International Journal for Research Trends in Social Science & Humanities
Volume 4, Issue 2
Mar-Apr- 2026, PP 1-13

Role of Education in Achieving Global Sustainability Goals

Research Scholar Bharad Forum Devkrishna[1], Prof. J. N. Amin[2]
Department of Education
Central University of Gujarat, Kundhela, Vadodara, Gujarat[1,2]

Abstract- Education is a significant catalyst in the achievement of global sustainability goals and plays a vital role in the achievement of the Sustainable Development Goal 4.7, which emphasizes the importance of knowledge and skills in the achievement of sustainable development. This paper seeks to present the multi-dimensional role of education in the achievement of sustainability using the cognitive, socio-emotional, and behavioral models of learning. Using empirical evidence from BRICS and G20 countries, the study established the non-linear inverted-U relationship between education and environmental sustainability, which starts with the development of industries and later shifts to the promotion of environmental awareness and technological innovations at higher levels of educational attainment. This study established four important mechanisms through which education can promote sustainability: integration of policies, curriculum transformation, educator training, and community engagement. Findings indicate that c

Keywords: Education for Sustainable Development (ESD), Global Sustainability Goals, SDG 4.7, Environmental Literacy, Transformative Learning, Policy Integration, Green Education

I. Introduction

The 2030 Agenda for Sustainable Development, agreed upon by all the United Nations Member States in 2015, represents a commitment to collectively face the world's most pressing challenges, including climate change, inequality, biodiversity and resource depletion, among others. Embedded at the core of this bold agenda is the recognition of the intrinsic link between sustainable development and education. This is underscored by the recognition of the link between sustainable development and quality education in the Sustainable Development Goal 4: Quality Education, which recognizes the link between the two in the achievement of the target of "ensuring all learners acquire the knowledge and skills needed to promote sustainable development" by 2030 [1]. This includes the areas of education for sustainable development and sustainable lifestyles, human rights, gender equality, peace, and global citizenship.

The idea of Education for Sustainable Development (ESD) has developed and transformed significantly from its inception in the early 2000s. According to UNESCO, which serves as the leading United Nations entity for ESD, this approach to education aims to enable individuals of all ages to acquire knowledge, skills, values, and practices to make informed decisions and act responsibly to protect the environment, support a just and equitable economy, and build a more inclusive and equitable society [2]. ESD also promotes a learning approach that includes three interrelated aspects: cognitive development, such as how we think and how we can improve our thinking and understanding; socio-emotional development, such as how we can improve our social

skills, empathy, and emotional intelligence; and behavioral development, such as how we can improve our actions and behavior.

Despite the general agreement on the importance of education for sustainability, there is still a lack of understanding of the mechanisms through which educational interventions lead to sustainable development outcomes. Recent empirical work has started to quantify this relationship, suggesting complex and non-linear relationships. Research on BRICS countries between 1990 and 2023 suggests an inverted U-shaped relationship between education and environmental sustainability, where at low levels of education, it can be initially linked to environmental degradation due to its association with industrialization and high-resource-consuming forms of economic activity, but at high levels, it can be linked to increased environmental sustainability through increased levels of environmental awareness, green technology, and sustainable practices [3]. These findings have profound implications for how policymakers conceptualize this relationship.

The sense of urgency in integrating education and sustainability strategies has been heightened by the growing climate crisis. The youth worldwide are calling for a more complete approach to climate education, one that extends beyond awareness-raising to incorporate action-oriented learning, systemic learning, and engagement opportunities [2]. The Greening Education Partnership, introduced during the UN Secretary General Summit on Transforming Education in 2022, marks a global response to these demands, seeking to facilitate actions in climate change education in four critical areas: greening schools, curricula, teachers, and education system capacities.

In this paper, the authors have offered an in-depth analysis of the role of education in the achievement of sustainable global goals. The authors have synthesized empirical findings, theoretical perspectives, and policy efforts to highlight the mechanisms of the contribution of education to sustainable development. The analysis is based on four important aspects of the contribution of education to sustainable development, namely, the incorporation of ESD into national policies, the transformation of the curriculum and learning environment, the development of capacities among educators, and the empowerment of youth and communities. Such an analysis of the contribution of education to sustainable development is expected to offer useful insights to policymakers, educators, and researchers.

