to sustainability education in Indonesia, the existing literature remains fragmented across institutions, educational topics, sustainability domains, and methodological approaches. A systematic synthesis is therefore needed to identify dominant patterns, emerging areas, and underexplored aspects of the field. This study aims to systematically review the development of sustainability and education research in Indonesia through structured content analysis and descriptive mapping. Specifically, it examines publication trends, institutional affiliations, geographic distribution, keyword trajectories, education-related topics, sustainability domains, methodological approaches, reported outcomes, and evidence levels. By mapping both the growth and substantive characteristics of the literature, this study provides an evidence base for strengthening sustainability-oriented curriculum development, identifying methodological gaps, expanding regional research participation, and informing future educational research in Indonesia.

2. Literature Review

To involve sustainability in education, many researchers use a framework for the inclusion of sustainability in education, which was first proposed by Sterling (2001), in which he explains three models of change. Responses to sustainability in education can occur in three different directions, which are referred to as education about sustainability, education for sustainability, and education as sustainability; these become the cornerstone for assessing its involvement (Kolmos et al., 2016). The first model, which is education about sustainability, does not involve changes in the educational paradigm; it is mostly an add-on strategy in which sustainability subjects are included in the syllabus and become part of the educational curriculum. It is also considered a starting point for inclusion in any education system, which can become the basis for capacity building that moves from individual involvement to the group or program level in any system (Narong & Hallinger, 2024).

The next model, which is called education for sustainability, involves an integration strategy and is considered a systems approach to sustainability issues in education. In this model, activities are embedded in teaching and learning, where the involvement of sustainability-related knowledge, skills, and values or attitudes is more widespread in education. This model facilitates knowledge communities, in which many groups and levels are involved in exchanging information across organisations, utilising available social network structures to support sustainable development programs (Narong & Hallinger, 2024).

Education as sustainability is the latest model, which involves deep engagement at the systems level. This is essentially a rebuilding strategy, in which values, identity, commitment, risk-taking, contextualisation, and collaboration occur within society (Sterling, 2001). This model represents a shift in the educational paradigm that tends to rebuild the curriculum at the macro level, leading to system-wide implementation that connects societal contexts and needs with educational establishments (Kolmos et al., 2016).

With regard to how sustainability is practised in educational institutions, Narong and Hallinger (2023) group it into three approaches: problem-based, project-based, and service-based learning (SBL). The first approach, problem-based learning (PBL), is a type of activity that shifts from the traditional style of teaching by telling to student learning by doing. This approach emphasises experiential learning and challenges students' problem-solving skills, usually in the context of real-world problems. This approach is very popular in many fields and subjects; it is considered a manifestation of student-centred learning, in which students work in groups and can also enhance their critical thinking, interpersonal skills, and ability to handle interdisciplinary knowledge. The reality of sustainable development situations, in which students face complex and unresolved problems that need to be understood across multiple scientific disciplines, makes PBL an ideal pathway for experiential learning.

The second approach, which is project-based learning (PjBL), is where a student or a group of students works on a specific project that usually also originates from real-world problem situations. They need to complete the project and find solutions using inquiry-based and investigative processes that require them to implement and apply knowledge and skills related to sustainability. This makes PjBL different from PBL, where the latter is more focused on acquiring knowledge; however, there are some similarities between the two approaches, as both emphasise student-centred learning, in which students engage in experiential learning directly as problem solvers of real-world challenges. On many occasions, both PBL and PjBL are combined to address sustainable development problems as an effective learning strategy to involve students more deeply in the issues (Narong & Hallinger, 2024).

SBL, which is the final approach to practising sustainability in education, requires students to participate directly in societal problems in the field and attempt to find solutions. It is believed that SBL can improve students' academic learning, as they develop stronger conceptual understanding and knowledge retention; at the same time, their critical thinking and problem-solving abilities are also enhanced. Working in the field and solving sustainable development problems that address community needs contribute to the development of students' skills in collaboration, communication, and leadership. Narong and Hallinger (2024) state that this SBL approach involves three elements that enhance students' learning capacity: first, exposure to real social issues and community problems; second, students' reflection on their learning experiences and interactions; and third, reciprocity, in which members of the community and students exchange knowledge and skills, which largely benefits students' understanding.

3. Methodology

This study employed a systematic literature review (SLR) to synthesise the development of sustainability and education research in Indonesia. SLR was considered appropriate because the study systematically identifies, screens, classifies, and synthesises the substantive characteristics of the existing literature through a transparent and analytical process (Fromm et al., 2025). The identification, screening, eligibility assessment, and inclusion processes were structured and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Peixoto et al., 2021; Rethlefsen et al., 2021).

The review combined structured content analysis with supplementary descriptive mapping of the included literature. This approach is consistent with Schreiber and Cramer (2024), who emphasise that systematic reviews can incorporate content analysis to conceptually map complex and fragmented fields of research. Descriptive mapping was used to characterise the corpus through publication trends, institutional affiliations, geographic distribution, and keyword trajectories. These descriptive elements complemented the primary analytical focus of the review, which was the structured synthesis of document content, including education-related topics, sustainability domains, methodological approaches, reported outcomes, and evidence levels.

The time frame used for the search ranges from 1990 to 2025, in order to provide a comprehensive picture of knowledge development over the last 35 years. The search was conducted in the Scopus database, as it is the largest platform for peer-reviewed scientific journals and provides better coverage compared to Web of Science, Google Scholar, and the Dimensions database, which typically aggregate content from multiple sources (Singh et al., 2021). This study focuses only on journal articles with Indonesian affiliations indexed in Scopus and addresses sustainability within an educational context. The keywords used were “Indonesia,” “education,” and “sustainability,” along with their variations (such as “educational” and “sustainable”); the initial search identified 768 documents in the Scopus database.

The study-selection process was conducted in three stages. First, duplicate records were identified and removed. Of the 768 records retrieved from Scopus, three duplicates were excluded, leaving 765 records for screening. Second, the titles and abstracts of the remaining records were reviewed to determine their relevance to the scope of the study. Records were retained if they addressed sustainability within an educational context, including teaching, learning, students, curriculum, educational institutions, or higher education. Records were excluded if they focused solely on non-educational sectors or disciplines, such as engineering, technology, business, management, health sciences, or environmental studies, without a clear educational component. This screening stage excluded 316 records, leaving 449 records for further assessment. Third, the full texts of the remaining records were examined to confirm their eligibility. Articles were included if sustainability and education constituted a substantive focus of the study and if sufficient information was available to support content coding. Articles were excluded if the educational component was incidental, the sustainability dimension was not clearly addressed, or the full text did not provide sufficient information for classification. At this stage, 87 articles were excluded. The final corpus consisted of 362 documents. The earliest eligible publication was published in 1993, and all included documents were written in English. The selection process is summarised in Figure 1.

The included documents were analysed using a structured coding framework. Each document was coded according to five dimensions: education-related topics, sustainability domains, methodological approaches and subtypes, reported outcome domains, and evidence levels. Education-related topic codes included Education for Sustainable Development, higher education sustainability, whole-school approaches, teacher professional development, community and non-formal education, environmental education, STEM-oriented sustainability education, assessment, digital education, health education, and review-based studies. Sustainability-domain codes covered climate change, energy, water and sanitation, waste management and circular economy, biodiversity and ecosystems, food and agriculture, public health and wellbeing, disaster risk reduction, urban sustainability, economy and sustainable business, social equity and culture, governance and policy, and integrated or multi-domain sustainability issues. Methodological codes distinguished quantitative, qualitative, mixed-methods, review-based, and design-oriented

studies. Outcome-domain codes and evidence levels were used to examine the types of results reported and the extent to which the reported outcomes were supported by identifiable evidence. The complete codebooks, including definitions, decision rules, and worked examples, are provided in Appendices A–D.

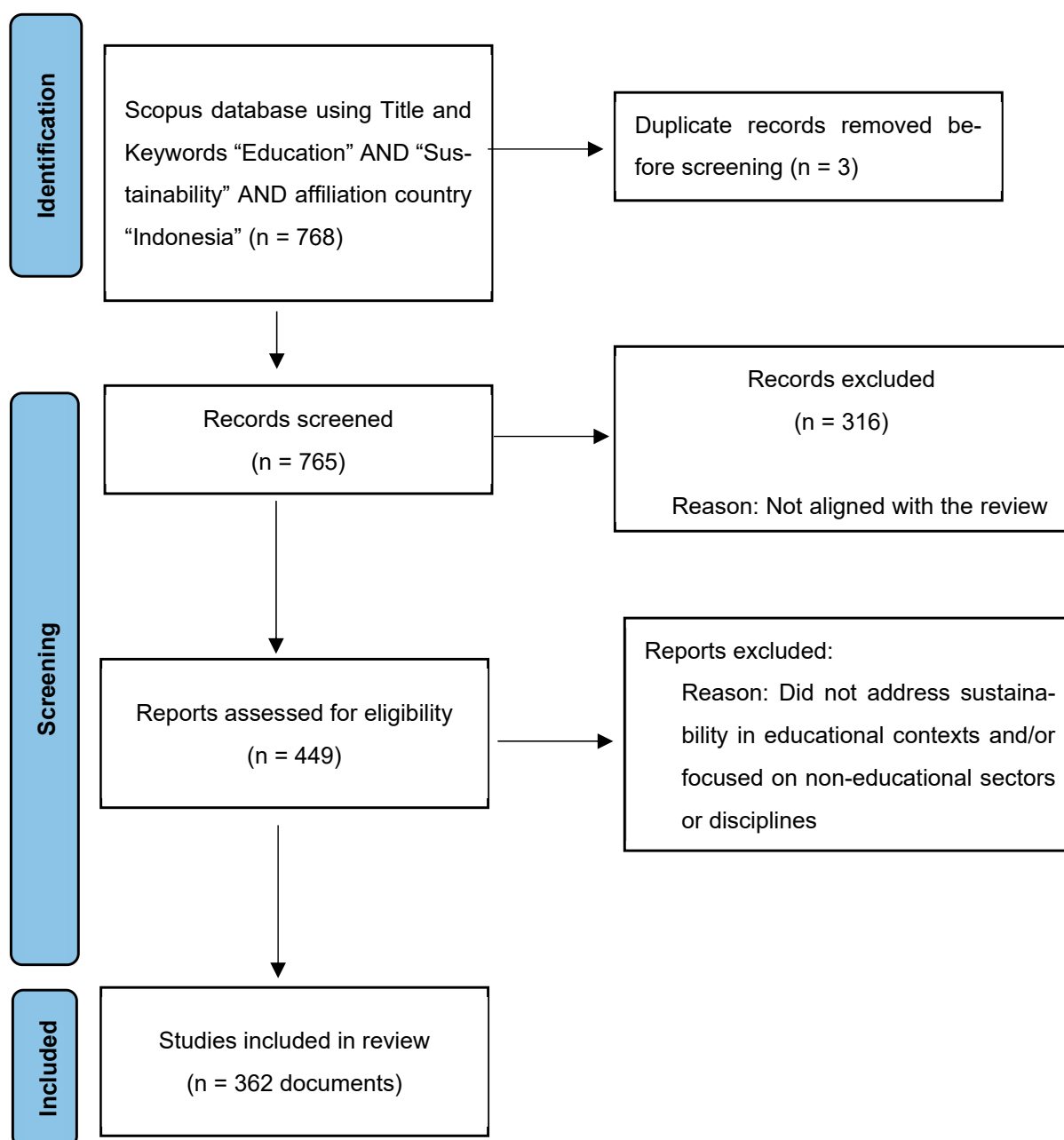


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework.

