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RIDES

EDUCATION FOR SUSTAINABLE DEVELOPMENT IN THE BRAZILIAN UNIVERSITY CONTEXT AND THE 2030 AGENDA[i]

Educação para o desenvolvimento sustentável no contexto universitário brasileiro e a Agenda 2030

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Abstract: Contemporary planetary crises, driven by environmental degradation and increasing social inequalities, underscore the urgency of sustainability as a civilizational imperative. In this context, Education for Sustainable Development (ESD) has emerged as a fundamental pillar for preparing individuals and societies to build a more resilient and equitable future. Through an exploratory literature review, this study analyzes the institutionalization of ESD in Brazilian higher education, examining its interactions with Environmental Education (EE) and the 2030 Agenda. The research explores the conceptual convergences, policy articulations, and implications of these approaches for advancing the SDGs within university settings. The findings indicate that, although sustainability has been incorporated into institutional policies and strategic planning, its implementation across Brazilian universities remains a gradual process that requires curricular reform, institutional commitment, and the adoption of sustainable management practices. The study concludes that the institutionalization of ESD is essential for preparing professionals and citizens capable of addressing complex socio-environmental challenges and contributing actively to the achievement of the 2030 Agenda.

Keywords: 2030 Agenda; Environmental education; Education for sustainable development; Higher education; Brazilian universities; Sustainable Development Goals.

Resumo: *As crises planetárias contemporâneas, impulsionadas pela degradação ambiental e pelo aumento das desigualdades sociais, ressaltam a urgência da sustentabilidade como um imperativo civilizacional. Nesse contexto, a Educação para o Desenvolvimento Sustentável (EDS) emergiu como um pilar fundamental para preparar indivíduos e sociedades para a construção de um futuro mais resiliente e equitativo. Por meio de uma revisão exploratória da literatura, este estudo analisa a institucionalização da EDS no ensino superior brasileiro, examinando suas interações com a Educação Ambiental (EA) e a Agenda 2030. A pesquisa explora as convergências conceituais, as articulações políticas e as implicações dessas abordagens para o avanço dos Objetivos de Desenvolvimento Sustentável (ODS) no ambiente universitário. Os resultados indicam que, embora a sustentabilidade tenha sido incorporada às políticas institucionais e ao planejamento estratégico, sua implementação nas universidades brasileiras permanece um processo gradual que requer reforma curricular, comprometimento institucional e a adoção de práticas de gestão sustentável. O estudo conclui que a institucionalização da EDS é essencial para preparar profissionais e cidadãos capazes de enfrentar os complexos desafios socioambientais e contribuir ativamente para o alcance da Agenda* 2030.

Palavras-chave: Agenda 2030; Educação ambiental; Educação para o desenvolvimento sustentável; Ensino superior; Universidades brasileiras; Objetivos de Desenvolvimento Sustentável (ODS).

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INTRODUCTION

As argued by Boff (2014), the imperative of sustainability emerges from the recognition that the current civilizational paradigm is biophysically unsustainable. The systemic degradation of vital resources such as water, soils, biodiversity, and energy sources, combined with an economic and political model based on predatory exploitation, has intensified social inequalities and weakened social cohesion. This growing vulnerability threatens not only the planet's ecological balance but also the long-term viability of the human species itself.

Similarly, Carson (2010) warned of the risks associated with the indiscriminate use of chemical substances without proper assessment of their impacts on soil, water, wildlife, and human health. According to the author, neglecting the preservation of the natural world—the "fundamental basis of life"—represents a serious long-term threat whose consequences may affect future generations.

In the face of the planetary crisis, sustainability has emerged as one of the greatest challenges of contemporary civilization. Considered by environmentalists and sociologists to be a multifaceted and constantly evolving concept, sustainability has undergone significant scientific and political development. However, the consolidation of its theoretical foundations has largely resulted from the growing recognition of environmental degradation. The current global crisis stems from a development model grounded in a fragmented worldview that fails to recognize the interdependencies among natural, economic, and social systems (Capra, 1996; Boff, 2014).

According to Capra (2002), understanding contemporary challenges requires a paradigm shift from fragmented thinking toward a systemic and ecological perspective. In this context, living systems are understood as interconnected networks in which environmental, social, and economic phenomena are deeply interrelated. Consequently, overcoming the planetary crisis depends on adopting new ways of thinking capable of recognizing these interconnections and guiding sustainable practices.

The Stockholm Conference (1972) represented a milestone in the consolidation of the global environmental agenda by highlighting the limitations of the prevailing development model and the risks associated with environmental degradation. This debate was subsequently strengthened by the Brundtland Report (1987) and the United Nations Conference on Environment and Development (Rio-92), contributing to the establishment of international commitments to sustainability, such as Agenda 21, the Millennium Development Goals (MDGs), and, more recently, the Sustainable Development Goals (SDGs) within the framework of the 2030 Agenda (United Nations Brazil, 2015).

The 2030 Agenda constitutes a global action plan aimed at promoting sustainable development, with the eradication of poverty, protection of the planet, and promotion of prosperity for all as its central objectives. Structured around 17 SDGs and 169 targets, the Agenda expands upon the commitments previously established by the MDGs, integrating the economic, social, and environmental dimensions of development. Its implementation is guided by the so-called "5 Ps"—People, Planet, Prosperity, Peace, and

Partnerships—which direct actions toward reducing inequalities, addressing environmental and climate crises, promoting sustainable socioeconomic development, strengthening peace, and fostering international cooperation under the commitment to leave no one behind (United Nations Brazil, 2015).

In this regard, Loureiro (2016) argues that one of the most urgent challenges facing contemporary society is the transition toward development models that integrate social, environmental, and economic dimensions while ensuring intergenerational equity. This transition requires overcoming fragmented perspectives in favor of a systemic approach capable of understanding the interdependencies among global phenomena.