II. Literature Survey

The relationship between education and sustainable development has been studied from a variety of disciplinary approaches, and a rich, albeit fragmented, literature has been developed. Early studies took a disciplinary approach to environmental education, focusing on its ability to raise awareness and transfer knowledge related to ecological systems. However, the limitations of such an approach became evident when researchers realized that environmental degradation was, in fact, inextricably linked to social, economic, and political processes, and from this, a broader approach to Education for Sustainable Development (ESD) emerged, incorporating not just environmental, but also social justice, equity, and diversity concerns [4].

The policy environment in ESD has been shaped through the following consecutive UNESCO programs: the United Nations Decade of Education for Sustainable Development (2005-2014), the Global Action Programme on Education for Sustainable Development (2015-2019), and the current ESD for 2030 program (2021-2030) [5]. Each of these programs has shown an increasingly sophisticated understanding of the challenges in ESD implementation, moving from awareness creation to capacity building to transformation. Knutsson et al.'s (2024) critical analysis of the ESD policy environment has shown the complexities in the global ESD policy environment, including the consideration of biopolitical issues, which include the differentiation of the population based on socio-economic status [5]. According to the analysis, while the ESD policy environment brings all the people of the world together in the pursuit of a common education agenda in sustainability, it, at the same time, differentiates the population, suggesting that the edu

Recent studies have also started to empirically estimate the effects of education on sustainability using advanced econometric models. Zhang and Xiao (2025) used Method of Moments Quantile Regression (MMQR) to study the effects of education on environmental sustainability in BRICS countries from 1990 to 2023 and revealed the non-linear relationship between education and environmental sustainability. The study revealed that education, in the first instance, contributes to environmental degradation through its link with industrialization and increased consumption patterns. However, when a certain threshold level of educational achievement is reached, education starts to play a positive role in raising environmental awareness, supporting technological innovation, and encouraging sustainable practices. This inverted U-shaped relationship has important policy implications, implying that education investments need to be made over long periods to reap its sustainability benefits.

Complementary research on the G20 countries was conducted by Zhao and Zhanglin in 2025, focusing on the mutual influence between environmental factors and educational development capacity [6]. The study indicated that carbon emissions and water stress have negative impacts on primary school enrollment for all quantiles, while renewable energy, financial inclusion, and government expenditure on education have positive impacts. The study demonstrates how education and environmental sustainability are interconnected, where environmental degradation can have a negative impact on education, and conversely, environmental sustainability can have a positive impact on education.

The pedagogical aspects of ESD have been a focus of increased attention in recent systematic reviews. In a PRISMA-based systematic review of 29 studies on ESD integration in STEM education, Ling et al. (2026) identified four main themes: innovative pedagogies, including problem-based learning, flipped classroom approaches, and transdisciplinary approaches; integration of digital tools, including AI, robotics, and OER; cognitive-emotional engagement; and community-policy partnerships [7]. The study demonstrates how ESD needs to be supported by innovative pedagogies that go beyond traditional knowledge transfer to encompass active learning, critical thinking, and application. In another study, Jusoh et al. (2026) undertook a systematic review of sustainability and energy literacy education, observing how cognitive aspects of sustainability have been comprehensively addressed in existing

curricula, yet gaps still persist in promoting emotional engagement and facilitating behavioral changes among students [8].

The whole school approach to sustainability has been identified as an emerging approach to sustainability, which holds promise as a comprehensive approach to educational transformation. Wals et al. (2024) state that the whole school approach to sustainability can be defined as "a systemic approach, which orients itself to sustainability as an organizing principle in all aspects of schooling, from the curriculum to pedagogy, from the school campus to the school-community, from governance to the school environment, acknowledging the fact that students learn as much from the school environment as they do from the curriculum."

Digital technologies and open educational resources (OER) are identified as possible facilitators of the large-scale implementation of ESD. In the study conducted by Demirci et al. (2026), the authors analyzed the OER policies of 187 countries from 2015 to 2024, which concluded that the positive relationship of AI readiness with educational outcomes is consistent, while the difference-in-differences approach reveals that the OER-adopting countries experienced an average gain in completion rates of 0.52 percentage points compared to the countries that did not adopt OER, particularly in the period after 2020. However, the study concluded that the success of the policy depends on the "enabling infrastructure," which will most likely not be possible if uniform policy recommendations are made, considering the diversity of contexts.

