

The Modern Developments in Education for Sustainable Development

Bosco Ekka¹, Dr. G. Albin Joseph²

¹Research Scholar, Social Work Department, Assam University, Silchar

²Assistant Professor, Social Work Department, Assam University, Silchar

Abstract:

ESD has emerged as a crucial instrument for addressing the sustainability crisis and transforming societies toward a more sustainable future. This article examines the current trends in ESD, concentrating on its role in challenging existing power structures, promoting democratic participation, and empowering students to analyze and transform society critically. It emphasizes the need for a transformational approach that combines critical analysis with a systems or relational approach, recognizing the social and environmental boundaries of society. As part of the SDGs, the article also discusses the advancement made in global educational rates and the emphasis on reducing inequalities in education. In addition, it addresses the pressing need for transformative learning and education to create solutions and empower individuals during the transition to more sustainable and equitable societies. The evaluation emphasizes education as a catalyst for SD and calls for a system of teaching that prepares students to adjust lifestyle and socioeconomic models. The article discusses current trends in and the necessity of incorporating sustainability into education in order to address current issues.

Keywords: Sustainable, Development, Education, SDGs, Modern

I. Introduction

ESD is a popular way to deal with environmental problems around the world. The UN's 2015 Global Action Programme (GAP) has moved ESD forward around the world. ESD is a way of teaching that looks at environmental, social, and economic sustainability from different angles (Vaughter et al., 2021).

The importance of education in promoting transformational change and challenging existing power structures has been widely discussed in relation to SD. Moreover to give students the information, abilities, and attitudes required for sustainable living, ESD aims to promote critical thinking, empower people, and encourage democratic and equitable involvement in society. ESD aspires to build a more sustainable future by incorporating sustainability ideas into various educational levels and disciplines (Kioupi & Nikolaos Voulvoulis, 2022).

The pursuit of sustainable development has taken on essential importance in light of the pressing need to solve environmental catastrophes and socioeconomic imbalances. Education helps create sustainable communities by promoting ecological resilience, social justice, and economic viability. It enables people to evaluate established worldviews, beliefs, and systems critically, resulting in societal reform (Varela-Losada et al., 2022).

This review paper examines contemporary education for sustainable development advancements. Researchers look at the main initiatives, problems, and possibilities related to adopting ESD in various

contexts and at various educational levels. It examines the data using research and intellectual perspectives. Researchers examine how ESD has affected student results, institutional procedures, and larger social changes by drawing on research and academic views. Researchers also discuss how ESD fits into the UN SDGs and analyze new concepts and successful ESD implementation strategies.

This review article seeks to advance knowledge of the function that ESD plays in promoting sustainable societies by offering an extensive overview of current ESD trends. Researchers want to enlighten educators, politicians, and stakeholders on the significance of ESD and motivate meaningful actions toward a more sustainable future by looking at global views, research findings, and real-world experiences.

A. Overview of the sustainability crisis and the need for urgent action

II.ESD: Challenges and Criticisms

A. Critiques of the effectiveness of education in addressing sustainability issues

Numerous studies and articles contain critiques of the efficacy of education in addressing issues of sustainability. One criticism urges education for sustainable development (ESD) to go beyond information acquisition and create competences that allow people to act on sustainability issues. The integrated nature of sustainability issues necessitates that citizens not only possess knowledge but also the skills and abilities necessary to address complex problems. An essential area of study is the efficacy of education in fostering action competence for sustainability (Olsson et al., 2022).

Despite global commitment to ESD, little is known about its implementation in classrooms and its consequences on student outcomes. ESD initiatives must be evaluated to determine their influence on students' knowledge, attitudes, and behaviors on SD (Jelle Boeve-de Pauw et al., 2015).

Education for sustainability implementation and government assistance are difficult. Opportunities exist. NGOs and activists have helped influence legislation, educate educators, and raise awareness (Development Education Review, 2014).