The coding categories were not treated as mutually exclusive. A document could receive multiple codes when it addressed more than one topic, domain, method, or outcome category. Counts were calculated using full counting with within-document deduplication. Each code therefore contributed at most once per document.

The initial coding was conducted by one reviewer using the predefined coding framework. The coding results were subsequently checked by a second reviewer and further reviewed by a third reviewer to ensure consistency in the application of the coding criteria.

Any discrepancies were discussed until consensus was reached, and the coding rules were clarified where necessary.

The data exported from Scopus were organised and analysed using Microsoft Excel Professional Plus 2021. Descriptive mapping was used to examine annual publication trends, institutional affiliations, geographic distributions, and keyword frequencies. Structured content analysis was used to examine education-related topics, sustainability domains, methodological approaches, reported outcomes, and evidence levels. Frequency distributions, pivot tables, temporal comparisons, and cross-tabulations were generated to identify dominant patterns, emerging areas, and underexplored aspects of sustainability and education research in Indonesia.

4. Results

4.1. Annual Publication Trends

The annual distribution of publications suggests that sustainability and education research in Indonesia follows a developmental trajectory rather than a stable (mature) pattern (Figure 2). During the early period (1993–2016), publications appeared only sporadically, with very low annual counts (typically 1–4 papers) and non-continuous publication years, indicating that the topic had not yet consolidated into routine annual scholarly output. A clear shift toward more consistent production emerges in 2017–2019, when annual publications increased from 12 to 18 to 22 (Figure 2). The strongest acceleration occurs in 2020–2025, with output rising from 38 to 78 publications, including a temporary correction in 2021 followed by renewed growth through 2025 (Figure 2).

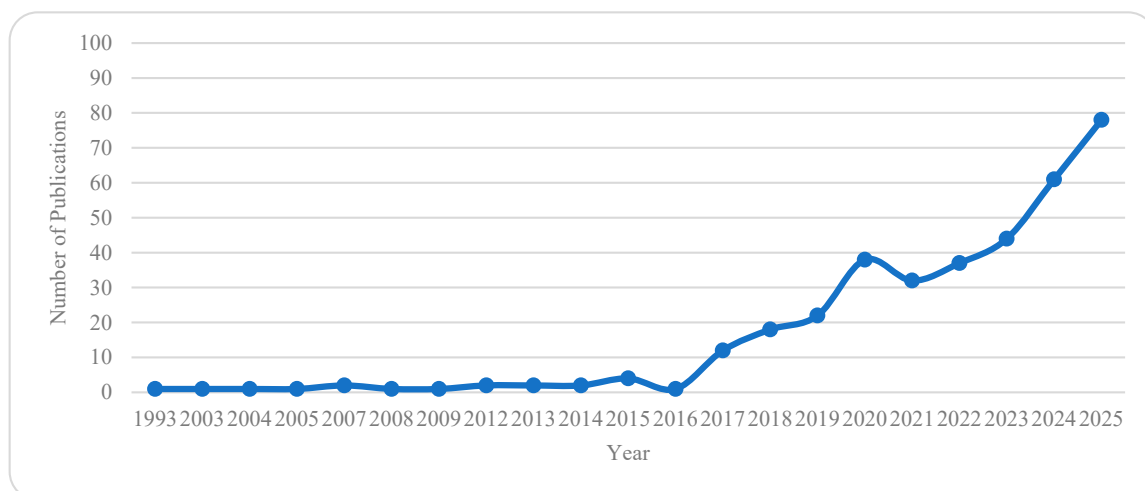


Figure 2. Annual publication counts of sustainability-in-education research in Indonesia (1993–2025; N = 362).

To translate this trend into an interpretable narrative of field development, we summarise the temporal evolution into publication phases based on annual volume and stability patterns (Table 1). The long emerging period, followed by recent acceleration, supports the interpretation that, within the scope of this dataset, sustainability and education research in Indonesia is still developing, characterised by late consolidation and rapid expansion rather than a sustained stabilisation phase. Because the early years are non-continuous and base values are small, apparent year-to-year fluctuations in 1993–2016 should be interpreted with caution, as they may reflect sparse coverage rather than systematic growth dynamics.

Table 1. Periodisation of sustainability publications in Indonesia based on annual volume and growth pattern (N = 362).

Phase	Year Range	Trend Pattern (Based on Annual Counts)	Interpretation
Phase 1 (Emerging; sporadic)	1993–2016	Very low volume (typically 1–4 papers/year) with non-contiguous years; apparent YoY volatility is driven by a small base	Sustainability appears only occasionally; publications are not yet a routine annual output
Phase 2 (Early growth; first consistency)	2017–2019	Clear shift to consistent output: 12 → 18 → 22 papers/year	Research attention becomes more visible and regular; sustainability and education begins to consolidate as a recognizable theme
Phase 3 (Acceleration; mainstreaming)	2020–2025	High-volume period with strong overall growth: 38 → 32 → 37 → 44 → 61 → 78 (one temporary correction in 2021, followed by renewed increases)	Sustainability-in-education becomes a mainstream topic; output expands rapidly and is ready for deeper thematic/methodological mapping

4.2. Affiliations and Institutional Distribution

Affiliations were analysed using a full-counting approach with within-article deduplication (i.e., the same institution appearing multiple times within an article was counted once) to characterise the institutional landscape of sustainability and education research in Indonesia. Affiliation strings were available for 344 of 362 records (95.0%); the remaining records had missing or unparsed affiliation fields in the export.

Figure 3 summarises the top 15 institutions by number of papers. The distribution shows a strong concentration among a small set of highly productive universities. Notably, the top contributors are dominated by Java-based institutions, led by Universitas Pendidikan Indonesia (Bandung), followed by Universitas Negeri Malang, Universitas Negeri Jakarta, Universitas Gadjah Mada, and Universitas Indonesia (Figure 3). Only a small portion of the top 15 list comes from outside Java (e.g., Universitas Lambung Mangkurat), indicating that the most productive institutional hubs are concentrated on Java Island.

The spatial pattern reinforces this institutional concentration. The island-level distribution of Indonesian affiliation credits is strongly dominated by Java, with substantially smaller contributions from Sumatra and other regions (Figure 4). The representation of eastern Indonesia is limited, indicating that national sustainability and education research is empirically uneven and geographically centralised. Together, the institutional and island-level patterns suggest that the field reflects a developing research landscape. The output is growing, but it remains concentrated in Java-based institutions and has not yet been broadly distributed across regions (Figures 3 and 4).

The dominance of Java-based institutions in the affiliation profile (Figure 4) likely reflects structural asymmetries in Indonesia's research ecosystem rather than topic-specific preferences. Java hosts a high concentration of long-established universities, doctoral programmes, research centres, and national-level academic networks, which may provide stronger pipelines for research production and international publishing capacity. This geographic concentration may also be reinforced by differences in access to research funding, collaboration opportunities, data infrastructure, and academic support services across regions. Importantly, the present analysis cannot directly attribute causality; affiliation credits capture where authors are institutionally based, not the distribution of sustainability challenges or educational initiatives. Nevertheless, the observed pattern suggests that the institutional base of sustainability-in-education scholarship remains unevenly distributed,

highlighting the relevance of future capacity-building and cross-island collaboration to broaden regional participation and strengthen national coverage.

