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by Saifana Iluj' Dhia Hakiki

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Effectiveness of Environmental Education Programs for College Students in Enhancing Sustainability Education for SDG's 2030 : A Systematic Literature Review

Saifana Iluj' Dhia Hakiki[1*], Diki Anggi Saputra[2]
[1] Department of Geography, Universitas Negeri Malang Malang, Indonesia
[2] Employee at Mayora Group, Indonesia

*Corresponding Author: saifanailujdh@gmail.com

Abstract : *The purpose of this study is to identify the challenges and barriers faced especially in the environment and student education and evaluate the effectiveness of environmental education programs for students in improving sustainability education based on the Sustainable Development Goals (SDGs) 2030 analyzed by a systematic literature review. This study used a systematic literature review research approach guided by the Preferred Reposrting Items for Systematic Review and Meta-Analysis (PRISMA). This research concludes that environmental education in higher education integrated with the 2030 Sustainable Development Goals (SDGs) plays an important role in building students' understanding, skills, and critical awareness of complex global environmental issues. This education programme aims to improve students' knowledge, critical thinking skills, and innovative solutions to environmental challenges.*

Keywords : *Effectiveness, education, programs, environmental, and SDG's*

1. INTRODUCTION

Sustainable Development plays an important role in education. This is because it can equip students with the knowledge, skills and values needed for future global challenges (J. C. González-Salamanca, O. L. Agudelo, and J. Salinas, 2020). In the context of higher education, the integration of sustainable development principles in the curriculum helps students understand the long-term impact of their decisions on the environment, society and the economy. This not only shapes theoretical understanding, but also develops critical thinking and problem-solving skills that can be applied in the real world. Sustainability-oriented education also encourages students to innovate and find solutions that support the achievement of the 2030 Sustainable Development Goals (SDGs).

In addition, students with sustainable education tend to be better prepared to become responsible and ethical future leaders, able to make decisions that pay attention to the balance between economic growth, social welfare, and environmental sustainability. Therefore, sustainable education in universities not only contributes to the individual development of students, but also plays an important role in the life of society.

The Sustainable Development Goals (SDGs) are a set of global goals agreed upon by United Nations (UN) member states in 2015 as part of the 2030 Agenda for Sustainable Development. Consisting of 17 goals covering various aspects of human life and the planet, the SDGs aim to end poverty, reduce inequality, protect the environment, and ensure that all people have access to quality education, good health, decent work and a decent life (M. A.

Camilleri and A. C. Camilleri, 2020). Each of these goals is supported by specific targets and indicators that all countries must achieve, with the overriding principle of "*no one left behind*" that meaning no single person or community is left behind. The SDGs recognize that global challenges such as climate change, inequality and the environmental crisis are interconnected and require a holistic approach and international cooperation to achieve sustainable solutions. Through the SDGs, the world is committed to creating a more inclusive, just and prosperous future for all humanity and future generations (C. Wamsler and F. Restoy, 2020).

Environmental education programs for university students are essential for achieving the Sustainable Development Goals (SDGs) by providing students with the knowledge and skills necessary to support environmental sustainability, health, and quality education (A. M. Hunashyal, S. Halyal, and R. A.K, 2024). However, there is a need to address gaps in evaluating the effectiveness of these programs among university students (Ridayani, N. Saputra, N. Siagian, R. A. S. Owon, and I. Rawadhy, 2022). Research has shown that campus programs and policies focused on environmental conservation significantly influence student involvement and environmental behavior, particularly in areas like waste management (Ridayani, N. Saputra, N. Siagian, R. A. S. Owon, and I. Rawadhy, 2022).

The success of environmental education programs in universities is closely tied to students' environmental orientation, concern for environmental issues, and the promotion of sustainable initiatives by educational institutions. Studies have indicated that providing environmental education to university students can enhance their environmental knowledge and attitudes (B. CENGİZ and Z. BAHAR, 2023). Therefore, integrating sustainability-focused courses into university curricula is crucial for fostering a culture of environmental responsibility among students (A. M. Hunashyal, S. Halyal, and R. A.K, 2024).

Moreover, the SDGs underscore the importance of quality education, equal access to tertiary education, and lifelong learning opportunities for all (M. Chankseliani and T. McCowan, 2021). Achieving the SDGs necessitates a profound understanding of current global challenges and the development of innovative solutions and policies (K. Ansah-Mensah, A. Osman, C. E. Yalley, and K. Adu-Boahen, 2023). By incorporating the SDGs into educational frameworks, universities can contribute to addressing issues such as climate change, water conservation, and forest preservation (C. Davino and N. D'Alesio, 2023).

Gaps in the understanding of the effectiveness of environmental education programs for university students have a significant impact on the achievement of the Sustainable

Development Goals (SDGs). While environmental education is increasingly recognized as key to achieving many of the SDG targets, particularly those related to environmental sustainability, health and well-being, and quality education, there are still limitations in evaluating the extent to which these programs are effective among university students. Without a deep understanding of whether environmental education programs succeed or fail, it is difficult to optimize initiatives and ensure that they effectively equip students with the knowledge and skills needed to support the SDGs (M. J. Ketlhoilwe, N. Silo, and K. Velempini, 2020). As a result, the full potential of environmental education in shaping change agents capable of facing global and local challenges has not been fully achieved (C. D. Trott and A. E. Weinberg, 2020).