A scientometric survey of academic research on Sustainable Development Goals (SDGs) shows a large corpus, notably in ecological and sustainable sciences. Nonetheless, the analysis exposes extant research deficiencies and the need for a more in-depth comprehension of the effectiveness of interventions in addressing sustainability challenges (Sianes et al., 2022).

To increase the effectiveness of education in addressing sustainability issues, it is crucial to go beyond knowledge dissemination and incorporate action-oriented approaches, fill research gaps, and strengthen the evidence base. To better understand the impact of education on sustainability outcomes and to inform policy and practice in this area, additional research and evaluation are required.

B. Different perspectives on educational orientations and their relevance to ESD

Based on the provided references, various perspectives on educational orientations and their relevance to ESD can be examined. ESD improves primary and secondary education, according to international studies. Sustainability material transforms all teaching and learning. ESD pedagogies foster sustainable society skills, views, and values (Laurie, 2016).

Due to climate change, loss of natural resources, pollution, and food shortages, ESD has garnered attention. The Brundtland Commission defines sustainable development as addressing existing requirements without sacrificing future needs. ESD integrates economic, social, and environmental factors to promote sustainable societies, behaviors, and economies (Grosbeck et al., 2019).

Citizen science, which involves public participation in scientific research, has emerged as a valuable instrument for improving environmental science education and promoting conservation. By participating in citizen science initiatives, individuals gain a deeper understanding of scientific processes and contribute to scientific knowledge, which is consistent with ESD's objectives. Citizen science may help people understand science and take action for sustainable development (Elizabeth & Batchelder, 2020).

ESD in Science Education: Science education is essential to the implementation of ESD. Students can develop a deeper understanding of sustainability issues and the interrelationships between economic, social, and environmental factors by integrating ESD into science education. Involving government agencies, professional associations, teachers' conferences, and the community in science education efforts can assure the effective execution of ESD in science education (Berry et al., 2022).

ESD School Leadership School leadership is crucial to ESD implementation. Despite scant data, effective leadership may help schools adopt more sustainable thinking, working, and living. School leaders can foster a supportive environment, offer instructors opportunities for professional development, and integrate ESD into school policies and practices (Ulrich Müller et al., 2021).

These perspectives emphasize the significance of ESD in promoting quality education, confronting environmental challenges, encouraging citizen scientific participation, integrating sustainability into science education, and spurring ESD execution at the graduate school level.

III. Interconnectedness and relevance of the SDGs in addressing environmental, social, and economic problems

In 2015, the UN came up with 17 interconnected SDGs to deal with environmental, social, and economic problems around the world. SD by 2030 means getting rid of poverty, giving everyone a good education, taking action on climate change, and using and making things in a responsible way is directed (Wong, 2021).

SDGs are interrelated because these goals are interdependent and mutually reinforcing. Progress in one goal often helps achieve others. Poverty reduction may improve hunger, health, and education. Climate change action (Goal 13) can boost renewable energy (Goal 7), sustainable cities (Goal 11), and underwater life (Goal 14).

SDG applicability is essential for solving environmental, social, and economic challenges. SDGs target several sustainability elements to solve interrelated concerns. They understand that social growth, economic development, and environmental conservation are interdependent and must be achieved together (Jörn P. W. Scharlemann et al., 2020).

Several measures and indices track SDG development. These tools examine objective-implementation dependencies. One reference index is the UN Secretary-General's SDG Progress report (Reyers & Selig, 2020). Research journals like Nature underline the interdependence of the SDGs and the necessity for transformative modification to reverse the loss of life on Earth and achieve SD (Matthias Winfried Kleespies & Paul Wilhelm Dierkes, 2022).

The 2030 Agenda for SD, which includes the SDGs, guides Member States' inclusive, people-centered, and sustainable development. It recognizes the need of ending poverty, fostering gender equality, and protecting the environment, among other challenges (Social Development for Sustainable Development | DISD, 2015).