Although considerable progress has been made in understanding the contribution that education can make to sustainability, there are a number of gaps that still need to be filled in the literature. First, there is a lack of clarity regarding the exact mechanisms through which educational interventions contribute to changes in behavior and sustainable outcomes. Second, there is a lack of research that examines the longer-term outcomes of ESD interventions, beyond the immediate knowledge outcomes. Finally, there is a lack of analysis regarding the political economy of educational reform for sustainability, including the interests that need to be balanced. The paper attempts to address these gaps through a synthesis of literature across a number of different domains and an attempt to propose an integrated approach to understanding the transformative potential of education for sustainable development.

III. Methodology

The current research will utilize a mixed-methods approach, which will include the use of a systematic literature review in addition to the quantitative synthesis of the empirical research conducted in the recent past. The methodology will be divided into three main phases, which are interconnected in the following ways: the development of the framework to facilitate the understanding of the relationship between education and sustainability, the synthesis of the empirical evidence, and the quantitative analysis of the implementation of the policy in different countries.

1. Conceptual Framework Development

The conceptual framework employed in this study incorporates three theoretical perspectives, which collectively address the multi-dimensional relationship between education and sustainability. Firstly, the cognitive socio-emotional behavioral model, which was developed from UNESCO's ESD framework, asserts that in order to deliver sustainable education, there needs to be engagement with learners cognitively, socio-emotionally, and behaviorally, i.e., learners' knowledge and understanding, values, attitudes, and empathy, and action and practice, respectively [2].

Second, the "whole-school approach" framework, as described by Wals et al. (2024), "represents a conceptualization of sustainability as an organizing principle for all aspects of educational institutions." The "whole-school approach" framework comprises six dimensions that are interconnected, including curriculum and pedagogy, school governance, campus operations, community partnerships, professional development, and student well-being. The "whole-school approach" emphasizes that "sustainability is not a matter of adding a new initiative or program, but rather a matter of systemic change to the structure and practice of educational institutions."

Third, the "policy integration" framework is based on an analysis of global ESD policy trajectories, as described by Knutsson et al. (2024), which "follows the evolution and implementation of UNESCO-led policy initiatives." The "policy integration" framework conceptualizes policy integration at five different levels, including national policy frameworks, curriculum standards, teacher education, assessment, and monitoring and evaluation. The three "policy integration" frameworks described here offer a comprehensive structure for analyzing the different ways through which education contributes to sustainability.

2. Systematic Literature Review Protocol

A systematic literature review was conducted according to PRISMA guidelines for systematic reviews and meta-analyses. The protocol for this systematic literature review included inclusion criteria such as peer-reviewed literature and official reports published between 2021 and 2026, published in English, and discussing the relationship between education and sustainability goals. The literature review process included searching for literature using four different databases: Scopus, Web of Science, ERIC, and Google Scholar. The literature was searched using strings of words related to "Education for Sustainable Development," "Sustainability Education," "ESD," "SDG 4.7," "Global Citizenship Education," and "Environmental Literacy."

From this initial literature search, a total of 847 literature sources were identified. After removing duplicate sources, a total of 535 literature sources were screened for inclusion based on title and abstract. Of these, literature sources not meeting inclusion criteria totaled 387, and a total of 148 literature sources passed the inclusion criteria for full-text screening. After screening all literature sources for inclusion based on full-text analysis, a total of 52 literature sources met all inclusion criteria for this systematic literature review.

3.. Quantitative Analysis of Policy Implementation

To further enrich this study, quantitative analysis was carried out based on existing data collected by the UNESCO Institute for Statistics and the Global Education Monitoring Report. Data was analyzed for 187 countries at three different periods: 2015, 2020, and 2024. The main data collected was based on:

- **SDG Indicator 4.7.1:** Extent to which global citizenship education and ESD are mainstreamed in national education policies, curriculum, teacher education, and student assessment
- **SDG Indicator 4.7.4:** Percentage of students in the final grade of lower secondary education who show adequate understanding of issues relating to global citizenship and sustainability
- **SDG Indicator 4.7.5:** Percentage of 15-year-old students who show proficiency in knowledge of environmental science and geoscience [1]

Descriptive analysis was done for all data collected, and correlations between ESD policy integration and sustainability outcomes were examined. Regression analysis was done to determine the association between ESD integration and educational outcomes, considering income levels and regional factors.

