

Education For Sustainable Development in Higher Education: A Systematic Literature Review

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Abstract—Education for Sustainable Development (ESD) is a key strategy for higher education institutions advancing global sustainability objectives. Universities develop sustainable mindsets among students while influencing practices and societal transformation. Despite expanding research on ESD, studies show fragmentation in focus, methodology, and outcomes, highlighting the need for systematic literature synthesis. This study reviews scholarly research on Education for Sustainable Development in higher education from 2020-2025 to identify key themes, pedagogical methods, and outcomes.

In accordance with the PRISMA 2020 guidelines, a systematic literature review was executed utilizing three prominent academic databases: Scopus, Web of Science, and Google Scholar. Following the application of predefined inclusion and exclusion criteria, 30 peer-reviewed and authoritative studies were selected for the final analysis. The review employed both descriptive and thematic analysis techniques to synthesize findings across the selected studies.

The analysis reveals five themes: incorporating sustainability in higher education curricula, innovative pedagogies for Education for Sustainable Development (ESD), student learning outcomes, institutional strategies, and implementation obstacles. While institutions increasingly recognize sustainability education's importance, implementation remains inconsistent due to resource challenges. The review highlights ESD's potential in developing sustainable thinking, emphasizing the need for empirical research to enhance impact in higher education.

Index Terms—Education for Sustainable Development, Higher Education, Sustainability Education, Sustainable Development Goals, Systematic Literature Review.

I. INTRODUCTION

In the twenty-first century, sustainability has emerged as a critical global concern, driven by environmental degradation, climate change, social inequalities, and economic instability. Education for Sustainable Development (ESD) has gained recognition as a transformative strategy that equips individuals with knowledge, skills, and values for a sustainable future. ESD extends beyond conventional education by emphasizing critical thinking, systems thinking, and action-oriented learning to address sustainability challenges (Kioupi & Voulvoulis, 2020).

UNESCO has been pivotal in advancing Education for Sustainable Development (ESD). As stated by UNESCO (2020), ESD empowers learners to make informed choices and actions that support environmental integrity, economic sustainability, and social equity for future generations. "Education for Sustainable Development: A Roadmap" emphasizes embedding sustainability in educational curricula and governance. UNESCO (2023) has reaffirmed this by urging educational transformation to address sustainability issues.

Higher education institutions (HEIs) play a pivotal role in advancing Education for Sustainable Development (ESD) as centers of knowledge creation and human capital development. Universities shape future professionals, leaders, and citizens who must address sustainability challenges. According to Wals and Benavot (2022), higher education drives sustainability transitions by fostering critical awareness, interdisciplinary learning, and innovation. Through curriculum design, research, campus operations, and community engagement, HEIs

demonstrate sustainable practices while equipping students with sustainability competencies.

Higher education's involvement in promoting the Sustainable Development Goals (SDGs) emphasizes Education for Sustainable Development's (ESD) importance. The SDGs integrate social, economic, and environmental development aspects. While SDG 4 focuses on quality education, education enables achievement of all 17 SDGs (Sachs et al., 2021). Higher education institutions advance SDGs through sustainability curricula, research, and community engagement.

While ESD's importance is increasingly recognized, its application in higher education remains uneven. According to Sterling et al. (2020), university sustainability initiatives show gradual rather than radical changes. Sustainability efforts are often limited to specific courses rather than being integrated across disciplines and institutional frameworks. This approach restricts ESD's capacity to drive behavioral and systemic transformations in education and society.

Kioupi and Voulvoulis (2020) highlight that while conceptual discussions on ESD exist, there is variation in how ESD is interpreted across institutions. Differences in pedagogy, assessment, and institutional commitment affect outcomes. Wals and Benavot (2022) emphasize that higher education faces tensions between market priorities and social responsibility to advance sustainability.