Within this context, education plays a strategic role in transforming values and promoting behaviors aligned with sustainability. This need becomes even more evident in light of the worsening socio-environmental crisis. According to UNESCO (2021), rising global temperatures, accelerated biodiversity loss, and increasing pressure on natural resources threaten ecosystem stability and human well-being. In response, Education for Sustainable Development (ESD) emerges as a fundamental instrument for developing the knowledge, competencies, and attitudes necessary to build more resilient and sustainable societies.

The United Nations Decade of Education for Sustainable Development (DESD), established by UNESCO (2005), represented a broad and complex initiative whose conceptual foundations and socioeconomic, environmental, and cultural impacts extended across multiple dimensions of social life. Its primary objective was to integrate sustainability-related values into all levels and forms of learning in order to promote behavioral changes capable of contributing to a more just and sustainable society.

Based on the vision of a world in which everyone has access to education and can learn values, practices, and lifestyles oriented toward sustainability, the DESD established strategic priorities that included recognizing the essential role of education in promoting sustainable development; strengthening cooperation networks among stakeholders involved in ESD; expanding learning opportunities and public awareness initiatives; improving the quality of teaching and learning in this field; and developing strategies at all levels to enhance institutional and educational capacities related to ESD.

ESD has been internationally established by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as an educational approach designed to promote the knowledge, competencies, values, and attitudes necessary to address the social, economic, and environmental challenges of the twenty-first century. Within the framework of the 2030 Agenda, UNESCO (2020) reaffirms that ESD constitutes one of the principal mechanisms for achieving the SDGs, particularly Sustainable Development Goal 4 (SDG 4), which focuses on ensuring inclusive, equitable, and quality education.

Specifically, Target 4.7 establishes that, by 2030, all learners should acquire the knowledge and skills needed to promote sustainable development, including education for global citizenship, human rights, gender equality, a culture of peace and non-violence, appreciation of cultural diversity, and sustainable lifestyles (United Nations, 2015; UNESCO, 2020). Consequently, ESD extends beyond a traditional environmental perspective by incorporating an interdisciplinary approach aimed at preparing citizens to contribute to more inclusive, resilient, and sustainable societies.

In the Brazilian context, incorporating ESD principles into the legal framework and educational policies represents a strategic pathway for aligning the national education system with the objectives of the 2030 Agenda. In this regard, examining the Brazilian legal framework makes it possible to identify progress, challenges, and opportunities for the effective implementation of SDG Target 4.7, highlighting the need for greater integration among legislation, curriculum development, teacher education, and pedagogical practice.

Despite the advances observed in the literature on sustainability, Environmental Education (EE), ESD, and the 2030 Agenda, theoretical and institutional challenges remain regarding the articulation of these fields within higher education. Although numerous studies have separately examined the implementation of the SDGs, EE, or ESD, fewer investigations have explored, in an integrated manner, the conceptual, normative, and operational relationships among these approaches, particularly within Brazilian Higher Education Institutions (HEIs).

Furthermore, the boundaries, convergences, and complementarities between EE and ESD, as well as the role of universities in institutionalizing sustainability and advancing the 2030 Agenda, remain subjects of debate. Addressing this gap requires a systematic examination of the scientific literature in order to better understand how these frameworks interact in promoting sustainable development.

Against this backdrop, the present study aims to analyze the interactions among Environmental Education (EE), Education for Sustainable Development (ESD), the Brazilian legal framework, and the 2030 Agenda, with particular emphasis on Sustainable Development Goal 4 (SDG 4) and Target 4.7, examining their conceptual convergences, policy articulations, and contributions to advancing sustainable development through education.

METHODOLOGY

Literature Review

This study adopts a qualitative and exploratory approach based on a literature review, following the methodological principles proposed by Gil (2019), Snyder (2019), and Booth *et al.* (2021). The literature review was considered appropriate because it enables the systematic identification, critical appraisal, and qualitative synthesis of scientific knowledge related to Education for Sustainable Development (ESD), Environmental Education (EE), and their relationship with the 2030 Agenda. The interpretive perspective adopted is also grounded in the principles of qualitative research described by Creswell and Poth (2018), emphasizing the development of analytical categories based on recurring themes identified in the literature.

The study aimed to analyze the interactions among EE, ESD, and the 2030 Agenda, examining their conceptual convergences, policy articulations, and contributions to the implementation of the SDGs, with particular emphasis on Brazilian higher education and SDG 4, especially Target 4.7.

The review was conducted through successive stages comprising: (i) definition of the research question; (ii) development of the search strategy; (iii) application of eligibility criteria; (iv) selection of the documentary corpus; and (v) qualitative analysis and synthesis of the findings. The guiding research question was: **How are EE, ESD, and the 2030 Agenda articulated in recent scientific literature within the context of higher education?**

The literature search was conducted between March and June 2026 using the *Scientific Electronic Library Online* (SciELO) database. Considering that the 2030 Agenda was adopted by the United Nations (UN) in 2015 and that ESD gained greater international prominence following this milestone, the search focused primarily on publications issued between 2015 and 2026. However, seminal studies published before 2015 were included whenever they provided essential theoretical foundations for understanding the evolution of EE, sustainability, or teacher education. References such as Freitas (2004) were therefore retained because they contribute to the historical and conceptual contextualization of education for sustainability rather than to the analysis of ESD within the framework of the 2030 Agenda.

The search terms were defined in both English and Portuguese in order to maximize the retrieval of Brazilian and international literature indexed in SciELO. The descriptors included "*Education for Sustainable Development*," "*Environmental Education*," "*Sustainability*," "*Sustainable Development Goals*," and "*Higher Education*," as well as their Portuguese equivalents: "Educação para o Desenvolvimento Sustentável," "Educação Ambiental," "Sustentabilidade," "Objetivos de Desenvolvimento Sustentável," and "Ensino Superior." These descriptors were searched individually and combined using the Boolean operators AND and OR, according to the characteristics of the database. Examples of search strategies included: ("*Education for Sustainable Development*" AND "*Higher Education*"), ("*Environmental Education*" AND "*Sustainability*"), and ("Educação para o Desenvolvimento Sustentável" AND "Ensino Superior").