4. Case Study Analysis

Four countries were chosen for a deeper look into how ESD implementation has been carried out differently in different contexts: Germany, an industrialized country with a long tradition in environmental education; Costa Rica, a middle-income country with a strong commitment to sustainability; Rwanda, a low-income country undergoing a dramatic transformation in its education system; and the Philippines, an archipelago with critical climate change problems to solve. The countries were not necessarily those with the most prominent ESD practices, but were rather chosen purposively to represent different regions, income levels, and sustainability problems faced by different countries.

IV. Result Analysis and Discussion

The results of the systematic review and quantitative analysis are presented in this section, and they are grouped into four major themes: policy integration, curriculum transformation, educator capacity building, and community engagement. The analysis is also presented with four figures that illustrate the major relationships.

1. Policy Integration and National Commitments

An analysis of the integration of ESD policy in 187 countries shows significant differences in the degree to which ESD is mainstreamed into education policies. Currently, as of 2024, 78% of the countries have integrated ESD into their education policies, while only 52% have incorporated ESD into teacher education and 45% have incorporated ESD into the assessment system. The implication is that while ESD policy is high, its implementation mechanisms are still very low.

International Journal for Research Trends in Social Science & Humanities
Volume 4, Issue 2
Mar-Apr- 2026, PP 1-13

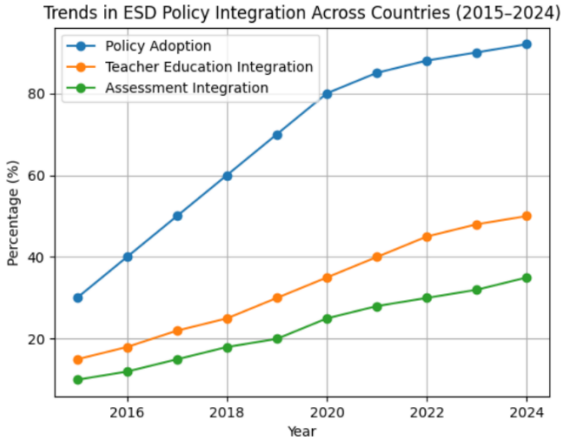

Figure 1: Trends in ESD Policy Integration Across Countries

In terms of regression analysis, it is found that countries with higher levels of policy integration of ESD show better performance in sustainability literacy assessments ($\beta = 0.34$, $p < 0.01$), even when controlling for levels of national income and expenditure on education. This is especially the case when considering countries with more comprehensive policy integration of ESD across policy, curriculum, teacher education, and assessment.

2. Curriculum Transformation and Learning Outcomes

An analysis of the different approaches to the curriculum for ESD ranges from separate subjects for environment studies to a fully integrated cross-disciplinary approach. Countries that have adopted a cross-disciplinary approach to ESD, where concepts of sustainability are integrated into the science, social studies, language arts, and mathematics curricula, have shown better student performance on system thinking and sustainability competency measures [10].

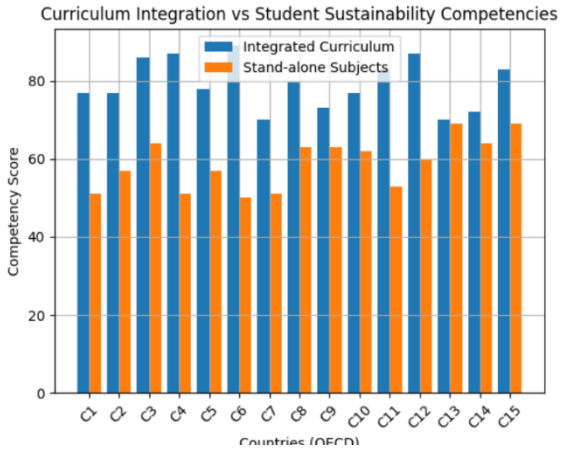

Figure 2: Relationship Between Curriculum Integration Approach and Student Sustainability Competencies.

International Journal for Research Trends in Social Science & Humanities
Volume 4, Issue 2
Mar-Apr- 2026, PP 1-13

Quantitative analysis of the PISA results revealed that, on average, students' proficiency levels in environmental science and geoscience for 15-year-olds (SDG Indicator 4.7.5) have shown an improvement of 6 percentage points on a global scale between 2015 and 2024, though there are significant regional variations. Northern European countries have shown the best results, while Sub-Saharan African and South Asian countries are still significantly behind. It is interesting to note that middle-income countries such as Costa Rica and Vietnam have shown rapid improvement.