Research on Education for Sustainable Development (ESD) in higher education needs systematic synthesis of recent findings. Current reviews focus on specific elements like competencies or institutional practices, often using pre-COVID literature. Reviews inadequately address new trends in digital learning, inclusivity, and institutional transformation emphasized in policy frameworks (UNESCO, 2023). This study conducts a systematic literature review of research from 2020-2025 on ESD in higher education. The review identifies key themes, pedagogical methods, and outcomes of ESD initiatives to enhance understanding of how higher education can foster sustainability.

II. OBJECTIVES & RESEARCH QUESTIONS

The growing academic focus on Education for Sustainable Development (ESD) in higher education

has created substantial literature. However, this expansion has brought challenges like conceptual fragmentation and methodological inconsistency, complicating insight extraction. Hallinger et al. (2020)'s bibliometric analysis reveals rapid publication growth with uneven thematic development, highlighting the need for systematic synthesis to prevent incomplete evidence-based decisions.

Earlier systematic reviews on sustainability in higher education examined literature before 2020, limiting their scope in capturing recent pedagogical and institutional developments. According to Leal Filho et al. (2021), sustainability efforts are evolving rapidly, influenced by the Sustainable Development Goals, digitalization, and institutional accountability. Continuous literature reassessment is crucial to represent these developments.

García-González et al. (2024) highlight evolving trends in education for sustainability, noting gaps in empirical research, longitudinal studies, and geographical representation. These findings emphasize the need for systematic literature review to guide future research.

Objectives of the Study

- To systematically review scholarly literature on ESD in higher education published between 2020 and 2025.
- To identify dominant themes, pedagogical approaches, and institutional strategies in recent ESD research.
- To examine reported outcomes and challenges associated with ESD implementation in higher education.

Research Questions

1. How is Education for Sustainable Development conceptualized and implemented in higher education literature published between 2020 and 2025?
2. What key themes and approaches characterize recent research on ESD in higher education?
3. What research gaps and future directions emerge from contemporary ESD studies?

III. METHODOLOGY

This study uses a systematic literature review (SLR) methodology to synthesize recent work on Education for Sustainable Development (ESD) in higher education. A systematic approach ensures transparency and rigor in identifying and analyzing relevant literature. The review follows established methodological frameworks to minimize bias and enhance reliability.

3.1. Review Design: PRISMA-Guided Systematic Literature Review

The review design follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines by Page et al. (2021). PRISMA provides a standardized framework that ensures transparency in study identification, screening, eligibility evaluation, and inclusion. This approach is valuable in sustainability and education research, given its interdisciplinary nature.

The review process also incorporated the systematic review methodology by Donthu et al. (2021), which emphasizes structured protocols for database selection, keyword formulation, inclusion/exclusion criteria, and thematic synthesis. This enables comprehensive knowledge aggregation and identification of research gaps.

The review followed four stages: (1) identification of studies through database searches, (2) screening of titles and abstracts, (3) assessment of full-text eligibility, and (4) final inclusion for qualitative synthesis. A predefined protocol was established before searching to ensure methodological rigor.

3.2. Databases and Search Strategy

Three primary academic databases were selected: Scopus, Web of Science, and Google Scholar. Scopus and Web of Science were chosen for their indexing of high-impact journals and use in systematic reviews in education and sustainability research. Google Scholar was included to capture interdisciplinary studies and reports not indexed in subscription-based databases.

The search strategy used keywords and Boolean operators to retrieve relevant studies. Key search terms included: "Education for Sustainable Development," "Sustainability Education," "Higher Education," "Universities," and "Sustainable Development Goals."

These were combined using "AND" and "OR" operators. An example search string was:

("Education for Sustainable Development" OR "Sustainability Education") AND ("Higher Education" OR "Universities").

The search covered publications from January 2020 to December 2025 to include recent developments in policy, pedagogy, and institutional responses. Only English-language studies were included. The initial search yielded records that were refined through screening.