SciELO was selected because of its recognized relevance to Latin American and Brazilian scientific production in the fields of education, sustainability, and environmental studies. The search strategy initially identified 51 records. Titles, keywords, and abstracts were subsequently screened, followed by full-text reading of potentially relevant publications.

The inclusion criteria comprised: (a) peer-reviewed scientific articles; (b) publications issued between 2015 and 2026, except for seminal theoretical works included to provide conceptual foundations; (c) studies addressing EE, ESD, sustainability, the 2030 Agenda, or the SDGs; and (d) publications discussing these topics within educational contexts, particularly higher education.

The exclusion criteria included duplicate records, editorials, conference abstracts, opinion papers, and studies that were not directly related to the objectives of the review. After applying the eligibility criteria, 21 studies were included in the analytical corpus (Table 1). Of these, 18 directly addressed ESD, while three contributed indirectly through discussions of climate education, socio-environmental challenges, and sustainability transitions. A detailed description of the selected studies, including authors, objectives, and main findings, is provided in Supplementary Material A.

Table 1. Characteristics of the studies included in the analytical corpus.

Category	Number of studies	Main focus
ESD	18	Conceptual discussions, implementation in higher education, curriculum integration, sustainability governance, and contributions to the SDGs.
Interfaces between EE and ESD	8	Convergences, divergences, and complementarities between EE and ESD approaches.
Sustainability and socio-environmental crisis	3	Climate change, socio-environmental challenges, resilience, and sustainability transitions.
HEIs and sustainability	13	Institutionalization of sustainability, sustainable campus initiatives, curriculum development, and SDG implementation.
2030 Agenda and SDGs	9	Contributions of universities to the implementation and monitoring of the SDGs.

Source: Prepared by the authors (2026).

The selected studies were analyzed using a qualitative interpretive approach based on thematic analysis. Data synthesis consisted of identifying recurring concepts, convergences, divergences, and emerging analytical categories across the selected publications. Four analytical categories were established: (i) sustainability and EE; (ii) ESD and the 2030 Agenda; (iii) regulatory frameworks for EE; and (iv) the role of Higher Education Institutions (HEIs) in promoting sustainability and implementing the SDGs.

The findings were interpreted in light of the scientific literature and the main international and Brazilian policy frameworks related to sustainability, EE, and ESD, ensuring coherence among the theoretical framework, methodological procedures, and analytical interpretation.

Figure 1

Figure 1 was developed by the authors as an original conceptual illustration designed to synthesize the relationships among EE, ESD, and the 2030 Agenda for Sustainable Development. The figure was developed based on a comparative analysis of the scientific literature and international normative documents examined in this review, including the Stockholm Conference (1972), the Tbilisi Declaration (1977), Agenda 21, UNESCO's *Education for Sustainable Development: A Roadmap* (2020), and the UN 2030 Agenda for Sustainable Development (2015).

During the development process, an artificial intelligence-assisted image generation tool was used to support the visual organization of the concepts. The authors defined the conceptual structure, validated all elements presented in the figure, and reviewed the final version to ensure its scientific accuracy and consistency with the literature analyzed.

THEORETICAL FRAMEWORK

Education for Sustainability

Over the past century, the intensification of natural resource exploitation has highlighted the growing pressure exerted by human activities on ecosystems. The depletion of raw materials, biodiversity loss, and environmental degradation on a global scale reveal the ecological limits of the prevailing development model, reinforcing the need for strategies guided by the principles of sustainability.

Concerns about the environmental impacts of human activities are not new. In *Silent Spring*, Carson (1962) warned about the harmful effects of the indiscriminate use of pesticides on ecosystems and human health. Decades later, Boff (2014) expanded this discussion by arguing that the predatory exploitation of water resources, soils, biodiversity, and energy sources has deepened social inequalities and compromised the long-term viability of human societies.

Recent literature emphasizes that the climate crisis represents one of the most urgent global challenges of the twenty-first century. According to Carniatto, Pereira, and Gonzalez (2025), the unsustainable exploitation of natural resources, combined with the prioritization of short-term economic interests, has generated significant impacts on ecosystems and human well-being. Similarly, Nepomoceno and Carniatto (2023) argue that climate change, driven by greenhouse gas emissions and changes in land use, has intensified the occurrence of extreme events such as droughts, floods, and heat waves, disproportionately affecting vulnerable populations.

Within this context, sustainability extends beyond strictly environmental concerns and encompasses the interconnected dimensions of social equity, economic viability, and cultural diversity. While the environmental dimension focuses on preserving the resources necessary for life and the well-being of future generations, the economic dimension requires organizations to reconcile profitability with social and environmental responsibility. Sustainability thus emerges as a comprehensive paradigm that requires changes in both individual and organizational behavior, with the aim of enhancing planetary resilience and promoting justice in human relations (Vieira *et al*., 2021).

Boff (2014), through the concept of the ethics of care, challenges the traditional view that associates care merely with emotion or assistance. Instead, he conceives care as an existential and ontological imperative. Since human beings are inherently vulnerable and interdependent, care should precede all actions and constitute a fundamental principle for the preservation of life. In a world characterized by excessive exploitation, this ethical perspective advocates a relationship of reciprocity and respect toward the Earth, understood not as a collection of resources to be dominated, but as a “Common Home” that sustains human existence.

Similarly, Costin (2020) argues that intellectual and cultural development must be accompanied by a solid ethical foundation. According to the author, traditional educational models, when detached from humanistic values, proved insufficient throughout the twentieth century and, in some cases, even supported authoritarian and violent regimes. Contemporary education should therefore contribute to the formation of responsible global citizens who value sustainability, social responsibility, and

scientific knowledge, while rejecting practices grounded in denialism and unsustainable patterns of consumption.