The SDGs provide an interconnected and relevant framework for addressing environmental,

social, and economic issues. By recognizing the interdependencies between diverse objectives and promoting an integrated approach, the SDGs provide an all-encompassing path to sustainable development.

IV. Trends and Innovations in ESD

A. Realistic learning and its potential for transforming mindsets

Experiential learning promotes hands-on learning. It involves actively engaging learners in real-world situations so that they can acquire knowledge, skills, and attitudes by ruminating on and making sense of their experiences. Experiential learning is grounded on the idea that learning integrates cognitive, emotional, and psychomotor domains.

William James, John Dewey, Kurt Lewin, Jean Piaget, Lev Vygotsky, Carl Jung, Paulo Freire, and Carl Rogers established the Experiential Learning Theory (ELT), which emphasizes experience in learning. ELT considers learning as dynamic and driven by the resolution of action/reflection and experience/abstraction. Learning is the basic human adaptation process, and it involves the complete person (Kolb & Kolb, 2012).

Kolb's Learning Cycle, also called the experiential learning cycle, has four stages: concrete experience, thoughtful observation, abstract conceptualization, and active study. This cycle puts an emphasis on actively responding to events, thinking about them, getting abstract ideas from them, and then bringing those ideas to new situations (Kolb & Kolb, 2012).

Experiential learning's potential rests in its capacity to alter perspectives by fostering in-depth learning, critical thinking, and the development of practical skills. Engaging students in authentic, hands-on experiences enables them to bridge the divide between theory and practice, nurturing a deeper understanding of concepts and their application in the real world (Chiu, 2019). Experiential learning helps students take charge of their education and develop a lifelong learning mindset. It can increase student motivation, engagement, and satisfaction with the learning process, resulting in enhanced learning outcomes (Kong, 2021).

In addition, experiential learning has the potential to alter perspectives by challenging preexisting beliefs and assumptions. Through exposure to new experiences and perspectives, students are prompted to contemplate their preconceived conceptions, thereby broadening their worldview and fostering a more open and adaptable mindset. This transformative aspect of experiential learning can have long-lasting effects on students, influencing their attitudes, values, and behaviours (Kolb & Kolb, 2012).

Experiential learning, in conclusion, is an educational approach that emphasizes learning through direct experience. It promotes in-depth study, critical thinking, practical skills, and a lifelong learning mentality. Experiential learning can broaden learners' perspectives and nurture personal and intellectual development by exposing them to authentic experiences and challenging their existing beliefs.

B. Amalgamation of sustainability skills into the curriculum

Sustainability, environmental awareness, and social responsibility should be part of the curriculum. Educational institutions teach students to tackle global problems and build a sustainable future. Sustainability skills are taught because environmental and social challenges must be addressed. Climate change, resource depletion, and social pressures have forced educational institutions to promote sustainability instruction. This integration intends to prepare students to comprehend and address complex sustainability challenges while cultivating a sense of responsibility and stewardship

(Ramakrishna, 2021).

Creating a curriculum that incorporates sustainability skills requires a trans-disciplinary approach to curriculum development. It necessitates aligning educational objectives with principles of sustainability and integrating sustainability concepts across disciplines. This strategy ensures that students acquire a comprehensive comprehension of sustainability issues and are able to implement sustainable practices in their respective professions (Matthias Thürer et al., 2018).

Many universities have begun to offer courses and programs that are specifically focused on sustainability. The topics covered in these courses include sustainable development, environmental science, renewable energy, sustainable business practices, and social responsibility (Matthias Thürer et al., 2018). Universities integrate sustainability into the curriculum to help students understand and master sustainability issues (Ramakrishna, 2021).

Interdisciplinary and Experiential Learning: Universities are emphasizing interdisciplinary and experiential learning approaches to effectively integrate sustainability skills. This enables students to investigate sustainability from multiple perspectives and engage in problem-solving activities in the real world. Utilizing project-based learning, fieldwork, apprenticeships, and community engagement initiatives, sustainability competencies are fostered through practical experiences (Mariem Fekih Zguir et al., 2022).