3.3. Inclusion and Exclusion Criteria

Clear inclusion and exclusion criteria were applied to ensure quality of selected studies, informed by prior systematic reviews (Leal Filho et al., 2021; García-González et al., 2024).

Inclusion criteria were:

- Peer-reviewed journal articles, authoritative reports, and systematic reviews.
- Studies focusing on Education for Sustainable Development within higher education institutions.
- Publications addressing curriculum integration, pedagogy, learning outcomes, institutional strategies, or ESD governance.
- Studies published between 2020 and 2025.
- Publications in English with full text available.

Exclusion criteria were:

- Studies focused on primary or secondary education.
- Conference abstracts, editorials, opinion pieces, and non-peer-reviewed sources.
- Articles addressing sustainability without educational focus.
- Duplicate database records.

Titles and abstracts were screened against these criteria, followed by full-text review of eligible studies. Discrepancies were resolved through re-examination.

3.4. Study Selection and Final Sample

Following PRISMA guidelines, the final review included 30 studies, organized to explore conceptual depth, methodological rigor, and thematic diversity. Ten Scopus-indexed articles represented high-impact empirical and review research, while 10 seminal works provided theoretical foundation and global perspectives on Education for Sustainable

Development (ESD). The remaining 10 peer-reviewed articles contributed contextual, methodological, and applied insights.

3.5. Data Analysis and Synthesis

The selected studies' data underwent descriptive and thematic analysis. Descriptive analysis explored trends in publication, geographical distribution, and methodological approaches. Thematic analysis uncovered patterns and themes concerning Education for Sustainable Development (ESD) implementation in higher education.

An inductive coding methodology allowed themes to emerge from the data naturally. This approach identified key areas including curriculum integration, pedagogical strategies, student outcomes, institutional strategies, and implementation challenges. The synthesis provided understanding of current ESD research and identified research gaps and future directions.

3.6. Methodological Rigor

By following PRISMA 2020 guidelines and SLR methodologies, this study ensures transparency and scholarly rigor. This systematic approach strengthens the review's credibility and provides a foundation for interpreting Education for Sustainable Development trends in higher education.

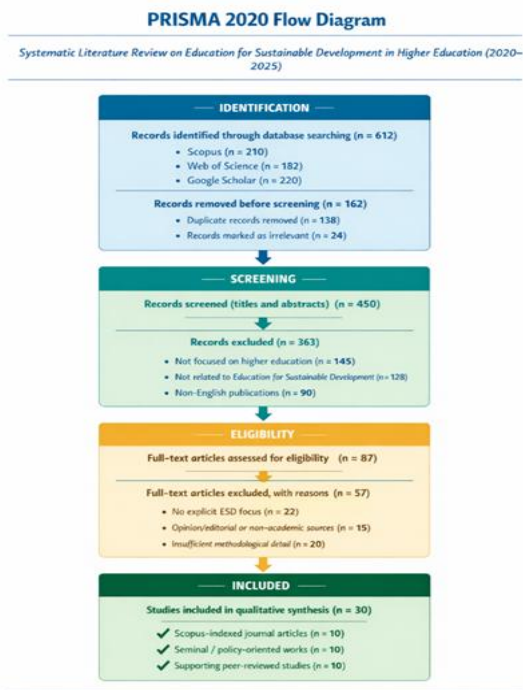


Figure X. PRISMA 2020 flow diagram illustrating the study selection process for the systematic literature review on Education for Sustainable Development in Higher Education (2020-2025).

IV. RESULTS

This section presents findings from the systematic literature review on Education for Sustainable Development (ESD) in higher education. The findings are divided into descriptive analysis of selected studies and thematic analysis of key patterns found in literature published between 2020 and 2025.

4.1 Descriptive Analysis

Publication Trends

Publication trends show growth in scholarly interest in Education for Sustainable Development (ESD) within higher education during the review period, aligning with Hallinger et al. (2020)'s findings. A rise in publications from 2021 corresponds with renewed focus on Sustainable Development Goals. According to Leal Filho et al. (2021), sustainability research in higher education has become central to academic discourse, while García-González et al. (2024) indicate that post-pandemic period has increased interest in ESD, particularly regarding institutional transformation.