In this scenario, education emerges as a strategic instrument for advancing sustainability. The literature suggests that contemporary environmental challenges cannot be addressed exclusively through technological innovations or regulatory mechanisms; they also require transformations in values, behaviors, and social structures. Consequently, Education for Sustainable Development (ESD) assumes a central role by promoting the knowledge, competencies, attitudes, and values necessary to support processes of social transformation aligned with sustainability principles (UNESCO, 2021).

At the same time, Environmental Education (EE) has become established as a fundamental field for promoting ecological awareness and environmental citizenship. Characterized by its interdisciplinary, critical, and participatory nature, EE seeks to deepen the understanding of interactions between society and nature while encouraging social engagement and critical reflection on the structural causes of socio-environmental problems. From this perspective, education goes beyond the simple transmission of knowledge and assumes a transformative role in building more equitable and environmentally responsible societies.

Therefore, integrating sustainability into educational processes constitutes an essential condition for preparing citizens capable of understanding the complexity of contemporary challenges. By promoting a systemic understanding of the relationships among environmental, economic, and social dimensions, education contributes to the development of the competencies necessary for the transition toward more sustainable development pathways. In this sense, education is increasingly recognized as a strategic mechanism for fostering socially just and ecologically resilient futures (Vieira *et al*., 2021).

Education for Sustainable Development and the 2030 Agenda

The literature analyzed indicates that Education for Sustainable Development (ESD) has become established as a global strategy for advancing sustainability through education, particularly following the United Nations Decade of Education for Sustainable Development (2005–2014), promoted by UNESCO (2005). However, the studies reviewed reveal different interpretations regarding its theoretical foundations and pedagogical implications.

Hencke and Silva (2022) argue that ESD can be understood as part of a broader process of knowledge institutionalization, associated with what the authors describe as “royal science,” characterized by the construction of normative and universal models. From this perspective, ESD tends to be incorporated into curricula and educational policies through international guidelines that define content, competencies, and pedagogical practices. The United Nations Decade of Education for Sustainable Development itself reinforced this trend by promoting common principles for integrating sustainability into educational systems worldwide (UNESCO, 2005).

On the other hand, part of the literature emphasizes the need for a critical

approach to ESD. Tozato (2022) argues that sustainability should not be treated merely as a set of technical or normative competencies, but rather as an educational process capable of fostering a complex understanding of the relationships between society and nature. From this perspective, ESD aligns with Leff's (2006) concept of environmental knowledge, recognizing the interdependence of ecological, social, economic, cultural, and political factors in understanding contemporary socio-environmental crises.

The studies reviewed also reveal broad consensus regarding the strategic role of Higher Education Institutions (HEIs) in advancing the 2030 Agenda. Campello and Silveira (2016) emphasize that universities have significant potential to lead processes of social transformation through teaching, research, extension activities, and sustainable institutional management. However, the authors argue that the effective implementation of ESD requires overcoming fragmented disciplinary structures and incorporating sustainability into all academic functions.

This perspective is supported by Fleig, Nascimento, and Michaliszyn (2021), whose review found that the integration of sustainable development into universities remains a slow and gradual process. Similar findings were reported by Souza, Cassanego Júnior, and Patias (2019), who observed that sustainability is frequently incorporated into Institutional Development Plans, although this incorporation is not always accompanied by effective implementation practices. Likewise, Palma, Alves, and Silva (2013) found that sustainability initiatives within Federal Institutes are often driven by individual faculty members rather than resulting from consolidated institutional policies.

Within the context of the 2030 Agenda, Souza and Ventura (2024) identified that Brazilian universities address the SDGs primarily through institutional management and teaching and research activities. Although these initiatives demonstrate progress in incorporating the global sustainability agenda, the authors highlight the need to expand actions related to external leadership, community engagement, and partnerships with society.

Furthermore, the literature suggests that ESD should extend beyond technical training and contribute to the development of ethical values and citizenship competencies committed to social transformation. Souza and Benevides (2005) argue that HEIs have a direct responsibility to educate professionals capable of reconciling economic development, social justice, and environmental protection. Similarly, Freitas (2004) highlights the importance of teacher education for sustainability, recognizing educators as key agents in promoting a culture oriented toward sustainable development.

From this perspective, education precedes sustainability, since cultural barriers often hinder the adoption of sustainable practices. Individuals who develop environmentally responsible habits contribute to transforming their workplaces, educational environments, and communities into more sustainable and harmonious spaces. Supported by a solid educational foundation, social actors are more likely to adopt practices capable of mitigating environmental impacts. Ideally, education for sustainability should begin within family and community contexts and be reinforced through lifelong learning processes, which are essential for developing informed, engaged, and responsible citizens (Souza *et al*., 2019).

Overall, the studies reviewed demonstrate that ESD constitutes a fundamental mechanism for advancing the 2030 Agenda and the SDGs. However, significant challenges remain regarding the transversal integration of sustainability into curricula, interdisciplinarity, teacher education, and the articulation among teaching, research, extension, and institutional management. These findings suggest that, despite the widespread recognition of the importance of ESD, its consolidation within HEIs remains uneven, highlighting the need for further progress in both educational policies and institutional practices.

Regulatory Frameworks for Environmental Education

The consolidation of Environmental Education (EE) in Brazil has been shaped by a set of regulatory instruments that have progressively expanded its scope and established it as a strategic component for promoting sustainable development. This process evolved alongside the strengthening of international debates on the environment and development, increasingly recognizing education as a fundamental mechanism for fostering environmental awareness, social responsibility, and citizen engagement in addressing contemporary socio-environmental challenges.