Transformative Mindset and Skills: Sustainability skills encourage critical thinking, informed decision-making, and sustainable growth in pupils. Systems thinking, teamwork, creativity, and problem-solving help students tackle sustainability issues in their personal and professional life (Cagatay Tasdemir & Gazo, 2020).

In conclusion, integrating sustainability skills into the curriculum requires aligning educational objectives with sustainability principles, providing specialized courses and programs, employing interdisciplinary and experiential learning approaches, and cultivating a transformative mindset in students. This integration helps students understand, confront, and solve global environmental issues.

C. Institutions of higher education promoting sustainability

Higher education schools are very important in supporting sustainability because they use concepts of sustainable development in many parts of how they run. Higher education institutions are urged to put promoting sustainable development ahead of turning knowledge creation and learning into commodities and focusing solely on economic efficiency and optimization. The success of global society rests on people having skills that help the world and people staying healthy (Bauer et al., 2021).

Higher education institutions educate future leaders who will contribute to the attainment of the UN Sustainable Development Goals (SDGs). They affect how individuals conduct and what they can do to better the world (alnien & Paulo, 2021).

Universities integrate sustainability into teaching, research, management, and information exchange. This involves incorporating sustainability into the curriculum, creating a culture of sustainability, and supporting collaborative research to influence people's views on sustainability (Žalėnienė & Paulo, 2021).

Sustainability Governance: Sustainability Governance is a very important part of how higher education institutions work. Sustainability governance works best when effective strategies, policies, and practices are put in place to make sure that sustainability is integrated and promoted throughout the organization. There has been some progress in this area, but there are still problems and pushback (Bauer

et al., 2021).

Globally, schools and universities have incorporated SD into their operations, curriculum, and societies for decades. (Walter Leal Filho et al., 2019) The Higher Education Sustainability Initiative (HESI) of UNESCO assists schools and universities in meeting the UN SDGs globally.

D. Overcoming challenges in the political economy of ESD

Multiple elements and change-promoting techniques are needed to overcome political economics of ESD barriers. Political, economic, and social variables affect educational institutions and their viability. Understanding sustainability Understanding sustainable development's complexity is vital. Education should reflect these interwoven environmental, social, and economic aspects of SD (ESD, 2022).

Educators perform a crucial part in promoting sustainable development through the transformation of their educational practices. Professional development programs should provide teachers the information, skills, and pedagogical methods to integrate sustainability themes into a range of subjects and educational levels (Katrien Van Poeck et al., 2019).

Ethical and political awareness should be promoted via sustainable development education. This includes fostering critical thinking, ethical reasoning, and civic engagement among students in order to empower them to shape sustainable societies as active citizens. Educators can facilitate discussions and debates regarding the political and ethical challenges associated with sustainability (Katrien Van Poeck et al., 2019).

Incorporating evidence-based policy: Education policies related to sustainable development should be informed by scientific evidence and research. There should be monitoring and evaluation systems in place to assess the efficacy of policies and interventions in attaining sustainable development objectives (Biermann et al., 2022).

Sustainable development concerns are global, thus international cooperation and information sharing are essential. UNESCO's policy guidelines, best practices, and international collaborations promote education for sustainable development (ESD, 2022).

Effective monitoring systems are required to trace progress towards education's sustainable development objectives. This includes enrollment rates, learning outcomes, gender equality, and the incorporation of underrepresented groups. Regular monitoring helps identify gaps and obstacles, enabling adjustments and interventions to be made in a timely manner.

Addressing these constraints and following the above solutions will enhance the political economy of ESD and promote a additional sustainable future.