Geographical Distribution

Research studies show a strong concentration in Europe, followed by North America, with European universities leading Education for Sustainable Development (ESD) research due to policy frameworks and sustainability mandates. This aligns with Leal Filho et al. (2021), who found higher institutional commitment to sustainability in European institutions. Contributions from Asia, Africa, and Latin America remain limited, though increasing. García-González et al. (2024) emphasize the need for greater Global South representation in ESD research for contextual relevance and inclusivity.

Research Methods

Qualitative methodologies dominate the literature under review, including case studies, interviews, document analysis, and narrative reviews to examine curriculum design and stakeholder perceptions. Quantitative research with surveys evaluating sustainability competencies is present but less common, while mixed-methods approaches are emerging. Hallinger et al. (2020) note that although qualitative studies provide valuable insights, the lack of longitudinal and experimental designs limits result

generalizability. This trend highlights the need for more varied research designs to assess long-term Education for Sustainable Development (ESD) impact.

4.2 Thematic Analysis

The thematic analysis resulted in the identification of five dominant themes that characterize contemporary research on Education for Sustainable Development in higher education.

Theme 1: Curriculum Integration

The integration of curricula has emerged as a key theme in the studies reviewed. Scholars emphasize the importance of embedding sustainability concepts across disciplines, rather than in standalone courses. Lozano et al. (2021) show that integrated curricula foster systems thinking and interdisciplinary perspectives needed for sustainability issues. Barth et al. (2021) emphasize competency-based curriculum design in developing sustainability knowledge and skills.

Curriculum integration varies among educational institutions. García-González et al. (2024) note that despite advocacy for holistic approaches, implementation remains fragmented. Integration is often selective, driven by faculty interests or institutional priorities, leading to disparate learning experiences. This suggests curriculum integration requires stronger institutional coordination and support.

Theme 2: Pedagogical Approaches

Innovative teaching strategies are pivotal in promoting Education for Sustainable Development (ESD) within higher education. The literature identifies experiential learning, problem-based learning, and transformative learning as effective approaches for sustainability education. Evans et al. (2021) highlight that participatory pedagogies are vital for fostering critical reflection and engagement with sustainability issues. Sterling et al. (2020) contend that transformative pedagogy is necessary for achieving deep learning and behavioral change.

Tilbury (2020) emphasizes pedagogical approaches that promote reflection, dialogue, and values-based learning for Education for Sustainable Development (ESD). Despite this, traditional lecture-based teaching in educational institutions constrains the

transformative potential of sustainability education. The literature indicates a need for innovative pedagogical practices and faculty development to implement ESD effectively.

Theme 3: Student Learning Outcomes

Research examines the effects of Education for Sustainable Development (ESD) on students, focusing on competencies, attitudes, and behaviors related to sustainability. Lambrechts and Van Petegem (2020) emphasize competencies like systems thinking, critical thinking, and ethical responsibility as core outcomes. Findler et al. (2020) show that well-structured ESD programs improve students' abilities to analyze sustainability issues.

Biasutti and Frate (2022) demonstrate positive links between sustainability education and student engagement, motivation, and pro-environmental attitudes. However, learning outcome evaluations show inconsistency across studies, with many relying on self-reported data, raising validity concerns. This indicates a need for standardized assessment frameworks and longitudinal studies to assess the lasting effects of Education for Sustainable Development (ESD) on student growth.

Theme 4: Institutional Strategies

Institutional strategies and governance frameworks are crucial for Education for Sustainable Development (ESD). According to Aleixo et al. (2021), effective leadership and clearly articulated sustainability policies are vital for implementation. Sustainability offices, strategic planning, and reporting systems indicate institutional involvement. Ramos et al. (2021) highlight sustainability reporting as a tool for accountability in higher education institutions. Leal Filho et al. (2022) argue that governance structures aligned with sustainability principles encourage cross-departmental collaboration. However, these strategies often face obstacles, including limited resources and inadequate stakeholder engagement.