The National Education Guidelines and Framework Law (LDB No. 9,394/1996) introduced a broader conception of education by recognizing that learning processes extend beyond formal schooling and occur within families, workplaces, social organizations, and cultural contexts (Brazil, 1996). This understanding expands the possibilities for incorporating environmental issues into different educational settings and aligns with the principles of Education for Sustainable Development (ESD), which emphasize both formal and non-formal learning processes.

Within the field of environmental policy, the National Environmental Policy (Law No. 6,938/1981) represented the first legal framework to explicitly incorporate EE as an instrument for environmental preservation and restoration. This approach was subsequently reinforced by the 1988 Federal Constitution, which recognized an ecologically balanced environment as a fundamental right and assigned public authorities the responsibility of promoting EE at all levels of education (Brazil, 1988).

A more comprehensive institutional framework was established through the National Environmental Education Policy (PNEA), enacted by Law No. 9,795/1999. The legislation defines EE as an essential and permanent component of national education, to be integrated into all levels and modalities of education. Furthermore, it adopts a holistic conception of the environment, encompassing ecological, social, economic, political, and cultural dimensions, thereby reflecting the multidimensional nature of sustainability (Brazil, 1999).

One of the most significant contributions of the PNEA lies in its emphasis on interdisciplinarity as a guiding principle. Rather than treating EE as a standalone subject, the policy establishes its integration across different areas of knowledge through a cross-curricular approach. This perspective is closely aligned with the principles underpinning ESD and the 2030 Agenda, both of which advocate systemic and integrated approaches to understanding and addressing sustainability-related

challenges (Brazil, 1999).

Beyond formal education, the PNEA also recognizes the importance of non-formal EE by encouraging the participation of public and private institutions, civil society organizations, media outlets, and other social actors in promoting environmental awareness and critical engagement. This orientation reinforces the understanding that sustainability depends on collective action and shared responsibility among governments, institutions, and society in protecting the environment (Brazil, 1999; Brazil, 2002).

Overall, the Brazilian regulatory framework demonstrates significant convergence with the principles later consolidated by the 2030 Agenda and Education for Sustainable Development. The emphasis on interdisciplinarity, social participation, environmental citizenship, and integrated approaches to sustainability reflects objectives that would subsequently become central to global sustainability agendas.

However, the literature indicates a persistent gap between regulatory advances and their effective implementation within educational institutions, particularly regarding the cross-curricular integration of sustainability into curricula, school governance structures, and teacher education programs. These challenges suggest that, despite the existence of a solid legal foundation, the institutionalization of sustainability in education remains an ongoing process, requiring more effective implementation of public policies and stronger institutional commitment.

Evolution of Environmental Education and Education for Sustainable Development

The literature reviewed indicates that Environmental Education (EE) and Education for Sustainable Development (ESD) share the common goal of educating citizens committed to sustainability, although they differ in terms of their historical origins, theoretical foundations, and political orientations. While EE emerged as a field dedicated to the critical analysis of the relationships between society and nature, ESD developed within the broader international debate on sustainable development, incorporating social, economic, and cultural dimensions into environmental concerns.

The concept of ESD, promoted by UNESCO (2021) and supported by a significant portion of the sustainability literature, seeks to advance sustainable development through the integration of environmental, economic, and social dimensions. This approach positions sustainability simultaneously as an educational and strategic framework for addressing contemporary global challenges. Its proponents argue that the concept is particularly relevant because it explicitly incorporates economic and social issues into sustainability discussions—dimensions that, although already present in many EE approaches, are further emphasized within the ESD agenda.

In the Brazilian context, the National Environmental Education Policy (PNEA) defines the environment as the result of the interaction between human societies and nature, thereby promoting a cross-cutting perspective that establishes connections between the natural and social sciences. According to Loureiro (2016), however, the effectiveness of this policy depends on overcoming fragmented initiatives based on

isolated projects in order to consolidate EE as a long-term public policy. Such a shift could strengthen the institutional foundations of ESD and reinforce the understanding of the environment as a common good within broader processes of socioeconomic development.

This discussion converges with Pitanga's (2016) critique of what he describes as the "biologization" of EE. According to the author, EE becomes limited when it focuses exclusively on ecological dimensions while neglecting political, economic, and social aspects. From this perspective, ESD emerges as a broader and more comprehensive educational framework, characterized by its global and cross-cutting nature. It incorporates topics such as human rights, peace, health, sexuality, and diversity, positioning itself as an educational response to the complexities of sustainable development.

The studies reviewed reveal that one of the main areas of debate concerns the concept of sustainable development itself. Scholars associated with critical EE question the use of the term "development," arguing that it may reproduce economic logics that have contributed to socio-environmental degradation. In contrast, proponents of ESD interpret sustainable development as a framework capable of reconciling economic growth, social inclusion, and environmental protection, in line with the commitments established by the 2030 Agenda (Loureiro, 2016; Pitanga, 2016; Hencke & Silva, 2022).

Leite and Dourado (2015) emphasize that Environmental Education predates Education for Sustainable Development. The origins of EE can be traced back to UNESCO initiatives in the mid-twentieth century and were subsequently consolidated through the Belgrade Charter (1975), which emphasized the development of an environmentally aware and engaged population capable of addressing environmental problems. In contrast, ESD emerged during the 1980s and 1990s in response to growing concerns about the consequences of unsustainable development. Closely associated with the concept of education for sustainability, ESD seeks to prepare individuals to assess the impacts of development processes and contribute to more sustainable pathways.

Barbieri and Silva (2011) argue that, despite differences in emphasis, the objectives of EE and ESD are broadly compatible and complementary. According to the authors, environmental management and environmental education should evolve alongside sustainable development initiatives, enabling students to acquire the competencies necessary to address environmental challenges generated by human activities. However, despite the support of numerous international frameworks and declarations, the institutional adoption of ESD has progressed relatively slowly. In response to the urgency of contemporary environmental crises, the authors advocate the voluntary incorporation of sustainability principles into the teaching, research, and extension activities of Higher Education Institutions (HEIs).