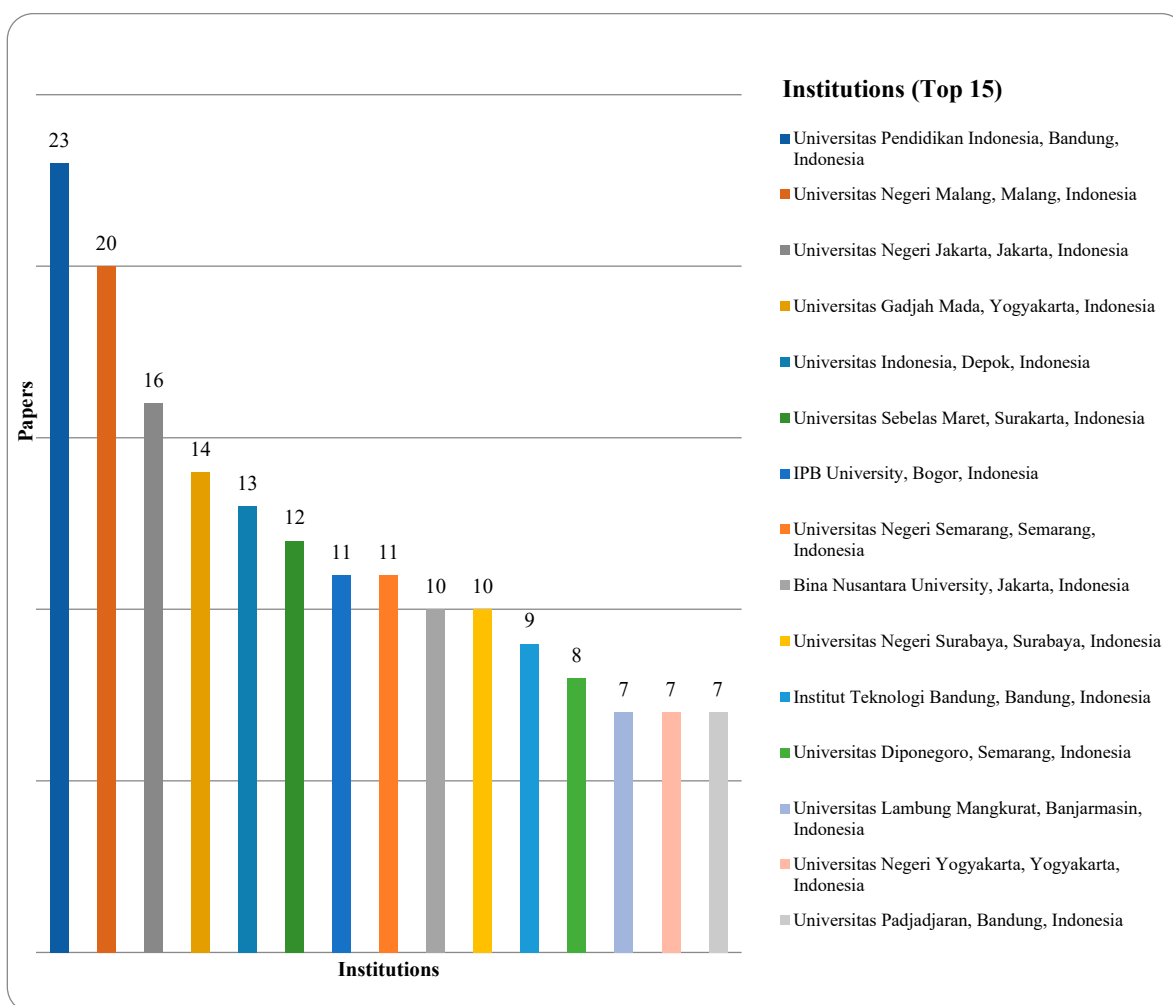


Figure 3. Top institutions by papers (full counting, deduplicated per article) (1993–2025).

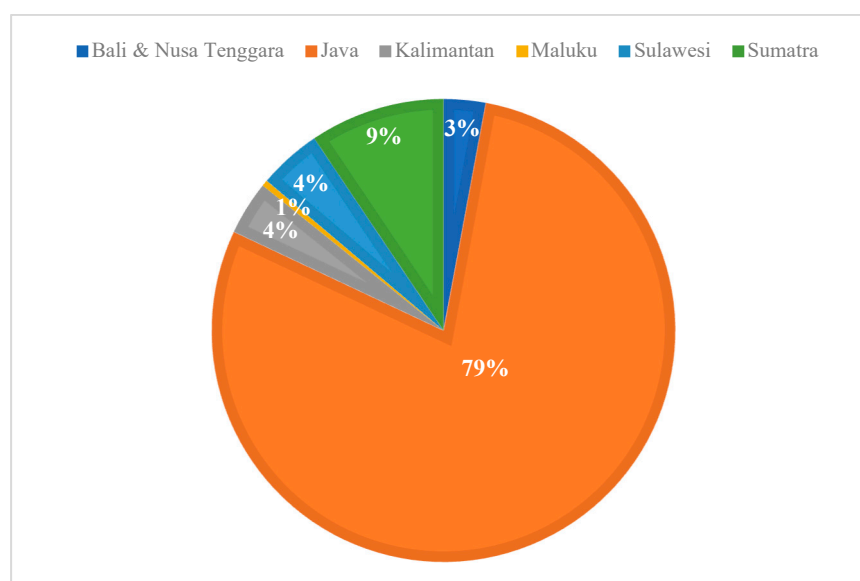


Figure 4. Distribution of Indonesian affiliation credits by island (full counting; deduplicated within article).

4.3. Keyword Trends

To examine the thematic signal of the dataset, we analysed author keywords and tracked the temporal trajectories of the most recurrent terms. Figure 5 visualises annual keyword occurrences and indicates that keyword dynamics closely mirror the overall publication growth pattern, with sparse and intermittent signals prior to 2016, followed by a pronounced expansion after 2017.

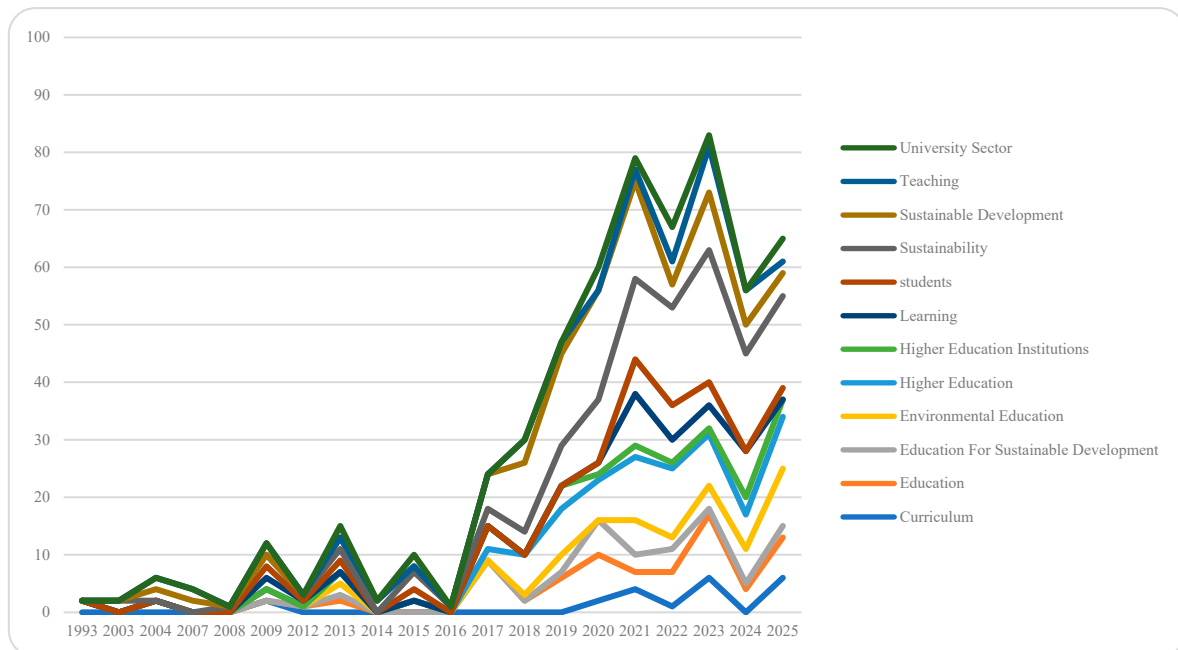


Figure 5. Annual trends of the most frequent keywords in sustainability-in-education research in Indonesia (1993–2025).

Across time, terms such as “university sector,” “teaching,” “students,” “learning,” and “higher education” form the dataset’s keyword profile, suggesting that sustainability research in this corpus is strongly anchored in formal educational settings, particularly tertiary education. In parallel, sustainability-oriented umbrella terms, including “sustainable development” and “sustainability,” remain prominent throughout the high-growth period, indicating that many studies frame sustainability at a general conceptual level rather than through narrowly specialised sub-domains.

At the same time, the co-presence of “university sector” and “higher education” points to two related but not identical emphases. In this corpus, “higher education” tends to be used when studies are situated in the context of universities, including teaching and learning processes, student experiences, curriculum and pedagogy, or learning outcomes. By contrast, “university sector” more often signals work that treats universities as institutions and systems whose sustainability is pursued through campus-wide strategies and performance management (e.g., green campus initiatives and frameworks such as Green-Metric). This strand includes studies in which the university is the setting of sustainability action (operations, facilities, governance, reporting, waste/energy/water management, and community engagement), but the focal point is not necessarily classroom instruction. Consequently, some papers involve universities while remaining only loosely connected to teaching or educational research, reflecting a broader institutional orientation in which sustainability is enacted through organisational change and campus practices rather than through pedagogy.

A clear post-2017 diversification is also visible. Alongside the dominant educational terms, Figure 5 shows increasing visibility of keywords associated with curriculum and instructional design, most notably “curriculum,” as well as education and sustainability labels such as “environmental education.” This pattern suggests a shift from early, conceptually oriented discussions toward more pedagogically actionable emphases (e.g., curriculum, learning processes, and teaching practice) as publication volume increases.

The keyword trajectories exhibit short-term fluctuations, especially around 2020–2025, where multiple keywords rise and decline in parallel. This synchronised movement is consistent with a rapidly expanding field in which general descriptors remain stable anchors, while the surrounding keyword ecosystem becomes more varied as research output scales. Overall, the keyword evidence supports the interpretation that sustainability and education research in Indonesia is developing toward a more consolidated yet increasingly diversified thematic profile, centred on higher education and teaching–learning processes.

4.4. Education Topics, Sustainability Domains, and Their Intersections

After characterising the institutional landscape, the analysis shifts to the thematic orientation of Indonesian sustainability and education research by examining education-related topics, sustainability domains, and their intersections. Consistent with the affiliation analysis, counts were calculated using full counting with within-article deduplication, so each label contributed at most once per article to represent article-level prevalence.

Regarding education topic evolution, Figure 6 shows a clear transition from a long low-activity period (1990s to mid-2010s) to a rapid expansion phase beginning around 2016, followed by continued growth into the most recent years. Unlike the earlier period, where most topics appeared only sporadically, the post-2016 pattern is strongly shaped by two dominant streams: higher education-focused sustainability research (EDU_HEI) and Education for Sustainable Development (ESD)/sustainability curriculum–pedagogy work (EDU_ESD). Both rise sharply from the late 2010s, become the most visible trajectories across the series, and peak in the mid-2020s, indicating that universities and formal ESD framings have become central organising hubs in this corpus.