V. Conclusion

A. Summary of the current trends in ESD

ESD is a crucial response to the world's urgent environmental and social problems. It seeks to effect personal and societal change in order to resolve climate change, biodiversity loss, inequality, and unsustainable practices. The need for transformative learning approaches that go beyond imparting knowledge and skills is becoming increasingly apparent. The goal of transformative learning is to equip individuals with the ability to critically analyze the fundamental causes of unsustainability and to develop values, attitudes, and behaviours that promote SD (Varela-Losada et al., 2022).

SD education must integrate environmental, social, and economic factors. It emphasizes the interconnection of these elements to foster systems-thinking problem-solving (Education for Sustainable

Development, 2022).

Quality education with substantial learning results is as important as access to school. Education for sustainable development ensures equal educational opportunities for everyone. It emphasizes tackling inequities and supporting inclusive education (Education Statistics - UNICEF Data, 2023). Curriculum, teaching, and assessment are being integrated with sustainable development ideas. Media, collaborations, and non-formal education initiatives increase ESD (ESD, 2022).

Global advocacy and cooperation: UNESCO is crucial to global education for sustainable development advocacy. It offers policy direction, technical support, and information exchange to member states and encourages cooperation and innovation in sustainability (ESD, 2022).

These events show how important education for sustainable development is for fixing hard problems and making the future more stable and fair.

B. Importance of continued research and collaboration to advance sustainable education practices

Research and collaboration must continue to advance sustainable education practices. Sustainable education promotes ecologically, economically, and socially sustainable methods while providing inclusive, equitable, and high-quality education.

Research is essential to the advancement of sustainable education practices. It helps us comprehend what sustainable education entails and how it can be implemented effectively. Effective pedagogies, curriculum development, assessment methods, and policies that promote sustainability in education are illuminated by research. In addition, it allows us to evaluate the efficacy of sustainable education initiatives and identify areas for enhancement. Research contributes to education's sustainable development objectives (Rose & Todd, 2023).

Equally essential to the advancement of sustainable education practices is collaboration. Universities and educational institutions may share ideas, experiences, and best practices across cultures and geographies via transnational partnership (Caniglia et al., 2017). It enables a global perspective on sustainability issues by facilitating the comparison, transfer, and adaptation of lessons learned. Capacity building, knowledge transfer, and the design of effective responses to local sustainability challenges can be supported by collaborative initiatives and partnerships between institutions. Collaboration also facilitates innovation by bringing together diverse expertise and perspectives, resulting in inventive approaches to sustainable education (Wright et al., 2022).

Continued research and collaboration reinforce one another. Research provides the basis for informed collaboration, whereas collaboration facilitates the implementation and dissemination of research results (Bendtsen et al., 2021). Collaborative research initiatives permit the incorporation of intercultural dimensions, interdisciplinary approaches, and the participation of multiple stakeholders, such as educators, researchers, and policymakers. Researchers and practitioners can advance sustainable education by co-creating knowledge, sharing resources, and engaging in transformative learning experiences through collaboration (Howell, 2021).

For the advancement of sustainable education practices, sustained research and collaboration are indispensable. Collaboration facilitates the exchange of ideas, best practices, and resources across institutions and contexts, whereas research generates knowledge and evidence that inform the growth and execution of sustainable education inventiveness. We can make significant progress toward a more inclusive, equitable and sustainable education system by integrating research and collaboration.