Theme 5: Challenges and Barriers

The final theme explores impediments to implementing Education for Sustainable Development (ESD) in higher education. Filho et al. (2020) identify barriers including lack of institutional support, inadequate funding, and resistance to change. Faculty workload and limited sustainability training

complicate implementation. Lozano et al. (2021) note that organizational silos hinder sustainability integration. Furthermore, Kopnina and Cherniak (2021) caution against "greenwashing" practices.

The analysis shows ESD has progressed in higher education but remains inconsistent across contexts. The themes highlight the need for integrated curricula, innovative teaching, measurable outcomes, supportive policies, and challenge management to realize ESD's transformative potential.

V. DISCUSSION

This systematic literature review analyzes how Education for Sustainable Development (ESD) is conceptualized and executed in higher education institutions from 2020 to 2025. The findings reveal advancements and challenges in sustainability education. The identified themes—curriculum integration, pedagogical methods, student outcomes, institutional strategies, and implementation barriers—provide insights into how institutions can contribute to sustainable futures.

The reviewed studies show Education for Sustainable Development (ESD) is increasingly seen as a transformative educational framework rather than an adjunct. This is reflected in embedding sustainability within the curriculum, moving from isolated courses to integrated strategies. This aligns with Wals and Benavot's (2022) view that higher education should cultivate environments for critical reflection, systems thinking, and social responsibility. However, inconsistent adoption of integrated curricula highlights the importance of institutional preparedness in actualizing this vision.

Pedagogical strategies connect curriculum design and learning outcomes. While innovative teaching methods like experiential learning are endorsed, consistent application remains challenging. As Wals and Benavot (2022) note, conventional teaching models hinder ESD. Without faculty development and institutional support, pedagogical innovations remain isolated rather than becoming standard practice.

The emphasis on student learning outcomes reveals both potential and limitations in current Education for Sustainable Development (ESD) initiatives. Research shows positive effects on sustainability awareness, indicating higher education institutions help cultivate responsible global citizens. Veiga Ávila et al. (2021)

argue that universities advance sustainable development by disseminating knowledge aligned with the Sustainable Development Goals (SDGs). However, the lack of standardized assessment frameworks limits evaluation of long-term impacts.

Institutional strategies often reveal a gap between ambitious goals and implementation. Despite sustainability policies and strategic plans, their effectiveness remains inconsistent. According to Leal Filho et al. (2023), achieving sustainability transformation in higher education demands systemic change, including cross-sectoral collaboration and alignment between institutional missions and sustainability goals. Without such alignment, Education for Sustainable Development (ESD) initiatives may become merely symbolic rather than impactful.

Resource constraints, organizational silos, and resistance to change remain significant obstacles, especially in market-driven environments. These challenges highlight the importance of implementing context-sensitive approaches to sustainability education that consider institutional diversity. By linking Education for Sustainable Development (ESD) to the Sustainable Development Goals (SDGs), higher education institutions can align educational practices with global priorities while addressing local needs.

The analysis shows Education for Sustainable Development's (ESD) potential in higher education to foster inclusive, sustainable futures. This requires coordinated efforts in curriculum, pedagogy, governance, and assessment. By integrating ESD within Sustainable Development Goals (SDGs) and focusing on inclusivity, institutions can create more equitable and transformative educational systems.

VI. RESEARCH GAPS & FUTURE DIRECTIONS

While research on Education for Sustainable Development (ESD) in higher education expands, significant gaps hinder theoretical progress and practical application. Addressing these gaps is crucial for directing future research and enhancing higher education's role in promoting sustainable development.