Despite these theoretical differences, there is broad consensus regarding the importance of integrating sustainability into educational processes. Barbieri and Silva (2011) maintain that EE and ESD pursue compatible goals, while Leite and Dourado (2015) demonstrate that both approaches are concerned with educating individuals capable of responding to contemporary socio-environmental challenges. Consequently, current debates appear to be moving away from the dichotomy between EE and ESD

and toward the development of educational strategies capable of integrating critical thinking, interdisciplinarity, and social transformation.

In this regard, Corrêa and Ashley (2018) argue that ambiguities surrounding the concepts of sustainable development, sustainability, EE, and ESD may result in divergent interpretations within the curricula, course plans, and educational practices of HEIs. Their analysis suggests that sustainable development should be understood within the broader framework of Environmental Education, conceived as a transformative, political, and emancipatory educational practice in which students play an active role in the construction of knowledge.

Similarly, Santana (2018) highlights the growing relevance of discussions concerning the relationship between education and sustainable development in global educational and political contexts. According to the author, the cultural, economic, and social transformations observed throughout the twentieth century contributed to the emergence of ecological awareness and greater sensitivity toward collective issues. Within this context, education is increasingly recognized as a central mechanism for educating ethical and democratic citizens capable of critically engaging with global sustainability challenges.

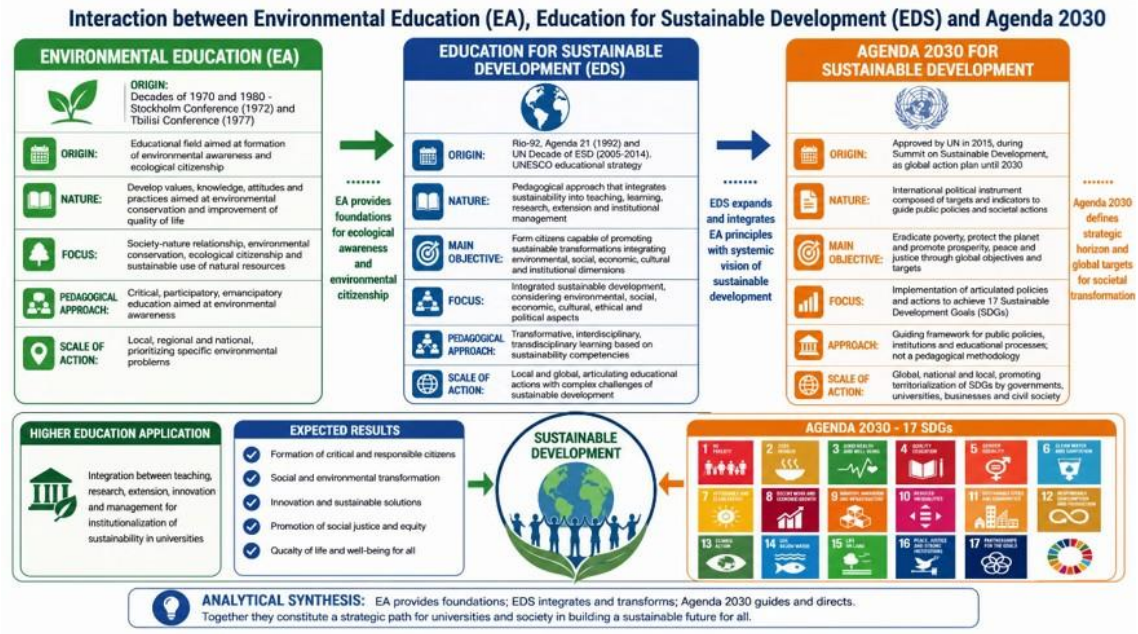
Overall, the literature suggests that ESD represents an expansion rather than a replacement of EE. While EE provided the critical foundations for understanding the relationships between society and nature, ESD broadened this perspective by incorporating economic, social, cultural, and institutional dimensions associated with sustainable development and the 2030 Agenda. However, theoretical debates regarding the meanings, limitations, and implications of sustainable development remain active, indicating that both EE and ESD continue to evolve as dynamic and contested fields of knowledge and practice.

Interactions among Environmental Education, Education for Sustainable Development, and the 2030 Agenda

The literature reviewed indicates that the relationship among Environmental Education (EE), Education for Sustainable Development (ESD), and the 2030 Agenda can be understood as an evolutionary and complementary process in which each approach performs distinct yet interdependent functions in promoting sustainability. Although they differ in terms of their historical origins, theoretical foundations, and fields of application, the three frameworks converge toward the common goal of promoting more equitable, inclusive, and environmentally responsible societies.

As illustrated in Figure 1, EE emerged and became consolidated during the 1970s and 1980s, particularly following the Stockholm Conference (1972) and the Tbilisi Conference (1977). Its primary focus has been the development of ecological awareness, environmental citizenship, and a critical understanding of the relationships between society and nature. Grounded in critical, participatory, and emancipatory principles, EE seeks to promote values, knowledge, and attitudes that contribute to environmental conservation and the sustainable use of natural resources.

Figure 1. Interactions among EE, ESD, and the 2030 Agenda.



Source: Prepared by the authors (2026).

ESD, in turn, broadens this perspective by explicitly integrating the environmental, social, economic, cultural, and institutional dimensions of sustainability. Influenced by international milestones such as Agenda 21, the Rio-92 Conference, and the United Nations Decade of Education for Sustainable Development (2005–2014), ESD advocates an interdisciplinary, transformative, and action-oriented educational approach aimed at empowering individuals to address the complex challenges of sustainable development (UNESCO, 2021).