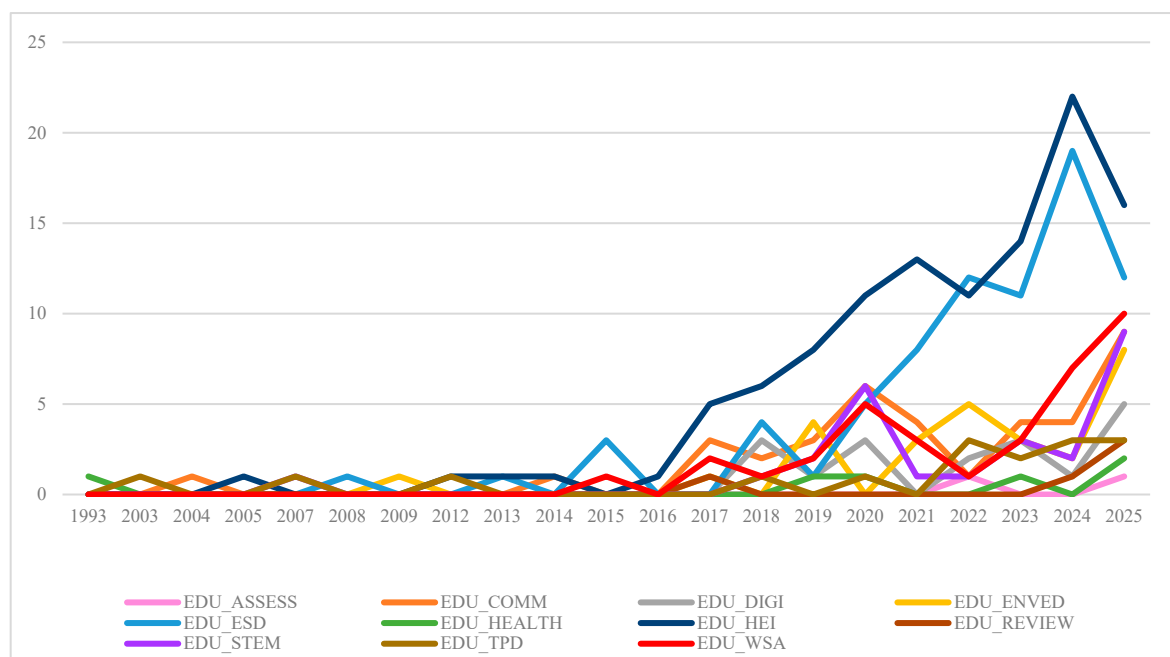


Figure 6. Temporal evolution of education-related topics in sustainability-in-education research.

Alongside these two leading themes, Figure 6 also shows a late-stage surge in whole-school and institutional approaches (EDU_WSA), which accelerate markedly from 2023 onwards and become one of the most prominent lines by 2025. Teacher professional development (EDU_TPD) and STEM-oriented sustainability education (EDU_STEM) show intermittent but increasingly visible growth after 2019, suggesting that educator capacity building and STEM framings are expanding, although they remain secondary to the dominant HEI and ESD trajectories.

Finally, smaller strands such as digital/EdTech (EDU_DIGI), environmental education (EDU_ENVED), communication/outreach (EDU_COMM), assessment (EDU_ASSESS), and health-related education (EDU_HEALTH) remain comparatively low but consistently present. This pattern points to gradual diversification: while the field is led by HEI- and ESD-centred work, newer approaches and specialised emphases are increasingly entering the literature in the most recent years.

Transitioning to the sustainability domain evolution, Figure 7 (domains over time) again shows a clear inflection pattern: domain coverage remains sparse and intermittent across the 1990s–early 2010s, then expands rapidly from the mid-to-late 2010s onward. In the most recent period, two domain streams stand out as the main drivers of growth: social equity, inclusion, and cultural dimensions (D_SOCI) and economy/industry and sustainable business (D_ECON). Both rise strongly after 2017, but their acceleration is especially visible in the 2020s, indicating that a substantial share of sustainability-oriented education research is increasingly framed around social conditions and distributional issues (e.g., equity, inclusion, community realities) and economic- or industry-linked sustainability concerns (e.g., CSR, sustainable business practices, organisational responses, and economic resilience).

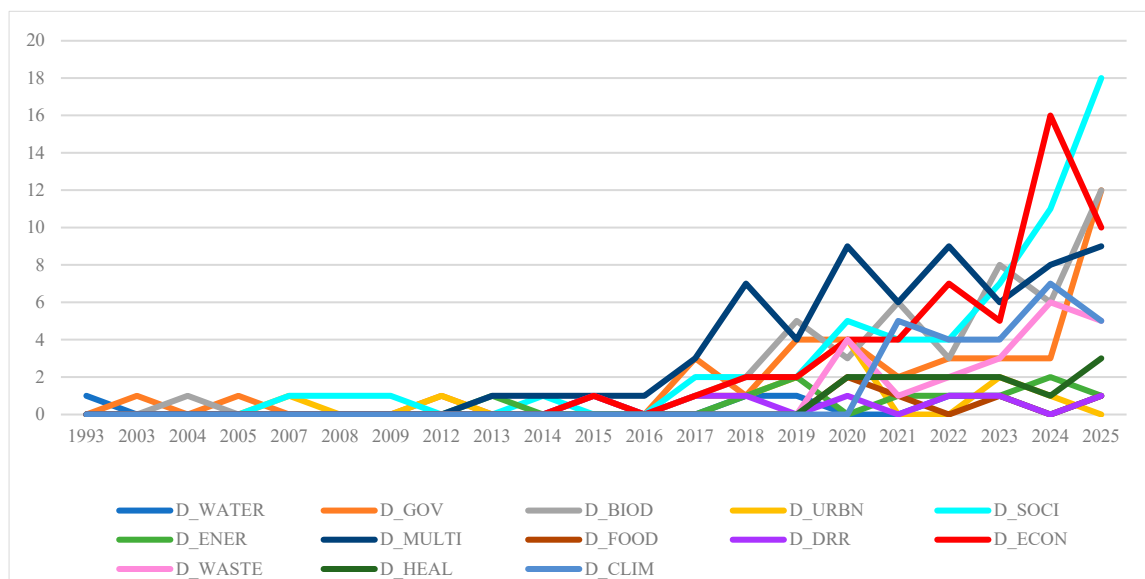


Figure 7. Temporal evolution of sustainability domains in sustainability-in-education research.

Beyond these leading trajectories, several domains show meaningful late-stage strengthening. Governance and policy (D_GOV) becomes more visible toward the end of the series, suggesting growing attention to institutional levers and regulatory or organisational arrangements that shape sustainability practice. Biodiversity and ecosystems (D_BIOD) also increases in the later years, indicating a widening ecological emphasis alongside the social and economic focus. Other domains, including climate (D_CLIM), waste/circular economy (D_WASTE), health and wellbeing (D_HEAL), and water/WASH/sanitation (D_WATER), appear as smaller but increasingly consistent streams af-

ter 2019. Meanwhile, energy (D_ENER), disaster risk reduction (D_DRR), food/agriculture (D_FOOD), and urban sustainability (D_URBN) remain relatively low and more intermittent across the full-time window. Overall, the domain pattern suggests that recent expansion has been shaped less by a single biophysical sector and more by a marked turn toward social and economic framings, complemented by a gradually broadening set of governance, ecological, and applied-sector domains.

Subsequently, as for the intersection between education topics and sustainability domains, Figure 8 clarifies how education topics are operationalised through sustainability problems. The strongest intersections in Figure 8 appear in higher education sustainability (EDU_HEI). This topic connects most frequently with economy/CSR/industry and sustainable business (D_ECON), and it also shows strong intersections with multi-domain/SDG-oriented framing (D_MULTI) and governance and policy (D_GOV). This pattern suggests that many higher education studies treat sustainability primarily as an institutional and socio-economic agenda (e.g., university strategy, management, reporting/metrics, and policy), not only as classroom-based teaching and learning.

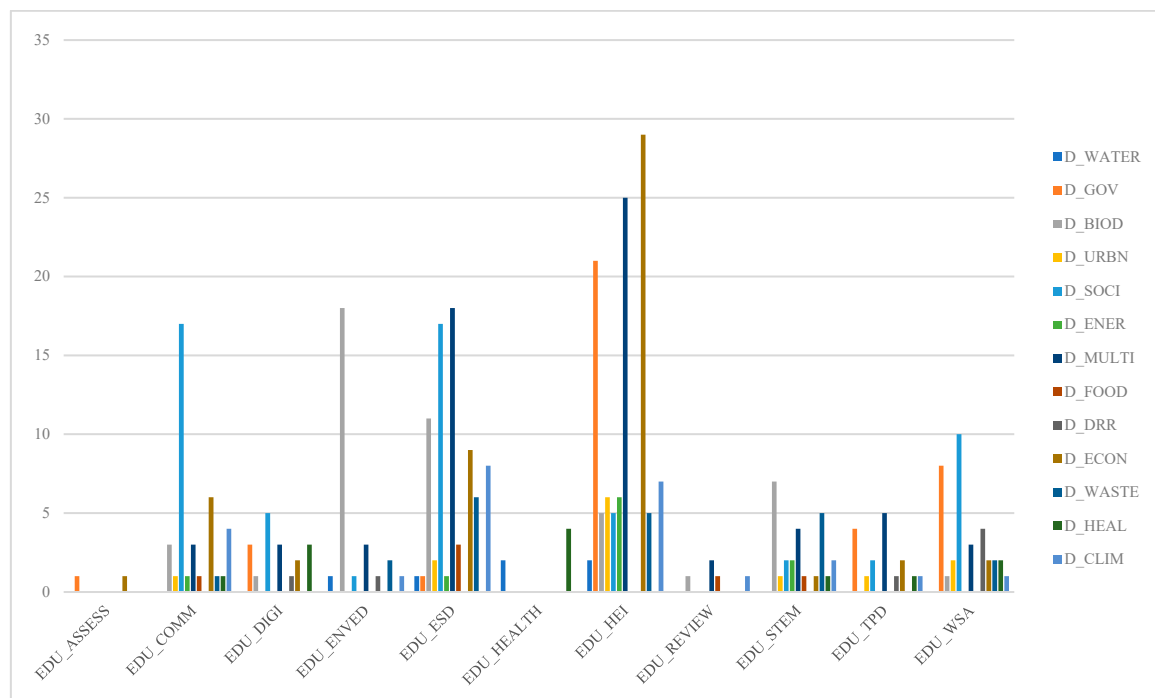


Figure 8. Topic–domain intersections (co-occurrence) between education-related topics and sustainability domains.

The second most visible cluster is ESD-focused curriculum and pedagogy (EDU_ESD). It intersects most strongly with D_MULTI and with social equity, inclusion, and culture (D_SOCI), including themes such as equity, gender, inclusion, and local or indigenous knowledge. Importantly, ESD also shows a strong additional intersection with biodiversity and ecosystems (D_BIOD), which is the most prominent domain linkage after D_SOCI. This indicates that ESD studies in this corpus are often framed through integrated sustainability problems, social justice concerns, and ecological themes, rather than through a single technical domain.

Additional “signature” pairings are also clear. Environmental education (EDU_ENVED) is heavily concentrated in biodiversity and ecosystems (D_BIOD), reflecting a conservation-oriented strand. Communication-focused education (EDU_COMM) aligns mainly with D_SOCI, consistent with its role in participation, awareness, and community engagement.