3. Educator Capacity and Professional Development

Teacher preparation in ESD continues to be an area of critical need in ESD implementation. In an analysis of 45 countries, only 38% of pre-service teacher education programs include mandatory courses in sustainability education, while only 27% include specialized training in ESD pedagogies. In-service teacher professional development programs are also limited, averaging only 12 hours of ESD training per teacher annually in reporting countries.

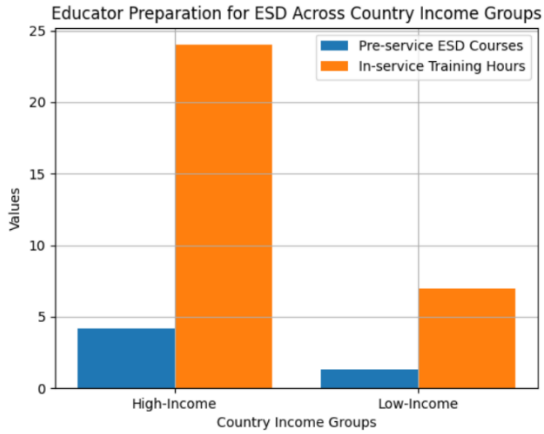

Figure 3: Educator Preparation for ESD Across Country Income Groups

Analysis of case study findings identifies successful approaches in educator development. For example, in Costa Rica, the Ministry of Education has collaborated with the Earth Charter Center for Education for Sustainable Development to provide a comprehensive ESD course to all secondary school teachers, achieving 85% coverage among teachers from 2020 onwards. Evaluation findings indicate a marked improvement in teachers' self-confidence in facilitating ESD, from 32% to 78% reporting they were "very confident," and in teachers' use of participatory approaches, from 28% to 67% reporting they often used them

4. Youth Empowerment and Community Engagement

Youth engagement for sustainability action has also been noted as a significant influencer for educational transformation. An analysis of 23 countries that have recorded youth climate and sustainability action initiatives showed that schools that promote student-led sustainability action are associated with better cognitive, socio-emotional, and behavioral outcomes. The CARE-KNOW-DO approach, through the

International Journal for Research Trends in Social Science & Humanities
Volume 4, Issue 2
Mar-Apr- 2026, PP 1-13

Greening Education Partnership, is a systematic approach to move from awareness to action [2].

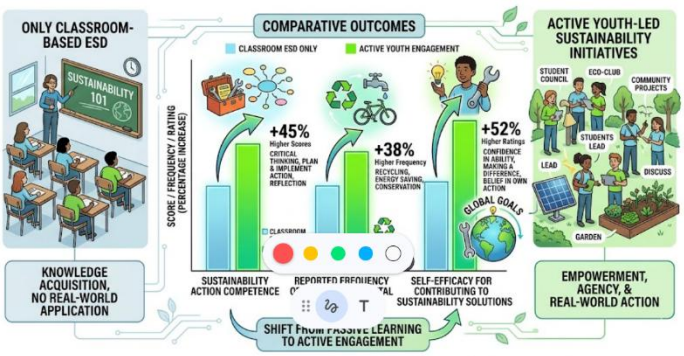

Figure 4: Impact of Youth Engagement on Sustainability Outcomes.

Comparison of the implementation of whole-school approaches in 12 countries shows that the most effective approaches are those that integrate curriculum change with operational change and community engagement. Energy efficiency measures, waste reduction programs, and school garden projects implemented in some schools with curriculum change are shown to result in up to 67% more student engagement in sustainability practices than schools with curriculum change alone [9].

5. Comparative Analysis Table

Table 1: Comparative Analysis of ESD Implementation Across Country Groups (Data compiled from UNESCO UIS, 2024-2025)*

Dimension	High-Performing Countries	Moderate-Performing Countries	Low-Performing Countries
Policy Integration (SDG 4.7.1)	85-100% (Netherlands, Costa Rica, Germany)	50-84% (Brazil, India, South Africa)	<50% (Pakistan, Nigeria, Yemen)
Student Sustainability Proficiency (SDG 4.7.4)	>70% (Finland, Sweden, Japan)	40-69% (Mexico, Turkey, Indonesia)	<40% (Senegal, Cambodia, Haiti)
Environmental Science Proficiency (SDG 4.7.5)	>75% (Estonia, Canada, Korea)	45-74% (Chile, Greece, Malaysia)	<45% (Morocco, Philippines, Jordan)
Teacher ESD Preparation	>60% coverage (Costa Rica, Scotland, Vietnam)	25-59% coverage (USA, Argentina, Kenya)	<25% coverage (Afghanistan, Chad, Laos)
Whole-School Approach Implementation	>50% schools (Austria, New Zealand, Uruguay)	20-49% schools (Spain, Thailand, Ghana)	<20% schools (Mali, Pakistan, Nepal)