The 2030 Agenda represents a global political and institutional framework designed to guide governments, organizations, and educational institutions through its 17 SDGs and 169 targets. Unlike EE and ESD, the 2030 Agenda does not constitute an educational paradigm in itself; rather, it provides a strategic framework that establishes priorities, objectives, and indicators for advancing sustainable development worldwide (United Nations Brazil, 2015).

Within this context, the Brazilian legal framework provides an important normative foundation for aligning EE with the principles of ESD and the objectives of the 2030 Agenda. Instruments such as the National Environmental Education Policy (PNEA – Law No. 9,795/1999), the National Education Guidelines and Framework Law (LDB – Law No. 9,394/1996), the National Common Core Curriculum (BNCC), and the National Education Plan (PNE) reinforce the integration of environmental, social, ethical, and citizenship dimensions into educational processes. These policies demonstrate a progressive convergence between national educational legislation and the international principles promoted by UNESCO and the United Nations, thereby strengthening the institutionalization of sustainability across different levels of education.

This convergence is particularly evident in SDG 4, which seeks to ensure inclusive, equitable, and quality education and promote lifelong learning opportunities for all. Target 4.7 explicitly recognizes ESD as a fundamental strategy for enabling students to acquire the knowledge, skills, values, and attitudes necessary to promote sustainable

development, global citizenship, human rights, cultural diversity, gender equality, and a culture of peace (United Nations, 2015; UNESCO, 2020).

From this perspective, the interaction among EE, ESD, the Brazilian legal framework, and the 2030 Agenda extends beyond conceptual convergence, representing a coherent policy framework that supports the integration of sustainability into educational systems and strengthens the contribution of education to achieving the SDGs.

Within this context, a strong complementary relationship can be identified among the three frameworks. EE provides the ethical and ecological foundations necessary for developing environmental awareness. ESD broadens this foundation by integrating multiple dimensions of sustainability and promoting competencies aimed at social transformation. The 2030 Agenda, in turn, provides a strategic roadmap that guides the implementation of educational and sustainability-oriented actions through the SDGs. Together, these approaches constitute a comprehensive theoretical and practical framework capable of informing public policies, educational curricula, and institutional sustainability strategies.

Higher Education Institutions (HEIs) play a central role in this process by integrating sustainability principles into teaching, research, extension activities, and institutional governance. The incorporation of ESD into curricula, combined with the implementation of the SDGs and the principles of EE, strengthens the education of professionals and citizens committed to social justice, environmental protection, and sustainable development. Consequently, the convergence of EE, ESD, and the 2030 Agenda represents one of the most promising pathways for addressing the complex socio-environmental challenges of the twenty-first century.

The studies reviewed further demonstrate that the relationship among EE, ESD, and the 2030 Agenda should not be interpreted as a process of conceptual replacement, but rather as a process of expansion and complementarity. Historically, EE has served as a foundation for the development of critical awareness and environmental citizenship, while ESD has broadened this perspective by explicitly incorporating the social, economic, cultural, and institutional dimensions of sustainability.

Within this framework, the 2030 Agenda provides a global policy reference that guides educational initiatives through the SDGs, particularly SDG 4 and its Target 4.7. The literature consistently recognizes HEIs as strategic actors in this process, serving as spaces for knowledge production, competency development, and the implementation of sustainability-oriented practices. Therefore, the institutionalization of ESD within universities emerges as a fundamental mechanism for advancing the principles and objectives of the 2030 Agenda, strengthening the articulation among education, sustainability, and social transformation.

Universities as Agents of the Sustainability Transition

The literature reviewed consistently recognizes Higher Education Institutions (HEIs) as strategic actors in advancing sustainable development. In the face of worsening environmental crises and the growing complexity of global socioeconomic

challenges, universities have assumed responsibilities that extend beyond professional education, becoming key spaces for knowledge production, technological innovation, and social transformation (Campello & Silveira, 2016; UNESCO, 2009).

Within this context, Education for Sustainable Development (ESD) has emerged as an important educational framework for preparing professionals capable of understanding the interconnections among the environmental, social, and economic dimensions of sustainability. According to Tozato (2022), ESD contributes to the development of critical environmental rationality, enabling students to recognize the socio-environmental consequences of conventional development models and actively participate in the search for sustainable alternatives.

International organizations have increasingly emphasized the central role of universities in implementing the 2030 Agenda, particularly because of their capacity to influence public policies, educate future leaders, and generate innovative solutions to contemporary challenges (Souza & Ventura, 2024). Through teaching, research, extension activities, and institutional governance, HEIs can foster sustainability-oriented competencies and contribute directly to the achievement of the Sustainable Development Goals (SDGs).

Recent evidence also reinforces the strategic role of Higher Education Institutions in advancing Education for Sustainable Development (ESD). Based on a bibliometric analysis of the scientific literature, Tafese and Kopp (2025) demonstrate a significant expansion of research on ESD in higher education, particularly following the adoption of the 2030 Agenda. Their findings indicate that universities have become central actors in promoting interdisciplinary learning, developing sustainability competencies, and conducting research aligned with the Sustainable Development Goals (SDGs), highlighting the growing integration of sustainability into higher education worldwide.

Institutionalization of Sustainability in Universities

The studies analyzed reveal a gradual increase in the incorporation of sustainability into university management and institutional policies. However, the institutionalization of sustainability remains uneven and is often fragmented across institutions (Souza, Cassanego Júnior, & Patias, 2019; Fleig *et al*., 2021).

The literature highlights the need to move beyond approaches limited to environmental management on university campuses and toward the development of "Sustainable Universities," in which sustainability is embedded in strategic planning, institutional policies, and decision-making processes (Diniz *et al*., 2024). From this perspective, initiatives related to reducing environmental footprints, promoting social inclusion, strengthening participatory governance, and aligning institutional actions with the Sustainable Development Goals (SDGs) are considered essential for consolidating sustainability at the organizational level (Campello & Silveira, 2016).