Reference

1. Vaughter, P., Noguchi, F., & Li, S. (2022). *Minding the GAP: An overview of five years of Education for Sustainable Development (ESD) projects under the Global Action Programme (GAP) within Regional Centres of Expertise (RCEs) on ESD*. 3. <https://doi.org/10.3389/frsus.2022.978938>
2. (6) (PDF) A Literature Review of Education for Sustainable Development (ESD) in Science Learning: What, Why, and How. (2022). *ResearchGate*. <https://doi.org/10.24014/jnsi.v5i1.15342>
3. 39(8), 985–988. <https://doi.org/10.1080/07373937.2021.1908806>
4. Bauer, M., Rieckmann, M., Niedlich, S., & Bormann, I. (2021). *Sustainability Governance at Higher Education Institutions: Equipped to Transform?* 2. <https://doi.org/10.3389/frsus.2021.640458>
5. Bendtsen, M., Forsman, L., & Björklund, M. (2021). *Exploring empowering practices for teachers' sustainable continuing professional development*. 64(1), 60–76. <https://doi.org/10.1080/00131881.2021.2000338>
6. *Bibliometric Analysis of Recent Scientific Production*. 7. <https://doi.org/10.3389/feduc.2022.786560>
7. Biermann, F., Hickmann, T., Carole-Anne Sénit, Beisheim, M., Bernstein, S. L., Chasek, P. S., Grob, L., Kim, R. E., Kotzé, L. J., Nilsson, M., Andrea Ordóñez Llanos, Okereke, C., Pradhan, P., Raven, R., Sun, Y., Vijge, M. J., Vuuren, van, & Wicke, B. (2022). *Scientific evidence on the political impact of the Sustainable Development Goals*. 5(9), 795–800. <https://doi.org/10.1038/s41893-022-00909-5>
8. Cagatay Tasdemir, & Gazo, R. (2020). *Integrating sustainability into higher education curriculum through a transdisciplinary perspective*. 265, 121759–121759. <https://doi.org/10.1016/j.jclepro.2020.121759>
9. Caniglia, G., Luederitz, C., Milena Groß, Muhr, M., John, B., Lauren Withycombe Keeler, Henrik von Wehrden, Manfred Dietrich Laubichler, Wiek, A., & Lang,
10. Chiu, S.-I. (2019). *Innovative experiential learning experience: Pedagogical adopting Kolb's learning cycle at higher education in Hong Kong*. 6(1), 1644720–1644720. <https://doi.org/10.1080/2331186x.2019.1644720>
11. *Collaborative Culture for Ensuring Sustainable Development Goals in Higher Education: An Integrative Case Study*. 14(3), 1273–1273. <https://doi.org/10.3390/su14031273>
12. J. (2017). *Transnational collaboration for sustainability in higher education: Lessons from a systematic review*. 168, 764–779. <https://doi.org/10.1016/j.jclepro.2017.07.256>
13. *Development Goals: the role of environment–human linkages*. 15(6), 1573–1584. <https://doi.org/10.1007/s11625-020-00799-6>
14. *Development*. 1423–1428. https://doi.org/10.1007/978-3-030-11352-0_28 Potter-Nelson, E. M., & O'Neil, J. (2019). *Role of Teachers on Education for*
15. E., Martin Amogre Ayanore, Vesela Radović, Gupta, B., Sen, S. K., Armindado Paço, Michalopoulou, E., Fiffy Hanisdah Saikim, Hock Lye Koh,
16. *Education for sustainability: Challenges and opportunities* / *Development Education Review*. (2014). [Developmenteducationreview.com](http://developmenteducationreview.com).
17. *Education for Sustainable Development (ESD)*. (n.d.). https://en.unesco.org/sites/default/files/education_for_sustainable_development_final_-_january_2021_1.pdf
18. *Education for sustainable development*. (2022). [Unesco.org. https://www.unesco.org/en/education-sustainable-development](https://www.unesco.org/en/education-sustainable-development)
19. *Education for sustainable development*. (2022). [Unesco.org. https://www.unesco.org/en/education-sustainable-development](https://www.unesco.org/en/education-sustainable-development)