A key gap is the geographical concentration of studies. Hallinger et al. (2020) note that sustainability education research is predominantly conducted in Europe and North America. García-

González et al. (2024) highlight the lack of representation from the Global South, including Asia, Africa, and Latin America. This geographical skewness limits findings' applicability across contexts, as institutional capacities, cultural values, and socio-economic challenges differs among regions. Future research must focus on context-specific studies that capture diverse educational systems and sustainability challenges.

A second gap concerns the scarcity of longitudinal research. While studies have documented immediate outcomes of ESD initiatives, evidence regarding their enduring impact on student behavior and professional practice remains limited. Leal Filho et al. (2021) emphasize the importance of longitudinal studies to determine whether sustainability competencies are retained post-graduation.

The literature shows heavy reliance on qualitative methodologies, including case studies and self-reported assessments. While these provide valuable insights, Hallinger et al. (2020) argue that such methodological uniformity limits research outcomes' generalizability. Future research should incorporate mixed-methods and quantitative designs to strengthen ESD research's empirical foundation and develop more robust sustainability education practices.

VII. IMPLICATIONS

Academic Implications

This systematic literature review uncovers significant implications for academic research and practical implementation in Education for Sustainable Development (ESD). The focus on curriculum integration and transformative pedagogy highlights the need for theoretical frameworks beyond traditional content-centric approaches. Sterling et al. (2020) contends that ESD requires a paradigm shift towards transformative learning, which challenges assumptions and promotes systems thinking. The studies analysed show that sustainability education is most effective when integrated across disciplines and aligned with broader educational objectives.

The emphasis on sustainability competencies highlights the role of competency-based education in higher education. Barth et al. (2021) stress the importance of defining and evaluating sustainability-related competencies, such as critical thinking and

values-based decision-making. The review indicates the need for robust conceptual models and standardized assessment tools across institutional settings. This presents opportunities to refine frameworks, develop measurement instruments, and investigate approaches connecting sustainability education with leadership development.

Institutional and Policy Implications

The research findings emphasize higher education's role in advancing global sustainability agendas at institutional and policy levels. UNESCO (2020) states that educational systems must integrate Education for Sustainable Development (ESD) into curricula, teaching methods, governance, and community involvement. UNESCO (2023) advocates for transformative educational reforms to address global challenges. Literature suggests institutions aligning sustainability efforts with their core mission achieve more significant impact.

Kestin et al. (2021) emphasizes the importance of aligning higher education strategies with Sustainable Development Goals (SDGs), positioning universities as key actors in policy implementation. Institutional leaders should facilitate cross-sectoral collaboration, allocate resources, and establish accountability mechanisms for effective ESD implementation. These implications highlight the need for coherent frameworks to actualize ESD's transformative potential in higher education.

VIII. CONCLUSION

This systematic literature review explores recent research on Education for Sustainable Development (ESD) within higher education from 2020 to 2025, synthesizing emerging trends, key themes, and challenges. The review highlights five central themes: sustainability integration into curricula, innovative pedagogical methods, student learning outcomes, strategic institutional approaches, and implementation obstacles. These themes reveal both higher education institutions' dedication to sustainability and enduring challenges hindering ESD's transformative impact.

The findings emphasize the necessity of integrating sustainability comprehensively within higher education systems, rather than as a marginal issue. Integrated curricula and innovative pedagogical strategies, particularly experiential and transformative learning, are crucial in cultivating sustainability

competencies among students. The focus on student learning outcomes demonstrates ESD's potential in shaping values and behaviors aligned with sustainable development, though limitations exist in assessment and evaluation.

Institutional strategies and governance are pivotal for effective ESD implementation. Leadership commitment, policy alignment, and accountability mechanisms are crucial for transforming sustainability goals into enduring practices. The review identifies significant challenges, including resource limitations, organizational silos, and resistance to change, which hinder progress across institutions. These challenges underscore the need for systemic and inclusive approaches to sustainability education.

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