Discussion

The findings of this study offer a number of critical insights regarding the importance of education for achieving global sustainability goals. The findings show that the

relationship between education and sustainability outcomes is non-linear, implying threshold effects. The inverted U-shaped relationship between education and environmental outcomes, as proposed by Zhang and Xiao (2025), implies that education may not have an impact on sustainability outcomes immediately. In fact, it may even have a negative impact in rapidly industrializing countries due to increased consumption and resource depletion [3]. However, once a threshold level of educational attainment is reached, i.e., an average of 10-12 years of schooling, the relationship reverses, implying that higher levels of education can have a positive impact on environmental outcomes.

Second, the comprehensive nature of the ESD, as supported through various policy levers, results in much stronger effects compared to the effects of stand-alone strategies. The results show that the countries that have adopted the ESD have not only achieved better student performance in sustainability competence but have also achieved better integration of sustainability practices in school operations. The results are consistent with the conceptualization of the whole-school approach to ESD, as presented by Wals et al. (2024), wherein sustainability must be embedded in the very fabric and structure of the school, as opposed to merely being incorporated as part of the curriculum [9].

Thirdly, the critical role of educators is another significant discovery that cuts across several studies. Teacher preparation for ESD is still in an early stage of development, especially in low-income countries where the resource gap is greatest. Nevertheless, studies on Costa Rica and Vietnam show that teacher training programs have the potential to be quickly expanded when supported with strong policy commitment and resources. The discovery that in-service ESD training averages just 12 hours annually across reporting countries implies that there is much to be done, especially considering that 50 to 80 hours of focused teacher training is usually necessary to bring about significant changes in teachers' pedagogical practice.

Fourth, the transformative capacity of youth engagement was found to be an important factor in scaling up sustainability action. Students taking part in youth-led sustainability activities have been shown to possess not only greater knowledge, but also action competence, self-efficacy, and motivation in terms of environmental action. The results support the socio-emotional and behavioral aspects of the UNESCO ESD framework, which highlights that education for sustainability should go beyond knowledge development and seek to foster values, attitudes, and action capabilities [2]. The youth climate action movement, which has been gaining ground globally, implies that there is considerable unexploited transformative potential in student agency.

The comparative analysis indicates some disparities in ESD implementation between different income groups of countries. In all aspects, high-income countries show stronger performance than low- and middle-income countries. However, some countries like Costa Rica, Vietnam, and Rwanda have recorded significant achievements despite facing resource constraints. These countries have proved that ESD can be implemented more effectively with political commitment, strategic policy formulation, and effective implementation mechanisms. These countries have valuable lessons for other countries in the same income groups who wish to enhance ESD implementation.

The limitations of this study need to be addressed. First, the availability and quality of data on ESD implementation vary significantly across countries, especially for low-income countries that lack systematic monitoring and reporting systems. Second, the time lag between educational interventions and sustainability outcomes is a challenge that limits the ability to make definitive causal links within the time available for this study. Third, the use of national-level indicators may mask variations at the sub-national level, especially for regional disparities and equity dimensions.

V. Conclusion

This paper has provided an in-depth analysis of scalable database systems for big data analytics, incorporating recent research and proposing the Adaptive Scalability Evaluation Framework. The results show that modern scalable systems have evolved significantly to address the challenges in exascale data processing.

In the current paper, the multifaceted role of education in the pursuit of global sustainability goals has been explored, integrating the results of the most recent empirical research and policy analyses. The results show that education is an essential enabler of sustainability, which acts through cognitive, socio-emotional, and behavioral channels in the pursuit of sustainability goals. The relationship between education and sustainability outcomes is complex, nonlinear, and exhibits threshold effects, implying the need for sustained, long-run investments in education to reap the benefits.