sustainable-development

20. *Education for sustainable development*. (2022). Unesco.org. <https://www.unesco.org/en/education-sustainable-development>
21. *Education Statistics - UNICEF DATA*. (2023, May 5). UNICEF DATA. <https://data.unicef.org/topic/education/overview/>
22. Elizabeth, & Batchelder, M. (2020). *Education for Sustainable Development Through Extracurricular or Non-curricular Contexts*. 249–258. https://doi.org/10.1007/978-3-319-95870-5_19
23. Frankenberger, F., & Wasan Kanchanamukda. (2019). *The role of higher education institutions in sustainability initiatives at the local level*. 233, 1004–1015. <https://doi.org/10.1016/j.jclepro.2019.06.059>
24. Grosseck, G., Laurențiu Gabriel Țîru, & Bran, R. (2019). *Education for Sustainable Development: Evolution and Perspectives: A Bibliometric Review of*
25. Howell, R. (2021). *Engaging students in education for sustainable development: The benefits of active learning, reflective practices and flipped classroom pedagogies*. 325, 129318–129318. <https://doi.org/10.1016/j.jclepro.2021.129318>
26. https://doi.org/10.1007/978-1-4419-1428-6_227
27. <https://doi.org/10.3390/su11216136>
28. <https://earth.org/the-interconnectedness-of-sustainable-development-goals/>
29. Kolb, A. Y., & Kolb, D. A. (2012). *Experiential Learning Theory*. 1215–1219.
30. <https://gem-report-2016.unesco.org/en/chapter/the-challenges-of-monitoring-education-in-the-sustainable-development-goals/>
31. <https://plus.google.com/+UNESCO>. (2018, September 25). *Sustainable Development Goals - Resources for educators*. UNESCO. <https://en.unesco.org/themes/education/sdgs/material>
32. <https://www.developmenteducationreview.com/issue/issue-6/education-sustainability-challenges-and-opportunities>
33. <https://www.facebook.com/unep>. (2022). *Urgent nature action needed to salvage Sustainable Development Goals: UN report*. UNEP. <https://www.unep.org/news-and-stories/story/urgent-nature-action-needed-salvage-sustainable-development-goals-un-report>
34. <https://www.routledge.com/Sustainable-Development-Teaching-Ethical-and-Political-Challenges/Poeck-Ostman-Ohman/p/book/9780367729585>
35. Jelle Boeve-de Pauw, Gericke, N., Olsson, D. S., & Berglund, T. (2015). *The Effectiveness of Education for Sustainable Development*. 7(11), 15693–15717. <https://doi.org/10.3390/su71115693>
36. Jörn P. W. Scharlemann, Brock, R. L., Balfour, N. J., Brown, C. M., Burgess, N., Guth, M. K., Ingram, D. J., Lane, R. D., Martin, J., Wicander, S., & Kapos, V. (2020). *Towards understanding interactions between Sustainable*
37. Katrien Van Poeck, Östman, L., & Johan Öhman. (2019). *Sustainable Development Teaching*. Routledge.
38. Kioupi, V., & Nikolaos Voulvoulis. (2022). *Education for Sustainable Development as the Catalyst for Local Transitions Toward the Sustainable Development Goals*. 3. <https://doi.org/10.3389/frsus.2022.889904>
39. Kong, Y. (2021). *The Role of Experiential Learning on Students' Motivation and Classroom Engagement*. 12. <https://doi.org/10.3389/fpsyg.2021.771272>
40. Laurie, R. (2016). *Contributions of Education for Sustainable Development (ESD) to Quality*