Whole-school approaches (EDU_WSA) connect strongly with D_SOCI and D_GOV, suggesting that school-wide sustainability work is commonly discussed in terms of inclusion, leadership, and policy arrangements. Finally, the assessment-focused topic (EDU_ASSESS) shows relatively few links across sustainability domains. This suggests that evaluation and measurement are still not common central themes in the literature, even though they have become more visible in recent years.

4.5. Trends in Research Methods

After mapping the thematic orientation of Indonesian sustainability and education research through education topics, sustainability domains, and their intersections, we next examine how this literature has been studied methodologically. This shift is important because thematic growth does not automatically indicate methodological maturity; therefore, profiling research methods helps clarify whether the field is expanding mainly through descriptive work, evidence-building empirical studies, or synthesis-oriented contributions. Consistent with earlier sections, counts were calculated using frequency counts, so each method label was counted at most once per article to represent article-level prevalence.

Figure 9 shows a clear methodological shift over time. Early publications are sparse, and method categories appear only occasionally. From the late 2010s onward, the number of method-coded articles increases sharply, indicating that the field has moved into a more active and methodologically defined phase.

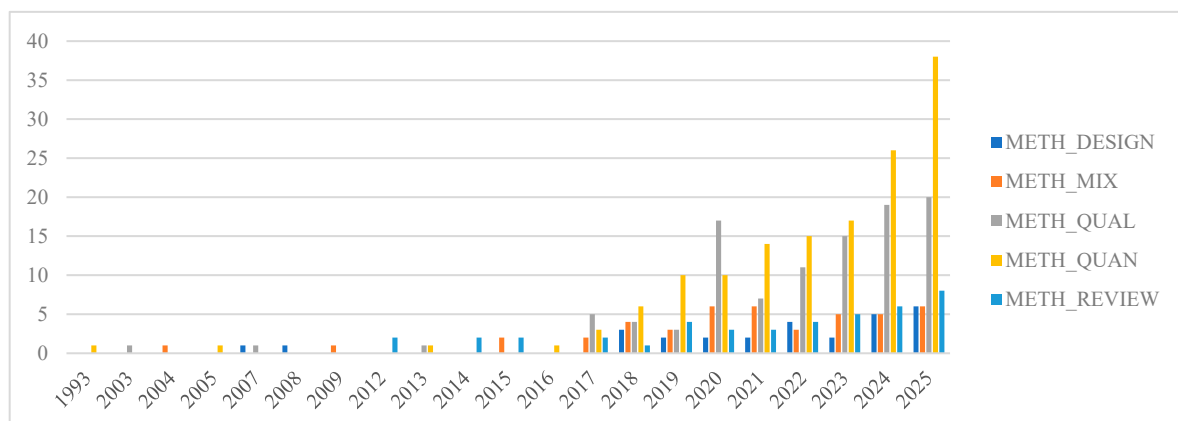


Figure 9. Temporal evolution of research methods in sustainability-in-education publications.

In the most recent years, quantitative studies (METH_QUAN) have become the most visible stream, with a steep rise toward the end of the period. According to Figure 10, descriptive analyses (METH_QUAN_DESC) remain the most consistent approach across years, while inferential strategies become more visible in the later period, particularly regression-based analyses (METH_QUAN_INF_REG). A notable recent development is the sharp emergence of structural equation modelling (METH_QUAN_SEM), suggesting increasing adoption of more complex modelling in the latest years. In contrast, Rasch-based measurement (METH_QUAN_RASCH) and clustering approaches (METH_QUAN_CLUST) remain rare, indicating that advanced measurement modelling and segmentation-oriented analyses are still underutilised in this literature corpus. The limited use of these approaches suggests room for further methodological strengthening, especially in measurement-focused work and in analyses that capture heterogeneity across learners, contexts, or institutions.

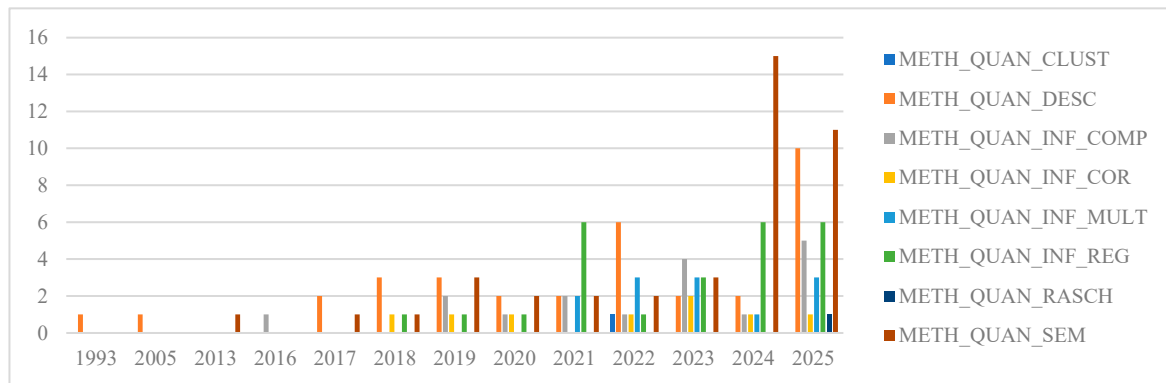


Figure 10. Breakdown of quantitative methods.

Qualitative research (METH_QUAL) also increases, particularly after the post-2016 expansion. The qualitative-method breakdown shows that this growth is mainly driven by case-study designs (METH_QUAL_CASE) and thematic analysis (METH_QUAL_THEM), which become increasingly visible in the later years (Figure 11). In contrast, narrative approaches (METH_QUAL_NARR) appear only occasionally, and discourse-based studies (METH_QUAL_DISC) remain relatively rare and emerge more clearly only in the most recent period. This pattern suggests that qualitative sustainability-in-education research in Indonesia is developing primarily through context-rich case accounts and theme-based interpretation, while narrative and discourse-oriented traditions remain less established.

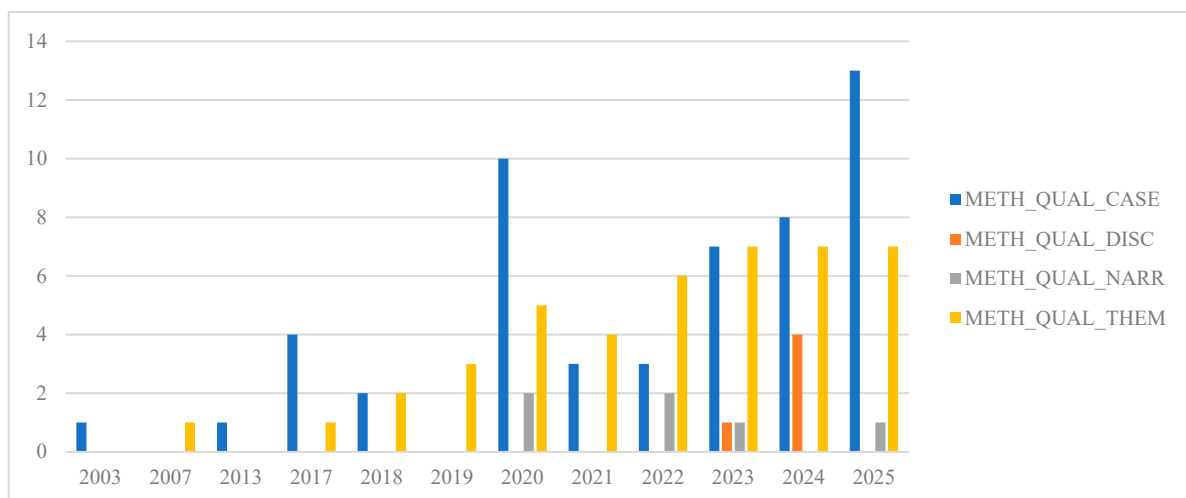


Figure 11. Breakdown of qualitative methods.

Moreover, mixed-methods studies (METH_MIX) remain comparatively limited across the timeline, indicating that fully integrated designs are still less common than single-paradigm approaches. However, the pattern for design-oriented research is more substantial than a simple “intermittent” presence. While its volume is smaller than the dominant quantitative and qualitative streams, design research appears consistently in the later years and is represented through multiple models rather than a single approach. As shown in the design-method breakdown (Figure 12), design-oriented studies are distributed across multiple frameworks rather than concentrated in a single model. This distribution, covering approaches such as ADDIE design (Analyse, Design, Develop, Implement, and Evaluate), DBR (Design-Based Research), and development/prototyping variants, suggests that design research has become a meaningful and increasingly structured methodological option in Indonesian sustainability and education research.

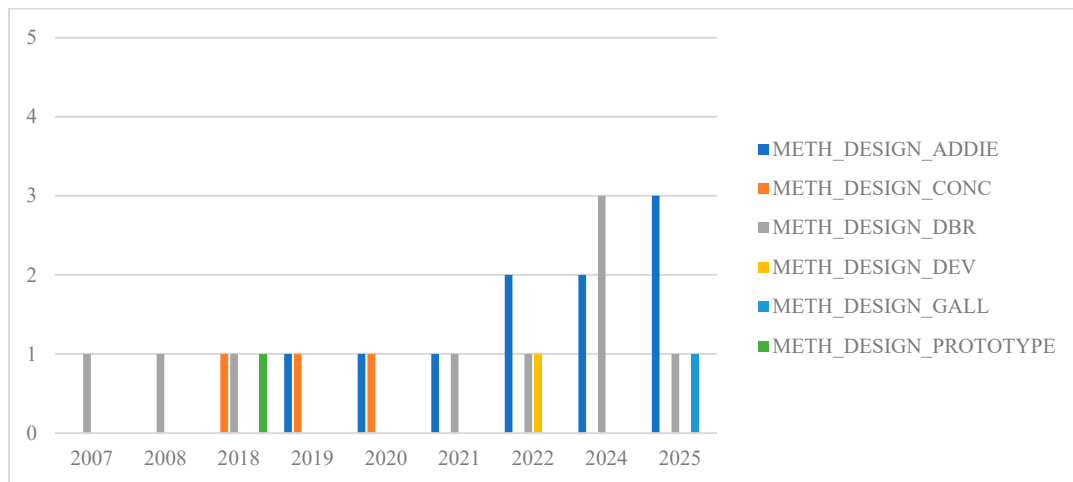


Figure 12. Distribution of design-research models.