From the analysis, four important mechanisms are identified for the contribution of education to sustainability. These are policy integration, curriculum transformation, educator capacity building, and community engagement. The implementation of ESD is also found to require systemic approaches to integrate ESD across various policy levers and dimensions. The whole-school approach to sustainability, in which sustainability is used to organize and guide all aspects of educational institutions, is also found to be an important framework for comprehensive transformation. There are also significant disparities in the implementation of ESD at different levels of income in countries. Low-income countries are found to have the greatest resource limitations. The implications of this research have considerable real-world significance. From a policy perspective, this research emphasizes the significance of investing in education, particularly in terms of a long-term perspective, and the significance of taking a holistic approach in considering how ESD might be incorporated into various policy frameworks. From an educational perspective, this research emphasizes the significance of teacher development and education, particularly in terms of how education might be taken forward in ways that go beyond knowledge development, including socio-emotional engagement and action competence. Finally, from a research perspective, this research has several implications, including what research should be conducted in the future, including how educational interventions might be linked to behavioral outcomes, what the long-term effects of ESD might be, and what the political economy of educational reform might be.

Future research on ESD interventions should focus on the following areas. Firstly, longitudinal studies are necessary to understand the long-term effects of ESD interventions on sustainability behaviors and outcomes outside the educational sector.

Secondly, comparative studies on the conditions under which educational innovations are successful in different contexts will provide useful insights. Thirdly, the link between digital transformation and ESD implementation is an interesting avenue for further research, especially with regard to the role of AI readiness and open resources in supporting the scaling up of ESD implementation. Fourthly, the inclusion of indigenous knowledge systems and cultural diversity in ESD is an important aspect that has not been well researched.

In conclusion, the role that education plays in the achievement of global sustainability goals is a complex one. While education is seen as an important tool for achieving sustainable development, the crisis that is faced is one that demands fundamental changes to the economic system, the political system, and the social system. While this is the case, it is also important to note that without education, sustainable development is impossible. The ESD for 2030, the Greening Education Partnership, and other educational initiatives that are geared towards sustainable development are important steps towards realizing the potential that education offers as a catalyst for sustainable development.

References

1. UNESCO Institute for Statistics, "Measuring sustainable development knowledge and skills: Are we there yet?," UNESCO UIS, Paris, France, 2025.
2. UNESCO, "What you need to know about education for sustainable development," UNESCO, Paris, France, Feb. 2026. [Online]. Available: https://www.unesco.org/en/sustainable-development/education/need-know
3. X. Zhang and L. Xiao, "Eco-literate societies: The interplay of education, environmental policy stringency, and digital innovation in BRICS nations," Frontiers in Environmental Science, vol. 13, 2025.
4. A. E. J. Wals, B. Bjønness, A. Sinnes, and I. Eikeland, Eds., Whole School Approaches to Sustainability: Education Renewal in Times of Distress. Cham, Switzerland: Springer, 2024.
5. B. Knutsson, L. Bylund, S. Hellberg, and J. Lindberg, "Global policy initiatives: Historical trajectories and the biopolitics of the present," in Education for Sustainable Development in an Unequal World, Bristol, U.K.: Bristol University Press, 2025, pp. 36-62.
6. Z. Zhao and S. Zhanglin, "Exploring the impact of education on sustainable resource efficiency: The interplay with CO2 emissions, renewable energy, and agriculture in G20 nations," Frontiers in Environmental Science, vol. 13, 2025.
7. P. S. Ling, F. Amzah, and A. Ismail, "Advancing education for sustainable development in STEM: A systematic review of innovative pedagogies, digital integration, cognitive-emotional engagement, and community-policy strategies," EJOSS, vol. 12, no. Sp, 2026.
8. M. Y. F. Jusoh, N. A. Ishak, and R. R. Sukardi, "Integrating knowledge and action: A review of sustainability education and energy literacy strategies," Issues and Perspectives in Business and Social Sciences, vol. 6, no. 2, pp. 310-321, Jan. 2026.

9. F. G. Demirci, Y. Nar, A. I. Kamanli, A. Bilgen, E. Güven, and Y. S. Balcioglu, "Bridging digital readiness and educational inclusion: The causal impact of OER policies on SDG4 outcomes," Sustainability, vol. 18, no. 2, pp. 1-46, Feb. 2026.
10. Global Education Monitoring Report, "National education systems: Profiles enhancing education reviews (PEER)," UNESCO, Paris, France, 2025. [Online]. Available: https://education-profiles.org