The successful institutionalization of sustainability also depends on the capacity of educational institutions to translate sustainability principles into pedagogical practices. Zhou (2024), in analyzing the experiences of teachers in China, found that although educators generally recognize the importance of Education for Sustainable

Development (ESD), its effective implementation is influenced by institutional support, teacher education, curriculum integration, and the availability of educational resources.

These findings suggest that the institutionalization of sustainability requires not only organizational commitment but also continuous investment in educators' professional development and in pedagogical practices capable of fostering sustainability competencies.

Despite the progress achieved, Fleig *et al*. (2021) emphasize that the effective integration of sustainability remains a slow process, requiring greater collaboration among governments, productive sectors, and educational institutions. The challenge lies not only in incorporating sustainability into official documents and strategic plans, but also in translating these commitments into consistent institutional practices capable of generating measurable impacts.

Main Challenges for Integrating Sustainability into Curricula and Developing Competencies

The integration of sustainability into curricula is one of the most frequently discussed topics in the literature on Education for Sustainable Development (ESD) and higher education. The studies reviewed indicate that integrating sustainability principles into curricula represents one of the most important mechanisms for implementing ESD within universities (Fleig *et al*., 2021; Tozato, 2022; Souza & Ventura, 2024).

However, significant challenges remain. Among the most frequently identified barriers are disciplinary fragmentation and the limited availability of courses specifically focused on sustainability-related issues. Fleig *et al*. (2021), for example, found that Business Administration programs still incorporate relatively little sustainability-oriented content. In contrast, recent studies indicate progress in fields such as Law, where topics related to climate justice, biodiversity conservation, and Environmental Education (EE) have been progressively incorporated into academic curricula.

The literature shows broad consensus that the effectiveness of ESD depends on multidisciplinary, interdisciplinary, and transdisciplinary approaches capable of integrating teaching, research, and extension activities while fostering competencies for addressing complex sustainability challenges (Tozato, 2022; Diniz *et al*., 2024). These competencies include systems thinking, critical reflection, collaborative problem-solving, ethical decision-making, and the ability to act in uncertain and rapidly changing contexts.

Although the 2030 Agenda has strengthened the role of universities in promoting sustainable development, important obstacles remain. These include institutional resistance to curricular reform, insufficient teacher education, the lack of robust evaluation indicators, and difficulties in integrating sustainability across different fields of knowledge (Fleig *et al*., 2021; Souza & Ventura, 2024).

According to Casagrande Junior and Agudelo (2023), one of the main challenges facing higher education is promoting innovation aimed at preparing individuals with complex competencies and professional behaviors grounded in socio-environmental responsibility and good governance practices.

From the perspective of environmental awareness, Principle 19 of the Stockholm Declaration highlights education as a fundamental instrument for balancing the relationship between humanity and nature. This principle is closely related to the concept of sustainable development that emerged during the 1980s, which advocates meeting present needs without compromising the ability of future generations to meet their own needs, while simultaneously respecting the planet's regenerative limits.

At the same time, growing mobilization around the SDGs can be observed within Higher Education Institutions (HEIs). Initiatives related to integrating sustainability into curricula, human rights education, institutional governance, and climate education demonstrate significant progress in implementing the 2030 Agenda within HEIs (United Nations Brazil, 2024; Weirich & Neres, 2025; Carniatto, Pereira, & Gonzalez, 2025).

Overall, the studies reviewed indicate that universities' contribution to sustainability extends far beyond the technical education of professionals. HEIs are increasingly understood as privileged spaces for promoting critical citizenship, social innovation, and socio-environmental transformation. Consequently, they play a fundamental role in advancing Education for Sustainable Development and supporting the achievement of the Sustainable Development Goals.

Final Considerations

The findings of this study demonstrate that Environmental Education (EE), Education for Sustainable Development (ESD), and the 2030 Agenda should not be understood as competing frameworks, but rather as complementary and mutually reinforcing approaches that contribute to advancing sustainability through education. While EE provides the critical and ethical foundations for understanding the relationships between society and nature, ESD broadens this perspective by integrating social, economic, cultural, and institutional dimensions into educational processes. In turn, the 2030 Agenda provides a global framework that aligns educational efforts with internationally recognized sustainability goals.

The analysis also highlights the strategic role of Higher Education Institutions (HEIs) in promoting sustainability transitions. Universities are uniquely positioned to foster systemic change by integrating sustainability principles into teaching, research, extension activities, and institutional governance. As centers of knowledge production and social innovation, they contribute not only to professional education but also to the development of citizens capable of addressing increasingly complex socio-environmental challenges.

At the same time, the study emphasizes that advancing sustainability in higher education requires more than formal commitments and policy and regulatory frameworks. Meaningful progress depends on the capacity of institutions to promote interdisciplinary perspectives, strengthen sustainability competencies, foster critical thinking, and translate global agendas into actions that are relevant to local contexts. In this regard, the institutionalization of ESD represents an important pathway for bridging international sustainability objectives and educational practices.

Finally, sustainability is not merely a technical or management challenge, but also

an educational and societal one. The integration of EE, ESD, and the 2030 Agenda reinforces the transformative potential of education to promote more equitable, resilient, and environmentally responsible societies. By strengthening this integration, universities can contribute significantly to building the knowledge, values, and capacities necessary to promote sustainable futures for present and future generations.

Abbreviations

EE – Environmental Education
ESD – Education for Sustainable Development
PNEA – National Environmental Education Policy
HEI – Higher Education Institution
SD – Sustainable Development
MDGs – Millennium Development Goals
SDGs – Sustainable Development Goals
Rio-92 – United Nations Conference on Environment and Development
UN – United Nations
UNESCO – United Nations Educational, Scientific and Cultural Organization
LDB – National Education Guidelines and Framework Law
NGOs – Non-Governmental Organizations
IPBES – Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
SISNAMA – National Environmental System

DECLARATIONS

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