Review-based publications (METH_REVIEW) also became more visible in the later years, suggesting early efforts to summarise and organise an expanding body of evidence. Building on this methodological profile, we then focus on a practice-oriented stream that is particularly salient in Indonesia, such as SBL and community engagement. This step links method trends to how sustainability education is implemented in real settings, as many initiatives are delivered through community-facing formats such as workshops, outreach/socialisation, and community service activities. Mapping these formats across methods and years helps clarify whether community-engaged work is mainly reported as contextual implementation, evaluated through outcome-oriented designs, or increasingly synthesised through reviews. Figure 13 maps the presence of SBL and community engagement formats in Indonesian sustainability-in-education publications. Overall, these activities form a small but visible stream, concentrated mainly in the more recent years. Two formats dominate the pattern, namely workshops and socialisation or outreach activities, indicating that community engagement in this literature is often organised through structured training events and dissemination-oriented programmes.



Figure 13. Distribution of service-based learning across research methods.

The method distribution indicates that service-oriented sustainability activities are reported most often in qualitative studies, where workshops and socialisation are the

most frequent formats. This aligns with the role of qualitative designs in documenting implementation processes, local contexts, and participant experiences in community-based education work. Quantitative studies contain fewer service-related cases overall, but they still show several workshop- and outreach-linked activities, suggesting a gradual move toward outcome-oriented reporting in some parts of the literature. Importantly, lecturers' community service and students' community service appear only sporadically and are concentrated mainly in the qualitative stream, indicating that these community service formats are present but remain a minor part of the published sustainability-in-education evidence base. Mixed-method and review publications contribute only a small number of service-related cases, implying that integrated evaluation designs and synthesis work on service-based sustainability education are still limited.

Taken together, Figures 9–13 suggest that Indonesian sustainability-in-education research has become more methodologically active over the last decade. The literature is increasingly shaped by quantitative and qualitative studies, with quantitative work expanding and showing greater analytical diversity (including a recent rise in SEM), while Rasch and clustering remain rare. Qualitative growth is mainly supported by case-study and thematic approaches, whereas narrative and discourse traditions remain limited. Design-oriented research is present and increasingly diversified across several models, pointing to a development-focused stream alongside mainstream empirical work. Within this broader methodological landscape, service-oriented practice appears as a small but visible strand, reported mainly through qualitative studies and centred on workshops and socialisation/outreach, with lecturer-led and student-led community service appearing only occasionally.

4.6. Trends in Reported Outcomes and Strength of Evidence

To analyse reported results, each publication was coded using our Level 1 outcome-domain codebook. This codebook is presented in Appendix A and defines 11 outcome categories that were used to classify the types of results reported in each study. The codebook captures learning-oriented outcomes such as knowledge gains, attitudes, skills, and achievement, as well as broader outcomes including behaviour change, institutional or policy change, community or environmental impacts, tool development, feasibility and implementation processes, systems-level competencies, and equity-related outcomes. Outcome domains were not treated as mutually exclusive, so a single article could receive multiple codes when it reported more than one type of outcome. Consistent with earlier sections, counts were calculated using full counting with within-article deduplication, meaning that each outcome-domain label contributed at most once per article.

Transitioning to the main findings, Figure 14 shows a clear expansion in reported outcomes over time. Outcome reporting is sparse in the early years, but it increases sharply after the mid-2010s and accelerates toward the end of the period. The strongest growth is concentrated in two closely competing outcome streams, namely knowledge gains (RES_KNOW) and institutional/policy/implementation change (RES_INST). While RES_KNOW appears slightly higher, the gap is small (only seven papers across 1993–2025), indicating that both outcome types are comparably dominant in the later period. Other learning-related outcomes, such as attitudes/values/intention (RES_ATT), also rise substantially, particularly from around 2017 onwards. This pattern suggests that recent studies not only report student learning gains, but also increasingly document how sustainability initiatives are embedded in programmes, policies, and implementation practices.

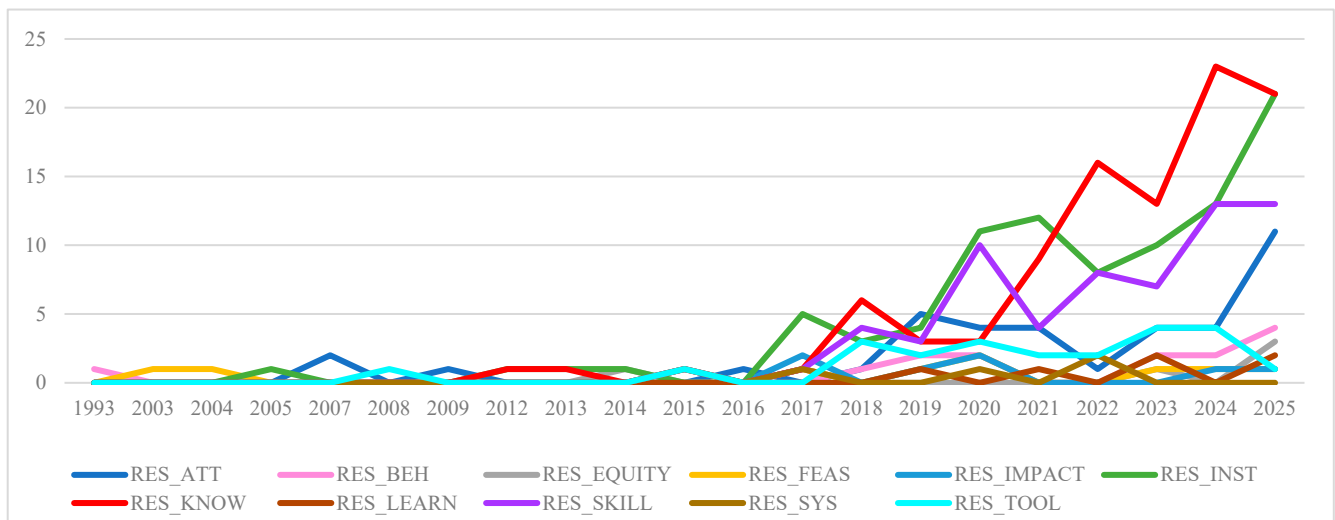


Figure 14. Temporal evolution of reported result categories in sustainability and education publications.

A smaller cluster of outcome types becomes more visible after 2019, including behaviour/practice change (RES_BEH), feasibility/process outcomes (RES_FEAS), and broader impacts (RES_IMPACT), but these remain comparatively limited in volume. Equity-related outcomes (RES_EQUITY) and systems-level learning outcomes (RES_LEARN) appear only intermittently and at low levels across the series. Overall, the pattern suggests that the literature continues to prioritise proximal educational outcomes, especially knowledge-focused reporting, while more distal outcomes, such as equity, behavioural change, and wider community or environmental impacts, remain less frequently documented.

To interpret how strongly outcomes were supported, we coded evidence levels using five categories. E0 indicates that evidence is not clearly stated. E1 refers to perceived or self-reported evidence, for example statements in which participants report improvements or perceived benefits. E2 indicates measured evidence supported by presented data and analysis, including instruments or systematic qualitative or quantitative results. E3 captures objective or behavioural traces such as observations, logs, documents, or other real-world indicators. E4 indicates long-term or sustained evidence supported by follow-up data or demonstrated durability of change.

Figure 15 shows that the evidence base is dominated by measured evidence (E2) and self-reported evidence (E1), while objective trace-based evidence (E3) is less common and long-term follow-up evidence (E4) is rare. Over time, measured evidence becomes increasingly visible in the later period, suggesting strengthening evaluation practices as the field grows. At the same time, E0 evidence remains present, indicating that a subset of publications reports outcomes without clearly stating the supporting basis, such as data sources, measurement indicators, or analytical rationale. This persistence of E0 suggests that reporting practices are uneven across studies and that some outcome claims are still presented in a descriptive manner rather than being explicitly evidenced. However, the limited presence of E3 and especially E4 indicates that many studies still focus on short-term outcomes and rely less on behavioural indicators or follow-up designs that could demonstrate sustained change.

Furthermore, Table 2 complements Figures 14 and 15 by showing how evidence levels vary across outcome domains. Institutional or implementation change outcomes (RES_INST) are the most frequently reported, followed by knowledge or awareness gains (RES_KNOW). Both domains are most often supported by measured evidence (E2), with self-reported evidence (E1) also common. In contrast, systems-level learning or ESD competency outcomes (RES_SYS) occur less often and are more likely to be coded as E0,

indicating that supporting evidence is not always stated explicitly. Behaviour or practice change (RES_BEH) and feasibility or implementation process outcomes (RES_FEAS) are less prevalent overall, but they show a relatively higher use of objective or trace-based indicators (E3). Long-term evidence (E4) remains rare across domains and appears only in a very small number of studies, mainly within behaviour change, skills, and institutional outcomes.

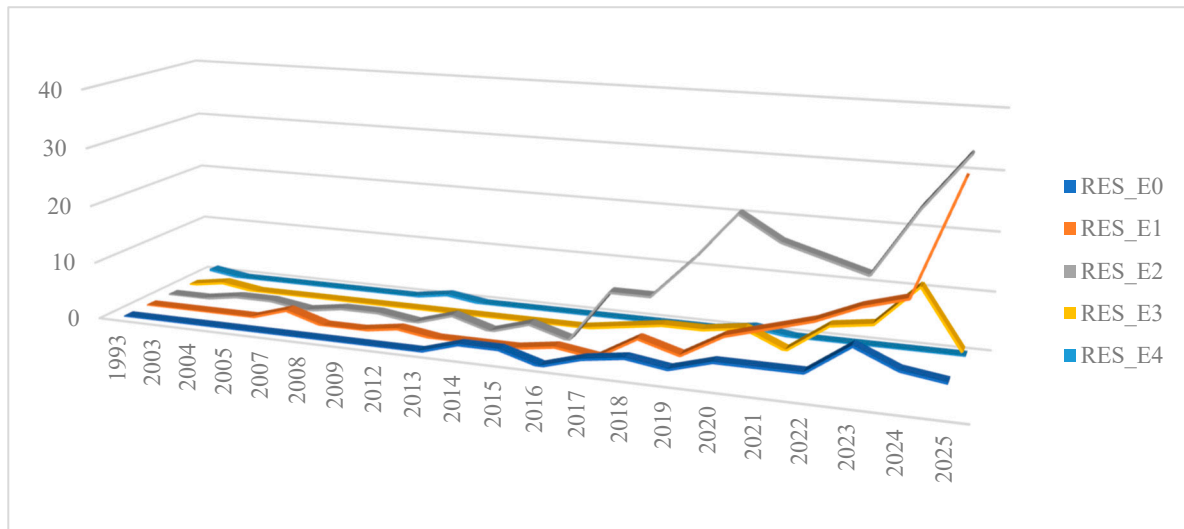


Figure 15. Temporal evolution of result evidence levels E0–E4.