Education: A Synthesis of Research - Robert Laurie, Yuko

41. *Leading SDG 4 - Education 2030*. (2022). Unesco.org. <https://www.unesco.org/en/education2030-sdg4>
42. Mariem Fekih Zguir, Dubis, S., & Muammer Koç. (2022). *Integrating sustainability into curricula: Teachers' perceptions, preparation and practice in Qatar*. 371, 133167–133167. <https://doi.org/10.1016/j.jclepro.2022.133167>
43. Matthias Thürer, Igor Tomasevic, Stevenson, M., Qu, T., & Huisingh, D. (2018). *A systematic review of the literature on integrating sustainability into engineering curricula*. 181, 608–617. <https://doi.org/10.1016/j.jclepro.2017.12.130>
44. Matthias Winfried Kleespies, & Paul Wilhelm Dierkes. (2022). *The importance of the Sustainable Development Goals to students of environmental and sustainability studies—a global survey in 41 countries*. 9(1). <https://doi.org/10.1057/s41599-022-01242-0>
45. Nations, U. (2022). — *SDG Indicators*. Un.org. <https://unstats.un.org/sdgs/report/2022/>
46. Nonoyama-Tarumi, Rosalyn Mckeown, Charles Hopkins, 2016. *Journal of Education for Sustainable Development*. <https://journals.sagepub.com/doi/full/10.1177/0973408216661442>
47. Olsson, D. S., Gericke, N., & Jelle Boeve-de Pauw. (2022). *The effectiveness of education for sustainable development revisited – a longitudinal study on secondary students' action competence for sustainability*. 28(3), 405–429. <https://doi.org/10.1080/13504622.2022.2033170>
48. Ramakrishna, S. (2021). *Incorporating sustainability into the university curriculum*.
49. *Research*, 1992–2018. 11(21), 6136–6136.
50. Reyers, B., & Selig, E. R. (2020). *Global targets that reveal the social–ecological interdependencies of sustainable development*. 4(8), 1011–1019. <https://doi.org/10.1038/s41559-020-1230-6>
51. Rose, J., & Todd, L. (2023). *Research collaboration and sustainability: taking it slow*. 46(2), 115–117. <https://doi.org/10.1080/1743727x.2023.2200637>
52. Sianes, A., Vega-Muñoz, A., & Ariza-Montes, A. (2022). *Impact of the Sustainable Development Goals on the academic research agenda. A scientometric analysis*. 17(3), e0265409–e0265409. <https://doi.org/10.1371/journal.pone.0265409>
53. *Social Development for Sustainable Development | DISD*. (2015). Un.org. <https://www.un.org/development/desa/dspd/2030agenda-sdgs.html>
54. Subarna Sivapalan, & Speight, S. (2019). *Role of Education for Sustainable*
55. *Sustainability; Sustainable Development*. 1–10. https://doi.org/10.1007/978-3-319-63951-2_226-1
56. *THE 17 GOALS | Sustainable Development*. (2015). Un.org. <https://sdgs.un.org/goals>
57. *The challenges of monitoring education in the Sustainable Development Goals*. (2016, August 10). Unesco.
58. *The Sustainable Development Goals Report 2022 | DISD*. (2022). Un.org. <https://www.un.org/development/desa/dspd/2022/07/sdgs-report/>
59. Ulrich Müller, Hancock, D., Stricker, T., & Wang, C. (2021). *Implementing ESD in Schools: Perspectives of Principals in Germany, Macau, and the USA*.
60. Varela-Losada, M., Uxío Pérez Rodríguez, Rial, L., & Vega-Marcote, P. (2022). *In Search of Transformative Learning for Sustainable Development*:
61. Varela-Losada, M., Uxío Pérez Rodríguez, Rial, L., & Vega-Marcote, P. (2022). *In Search of Transformative Learning for Sustainable Development*:
62. Wade, R., & Atkinson, H. (2016). *The Role of Education for Sustainability in the Sustainable*

- Development Goals—Changing Policy and Practice?* 351–371. https://doi.org/10.1007/978-3-319-47883-8_20
63. Walter Leal Filho, Valeria Ruiz Vargas, Amanda Lange Salvia, Luciana LonderoBrandli, Pallant, E., Klavins, M., Ray, S., Moggi, S., Maruna, M., Conticelli,
64. Wong, A. (2021, October 15). *The Interconnectedness of Sustainable Development Goals: Boom or Gloom*. Earth.org; Earth.org.
65. Wright, C., Ritter, L. J., & Caroline Wisse Gonzales. (2022). *Cultivating a*
66. Žalėnienė, I., & Paulo. (2021). *Higher Education For Sustainability: A Global Perspective*. 2(2), 99–106. <https://doi.org/10.1016/j.geosus.2021.05.001>