Table 2. Distribution of evidence levels E0–E4 across publications (1993–2025).

Code	RES_E0	RES_E1	RES_E2	RES_E3	RES_E4
RES_ATT	2	19	15	2	
RES_BEH	2	5	4	2	1
RES_EQUITY	2	1	2	1	
RES_FEAS	1		6	2	
RES_IMPACT		2	4	1	
RES_INST	9	19	56	7	1
RES_KNOW	12	28	46	12	
RES_LEARN		1	5		
RES_SKILL	6	19	33	5	1
RES_SYS	5				
RES_TOOL	4	2	13	4	

Note. Color shading is used as a heatmap to indicate the relative frequency of publications across evidence levels. Green shading represents higher frequencies, yellow shading represents moderate frequencies, and red shading represents lower frequencies. Blank cells indicate zero occurrences.

Taken together, the results suggest that the literature has expanded rapidly in the types of outcomes reported, with a strong emphasis on learning outcomes and tool development, supported mainly by measured and self-reported evidence. At the same time, the relatively low frequency of behaviour change, equity, and community impact outcomes, combined with the rarity of objective and long-term evidence, points to opportunities for future studies to strengthen outcome evaluation by incorporating trace-based indicators and follow-up designs.

5. Discussion

The paper analyses the SLR of education and sustainability research in Indonesia over the last 32 years, from 1993. All documents were extracted from the Scopus database

using specific keywords, resulting in a final corpus of 362 papers. As shown in Figure 2, knowledge production on sustainability and education in Indonesia increased substantially after 2016, with the strongest acceleration occurring during the 2020–2025 period. In fact, this is not a coincidence; a similar study by Sumintono et al. (2023b), as well as Hallinger and Walker (2026), found the same pattern, where research papers on educational leadership and management increased significantly after 2015. Both cases occurred due to the Indonesian Ministry of Higher Education stipulating in 2013 a policy requiring all lecturers to publish scientific articles as a condition for promotion, as well as for postgraduate students (master's and doctoral levels) to graduate from their programmes. As a result, the number of scientific articles from Indonesia rose dramatically, especially in international scientific databases such as Scopus. However, this also has unintended consequences, where issues of lower-quality peer-reviewed outputs, such as conference proceedings that are also indexed by Scopus, contributed significantly to this corpus (Purnell, 2021). More serious problems have also been identified, including the prevalence of potentially predatory publications (Marina & Sterligov, 2021; Macháček & Srholec, 2022), which are still present in Scopus.

Regarding institutions and their domicile, research papers on education and sustainability originate predominantly from major public universities located on Java Island, as indicated by the institutional ranking in Figure 3 and the island-level distribution in Figure 4. As explained previously, these higher education institutions have operated since the Dutch colonial era (Sumintono et al., 2023a), and have since grown rapidly in terms of lecturer qualifications, research networks, and postgraduate student enrolment in research-based programmes. These capacities, combined with access to fiscal resources and competitive research grants, make them dominant in knowledge production, a finding confirmed by other studies (Sumintono et al., 2023b).

The trend of increasing publication numbers is also paralleled by the diversification of research topics in education and sustainability, as shown in Figures 6–8 (see for instance Narong & Hallinger, 2023, 2024). This extends to multidisciplinary domains such as economics, social studies, governance and policy, and biodiversity, which are among the most common areas, indicating that the identity of education and sustainability research is evolving. This trend also suggests that more Indonesian education researchers and academics are collaborating with other experts and are likely gaining greater exposure to international literature.

Another interesting finding from this study concerns the methodologies used in the papers as presented in Figures 9–13; the trend is similar in that as the number of documents increases, methodological variation also increases. This indicates the influence of multidisciplinary on the topic, where different disciplines provide different perspectives regarding data collection and analysis. A notable feature in this regard relates to the identity of Indonesian higher education, where SBL is more common compared to PBL and PjBL. SBL has been practiced since 1960s in the Indonesian higher education system in order to make university students contribute directly to communities (especially in remote and rural areas). In fact, as undergraduate students, one of the graduation requirements is to participate in service learning for a certain period (usually three months or more), which makes SBL a rich constant source of data for researchers. Even recently the Indonesian Ministry of Higher Education recommended that lecturers report about SBL activities in academic journals.

Findings on outcome trends and evidence strength (see Figures 14 and 15 and Table 2) further indicate that the research corpus and quality of studies on education and sustainability in Indonesia are growing but not necessarily developing in terms of overall quality. This is understandable, as competition in high-tier journals requires strong support in terms of funding and networks, which are typically dominated by established academic communities in developed countries (Narong & Hallinger, 2023, 2024).

Taken together, the findings indicate that the future development of sustainability education in Indonesia requires more than an increase in publication volume. Greater attention is needed to systematic curriculum integration, robust assessment practices, broader regional participation, and stronger evidence of sustained impact. Sustainability should be embedded in learning outcomes, teaching strategies, and evaluation frameworks rather than addressed only through isolated activities. At the same time, future research should expand beyond established academic centres, incorporate more objective and longitudinal indicators, and examine how sustainability-oriented education contributes to meaningful changes in learners, institutions, and communities.

These findings have important implications for advancing the Agenda 2030 commitment to quality education and sustainable development. The rapid growth of sustainability and education research in Indonesia indicates increasing scholarly attention to SDG-related educational issues, but the findings also suggest that this growth needs to be translated into stronger curriculum integration, more robust assessment practices, and broader regional participation. In practical terms, sustainability should not only appear as a general topic in educational research, but should be embedded in learning outcomes, pedagogical design, institutional policy, and evidence-based evaluation. Future research should therefore move beyond descriptive mapping and short-term learning outcomes by examining how sustainability-oriented education produces sustained changes in learners, teachers, institutions, and communities. More collaborative studies involving institutions outside Java, longitudinal research designs, objective indicators of behavioural and institutional change, and stronger links between education research and SDG implementation would help strengthen Indonesia's contribution to the Agenda 2030.

6. Limitations

All in all, several limitations need to be acknowledged in this study. First, the paper relies solely on the Scopus database, which, although widely recognised as a well-curated peer-reviewed source, means that the 362 papers do not represent a fully comprehensive set of all available publications. For instance, all extracted documents are written in English; those written in the Indonesian language and available in local databases are not included (see [Sumintono et al., 2023b](#)). The second limitation is that the review did not independently assess the quality or current indexing status of the journals included in the corpus. Some journals may have been discontinued from Scopus, which could affect the representation of publication quality in the dataset ([Marina & Sterligov, 2021](#); [Macháček & Srholec, 2022](#)). The third limitation concerns the methodology used in this paper, which relies on quantitative methods and simple descriptive statistical analysis. This approach should be viewed as complementary to other methods, such as qualitative approaches or other types of SLRs, which may provide deeper insights and richer perspectives. This paper also relies primarily on descriptive analysis and does not differentiate the quality of individual documents reviewed or their substantive findings.

7. Conclusions

This study provides a systematic synthesis of sustainability and education research in Indonesia based on 362 Scopus-indexed journal articles published between 1993 and 2025. The findings show that the field has developed from a sparse and sporadic body of literature into a rapidly expanding research area, particularly after 2016. The corpus is dominated by higher education contexts, Java-based institutions, and increasingly diverse sustainability domains, education topics, and methodological approaches. At the same time, the findings indicate that the field remains uneven in terms of regional representation, methodological depth, and evidence strength, with relatively limited use of objective,

behavioural, and long-term indicators. Overall, the study highlights both the progress and the unfinished agenda of sustainability education research in Indonesia. To better support the Agenda 2030, future studies should strengthen curriculum-level integration, expand research participation across regions, employ more rigorous and longitudinal designs, and generate clearer evidence of how sustainability education contributes to meaningful change in educational institutions and society.

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Appendix A. Codebook for Results

Level 1—Outcome Domain

Code	Label	Definition/Cues
RES_KNOW	Knowledge/awareness gain	knowledge, awareness, literacy, understanding
RES_ATT	Attitudes/values/intention	attitude, value, intention, motivation, perception
RES_SKILL	Skills/competencies	competency, skill, critical thinking, systems thinking, problem solving
RES_BEH	Behaviour/practice change	behaviour, practice, adoption, participation, action
RES_LEARN	Learning achievement/performance	test scores, achievement, learning outcomes, grades
RES_INST	Institutional/policy/implementation change	policy adoption, programme institutionalisation, management change
RES_IMPACT	Community/environmental/health impact	reduced waste/diarrhoea/emissions; external measurable outcomes
RES_TOOL	Tool/module/model developed	module, framework, model, instrument developed/validated
RES_FEAS	Feasibility/acceptability/implementation process	feasibility, acceptance, barriers/facilitators, implementation quality
RES_SYS	Systems-level learning/ESD competencies (holistic)	systems thinking, anticipatory, normative, strategic competence, collaboration, futures thinking, ESD competencies
RES_EQUITY	Equity/inclusion/participation access outcome	inclusion, participation of marginalised groups, gender equity, access barriers reduced, empowerment, agency

Level 2—Strength of Evidence

Code	Label
RES_E0	Not stated
RES_E1	Perceived/self-report (“students reported...”, “participants perceived...”)
RES_E2	Measured (quant/qual evidence) (data is presented, instruments, analysis)
RES_E3	Objective/behavioural/trace (observation, log, document, real indicator)
RES_E4	Long-term/sustained (follow-up, durability, sustained change)

Appendix B. Codebook for Education Topic (Primary)

Code	Label	Definition
EDU_ESD	ESD/sustainability curriculum & pedagogy	Curriculum, pedagogy, teaching/learning focused explicitly on sustainability/ESD (school/uni).
EDU_TPD	Teacher professional development (TPD/PD) for sustainability	Training/coaching/lesson study/PD for teachers to teach sustainability/ESD.
EDU_HEI	Higher education sustainability (campus/HE curriculum)	University/college sustainability education, green campus, HEI policy/curriculum.
EDU_WSA	Whole-school approach/school policy & management	School-wide programmes, policy, leadership, management for sustainability in schools.
EDU_COMM	Community/non-formal education & outreach	Education outside formal schooling: community learning, extension, outreach, public campaigns.
EDU_HEALTH	Health education/behaviour-change education	Health education programmes aiming behaviour change (hygiene, sanitation, nutrition, etc.).
EDU_ENVED	Environmental education/conservation education	Education focused on environment, conservation, ecology (often pre-ESD framing).
EDU_STEM	Science Technology Engineering and Mathematics (STEM)/Science/Engineering education for sustainability	Sustainability integrated into STEM/physics/engineering learning, STEM projects for sustainability.
EDU_ASSESS	Assessment/instrument/measurement in sustainability education	Development/validation of instruments, rubrics, tests, evaluation tools in sustainability/ESD learning.
EDU_DIGI	Digital/EdTech for sustainability education	Technology-supported learning: online modules, apps, AR/VR, LMS for sustainability learning.
EDU_REVIEW	Review/Bibliometric about sustainability education	Systematic review, bibliometric, scoping review in sustainability/ESD education.

Appendix C. Codebook for Sustainability Domains (Secondary)

Code	Label	Definition/Cues
D_CLIM	Climate change & mitigation/adaptation	climate, mitigation, adaptation, resilience
D_ENER	Energy & renewables	renewable, energy efficiency, solar, wind, bioenergy
D_WATER	Water/WASH/sanitation	water, sanitation, hygiene, WASH, diarrhoea, handwashing
D_WASTE	Waste, recycling & circular economy	waste management, recycling, circular economy, plastics
D_BIOD	Biodiversity & ecosystems	biodiversity, conservation, ecosystem, marine, coral
D_FOOD	Food, agriculture & nutrition	agriculture, food security, nutrition, farming
D_HEAL	Public health & wellbeing	health promotion, wellbeing (non-WASH)
D_DRR	Disaster risk reduction & preparedness	disaster education, preparedness, risk reduction, hazard
D_URBN	Urban/smart city/transport/built environment	urban sustainability, smart city, transport, housing
D_ECON	Economy/CSR/industry & sustainable business	CSR, green economy, sustainable business, SMEs
D_SOCI	Social equity, inclusion & culture	equity, gender, inclusion, local wisdom, indigenous
D_GOV	Governance & policy for sustainability	policy, governance, institutions, regulation
D_MULTI	Multi-domain/SDGs (integrated)	explicit SDGs, integrated sustainability, multiple domains

Appendix D. Codebook for Method

Code	Label	Typical Indicators
METH_QUAN	Quantitative	Surveys with stats, experiments/quasi, regression, SEM, RCT
METH_QUAL	Qualitative	Interviews, focus groups, ethnography, thematic/case study
METH_MIX	Mixed methods	Explicit mixed, QUAN + QUAL integrated
METH_REVIEW	Review/Desk study	Bibliometric, systematic/scoping review, document analysis only
METH_DESIGN	Design Research	Developing, producing a prototype, making a product

Code	Label	Purpose	Description
METH_QUAN_DESC	Descriptive Statistics		
METH_QUAN_SEM	Structural Equation Modelling (SEM)	Used to test complex relationships.	Can display causal relationships, mediators, moderators, as well as model fit.
METH_QUAN_INF_COMP	Inferential Comparative Analysis	Used to compare groups based on a specific variable. Often used are t-tests, ANOVA, and Mann–Whitney.	Often used are t-tests, ANOVA, and Mann–Whitney.
METH_QUAN_INF_COR	Inferential Correlational Analysis	Used to determine the relationship between variables.	Using Pearson or Spearman correlation.
METH_QUAN_INF_REG	Inferential Regression Analysis	Used to predict a dependent variable based on one or more independent variables.	Can be simple or multiple linear regression.
METH_QUAN_INF_MULT	Inferential Multiple Regression/Multivariate Analysis	Used to test the effect of multiple independent variables simultaneously on one or more dependent variables.	Manova, Mancova, and multiple regression can be used.
METH_QUAN_RASCH	Rasch Analysis	Used to measure respondents' abilities, attitudes, or characteristics using probabilistic models.	Often used to assess the validity and reliability of instruments.
METH_QUAN_CLUST	Cluster Analysis	Used to group respondents or objects based on similar patterns.	Not to test cause-and-effect relationships, but for segmentation or group identification.

Code	Label	Purpose	Description
METH_QUAL_THEM	Thematic Analysis	Used to identify, analyse, and report patterns or themes in qualitative data.	Focus on main ideas or recurring themes that emerge from interviews, documents, or observations.
METH_QUAL_NARR	Narrative Analysis	Used to analyse individual stories or experiences in detail.	Suitable for: studying participant experiences, life stories, personal reflections.
METH_QUAL_DISC	Discourse Analysis	Used to examine the use of language, symbols, or text in a social or cultural context.	Focuses on how meaning is created through language, communication, or text.
METH_QUAL_CASE	Case Study Analysis	Used to study a specific phenomenon in depth in a real-life context.	It can involve one or several cases to gain a holistic understanding.

Code	Label
METH_DESIGN_ADDIE	ADDIE Model (Analysis, Design, Development, Implementation, Evaluation)
METH_DESIGN_4D	4D Model (Define, Design, Develop, Disseminate)
METH_DESIGN_DBR	Design-Based Research (DBR)
METH_DESIGN_GALL	Research and Development (R&D) based on Gall, Gall, & Borg
METH_DESIGN_PROTOTYPE	Real Prototype Creation
METH_DESIGN_CONC	Conceptual Design

References

- Fromm, Y. M., Martin, F., Gezer, T., & Ifenthaler, D. (2025). Best practices for conducting systematic reviews: Perspectives of experienced systematic review researchers in educational sciences. *Technology, Knowledge and Learning*, 30(1), 1–28. [\[CrossRef\]](#)
- Groot, W. J. D., Field, R. D., Brady, M. A., Roswintarti, O., & Mohamad, M. (2007). Development of the Indonesian and Malaysian fire danger rating systems. *Mitigation and Adaptation Strategies for Global Change*, 12(1), 165–180. [\[CrossRef\]](#)
- Hallinger, P., & Walker, A. D. (2026). Tracking accelerated knowledge production in educational leadership and management: Trajectories, drivers, and impact in Asian research, 2000–2025. *Educational Management Administration & Leadership*. [\[CrossRef\]](#)
- Kolmos, A., Hadgraft, R. G., & Holgaard, J. E. (2016). Response strategies for curriculum change in engineering. *International Journal of Technology and Design Education*, 26(3), 391–411. [\[CrossRef\]](#)
- Macháček, V., & Srholec, M. (2022). Predatory publishing in Scopus: Evidence on cross-country differences. *Quantitative Science Studies*, 3(3), 859–887. [\[CrossRef\]](#)
- Marina, T., & Sterligov, I. (2021). Prevalence of potentially predatory publishing in Scopus on the country level. *Scientometrics*, 126, 5019–5077. [\[CrossRef\]](#)
- Narong, D. K., & Hallinger, P. (2023). A keyword co-occurrence analysis of research on service learning: Conceptual foci and emerging research trends. *Education Sciences*, 13(4), 339. [\[CrossRef\]](#)
- Narong, D. K., & Hallinger, P. (2024). Traversing the evolution of research on engineering education for sustainability: A bibliometric review (1991–2022). *Sustainability*, 16(2), 641. [\[CrossRef\]](#)
- Nielsen, H. D. (2003). Reforms to teacher education in Indonesia: Does more mean better? In E. R. Beauchamp (Ed.), *Comparative education reader*. RoutledgeFalmer.
- Peixoto, B., Pinto, R., Melo, M., Cabral, L., & Bessa, M. (2021). Immersive virtual reality for foreign language education: A PRISMA systematic review. *IEEE Access*, 9, 48952–48962. [\[CrossRef\]](#)
- Purnell, P. J. (2021). Conference proceedings publications in bibliographic databases: A case study of countries in Southeast Asia. *Scientometrics*, 126, 355–387. [\[CrossRef\]](#)
- Rethlefsen, M. L., Kirtley, S., Waffenschmidt, S., Ayala, A. P., Moher, D., Page, M. J., & Koffel, J. B. (2021). PRISMA-S: An extension to the PRISMA statement for reporting literature searches in systematic reviews. *Systematic Reviews*, 10(1), 39. [\[CrossRef\]](#) [\[PubMed\]](#)
- Schreiber, F., & Cramer, C. (2024). Towards a conceptual systematic review: Proposing a methodological framework. *Educational Review*, 76(6), 1458–1479. [\[CrossRef\]](#)
- Singh, V. K., Singh, P., Karmakar, M., Leta, J., & Mayr, P. (2021). The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis. *Scientometrics*, 126(6), 5113–5142. [\[CrossRef\]](#)
- Sterling, S. (2001). *Sustainable education: Re-visioning learning and change*. Schumacher briefings. CREATE Environment Centre. Available online: <http://eric.ed.gov/?id=ED464791> (accessed on 12 January 2026).
- Sumintono, B., Hariri, H., & Izzati, U. A. (2023a). Attraction of authority: The Indonesian experience of educational decentralization. In Z. Sakhiyya, & T. Wijaya Mulya (Eds.), *Education in Indonesia, critical perspectives on equity and social justice*. Springer. [\[CrossRef\]](#)
- Sumintono, B., Hariri, H., & Kusumaputri, E. S. (2023b). School leadership and Indonesian culture: Revealing the local knowledge development in Post New Order Indonesia. In P. Liu, & L. M. Thien (Eds.), *Educational leadership and Asian culture, implications for culturally sensitive leadership practice*. Routledge.
- UNESCO. (2012). *Education for sustainable development: Building a better, fairer world for the 21st century*. Available online: <https://unesdoc.unesco.org/ark:/48223/pf0000216673> (accessed on 25 January 2026).
- UNESCO. (2017). *Measurement strategy for SDG target 4.7: Proposal by GAML task force 4.7*. Available online: <https://www.uis.unesco.org/sites/default/files/medias/fichiers/2025/08/gaml4-measurement-strategy-sdg-target4.7.pdf> (accessed on 12 January 2026).

- UNESCO. (2021). *Education for sustainable development*. Available online: <https://tcg.uis.unesco.org/wp-content/uploads/sites/4/2020/09/Metadata-4.7.4.pdf> (accessed on 25 January 2026).
- United Nations General Assembly. (2015). *Transforming our world: The 2030 agenda for sustainable development*. Available online: <https://sdgs.un.org/2030agenda> (accessed on 25 January 2026).

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