To overcome the gap in understanding the effectiveness of environmental education programs for university students, a solution is needed in the form of a comprehensive desk-based evaluation of these programs to enhance sustainability education in line with the goals of SDG 2030 (J. Sierra-Pérez and I. López-Forniés, 2021). The evaluation involved an in-depth analysis of existing research and publications. It aims to identify trends, successes and challenges in the implementation of environmental education programs. Through a systematic approach to collecting and analyzing literature, the evaluation was able to reveal important factors that contribute to program effectiveness, student engagement in the environment, and long-term impact on sustainable behavior. In addition, desk research allows for an assessment of the different approaches that have been used in different institutions, providing insights that can be used to refine existing programs. Therefore, desk-based evaluations not only provide robust evidence on what works and what doesn't, but also help strengthen the role of higher education in achieving SDG 2030 more effectively and efficiently (L. Zhou, N. Rudhumbu, J. Shumba, and A. Olumide, 2020).

Research studies have shown that environmental education programs can positively impact the ecological awareness of university students (I. Guevara-Herrero, B. Bravo-Torija, and J. M. Pérez-Martín, 2024). These programs have been found to enhance students' environmental literacy, including their awareness, sensitivity, knowledge, values, attitudes, skills, and experiences related to the environment (M. P. Amador-Alarcón, C. A. Torres-Gastelú, A. Lagunes-Domínguez, H. Medina-Cruz, and C. A. Argüello-Rosales, 2022). Additionally, environmental education not only imparts knowledge but also influences behavior, engagement, and environmental knowledge, significantly affecting students' pro-environmental behavior (A. F. Aulya, N. Suparman, and S. N. Kaunain, 2022).

The novelty of this research is that by examining various geographical, social, and institutional contexts, this literature study can uncover differences and similarities in the implementation of environmentally-based sustainable education programs in different regions, thus providing a global view while taking into account local uniqueness. The novelty also lies in the potential of the desk-based approach to inform curriculum development and educational strategies that are more adaptive and responsive to the evolving sustainability challenges in achieving the 2030 SDG goals.

The purpose of this study is to identify the challenges and barriers faced especially in the environment and student education and evaluate the effectiveness of environmental education programs for students in improving sustainability education based on the Sustainable Development Goals (SDGs) 2030 analyzed by a systematic literature review.

2. MATERIALS AND METHODS

This study used a systematic literature review research approach guided by the Preferred Reposrting Items for Systematic Review and Meta-Analysis (PRISMA). The existence of this research review allows researchers to identify and map similar research topics simultaneously. This study aims to generate and map variables that affect teacher competence and performance. Researchers focused on factors that influence teacher performance and competence.

Review of Systematic Literature Review Process

In this literature systematic review process, researchers used journal indexing portals accessed through Google Scholar, SINTA and Scopus. The article search process was adjusted to the research topic, namely focusing on factors that affect teacher competence and performance. The literature systematic review process in this study begins with determining the string category or coding used to search for related articles.

In this case, researchers used the strings “environmental education programs for college students in enhancing sustainability education for SDG’s 2030”. Through these search strings, the researcher then began to search for articles through search engines and collected the articles before data reduction and extraction. The first discovery through Google Scholar, researchers obtained data as many as 314 articles using Indonesian strings and 97 articles using English strings. While in Scopus, researchers obtained 19 articles using English strings, and in SINTA researchers found 33 articles using English strings. Next, researchers conducted data reduction and extraction by identifying topic suitability, completeness of

inclusion and exclusion criteria, and removing duplication of topics. The final results of the extraction on the three journal indexing portals, researchers obtained 20 articles.

Data extraction

Extraction was carried out on 25 articles that were identified according to the criteria. By extracting data, researchers can map the dominant and significant factors from the article search results. In this systematic literature review research, the data extraction process is divided into 2, such as data extraction on articles with Indonesian search strings and data extraction on articles with English search strings.

1. Figures Numbering & Citation

In this research, string search is the initial stage to identify articles that match the research topic. The strings used are based on the keywords contained in the title of the article which is focused on environment-based education. In using the keyword "Sustainability Development Goals (SDGs) 2030" the researcher had some difficulty when identifying articles with English keyword strings. Therefore, the researcher used an additional string of "effect" which describes the presence of other related variables. The application of this search was carried out on the SINTA and Scopus journal indexing portals. As for Google Scholar indexing, researchers can search using keywords using Indonesian and English.

2. Inclusion and Exclusion Criteria

In this study, there are inclusion and exclusion criteria set with the aim of limiting the space for identifying articles so that in the process of mapping the results, researchers can map factors that are relevant to the research topic. The following criteria were set in this study :

Table 1. Inclusion and Exclusion Criteria

Inclusion	Exclusion
Articles using English and Indonesian language	Articles using languages other than english and indonesian
Articles are included in the journal or proceedings category	Articles are not included in the category of journals or proceedings
Articles are focused on research topics, environment-based sustainable education for students	The article is relevant to the research topic but does not discuss the effect caused
Articles published in the range of 2019-2024	Duplication of articles
Articles can be downloaded to facilitate the	Articles are relevant to the research topic

analysis process	but cannot be downloaded so they cannot be analyzed.

3. RESULT

Table 2. Result of Paper

No.	Author/ Years	Country	Method	Effectiveness of Programs	Result
1.	Kenneth M. Klemow, et all (2024)	England	Literature review	Yes	4DEE framework enhances college curricula for sustainability education. Integrating 4DEE with SDGs improves ecological literacy and decision-making.
2.	Denise Rodríguez-Zuritaet all (2024)	England	Systematic literature review	Yes	The findings reveal two significant trends: a substantial shift from curriculum development (2000–2010) to education for sustainable development (2011–2022), and the effectiveness of experiential learning teaching approaches.
3.	Steven J. Greenland, et all (2023)	Australia	Mix-method	Yes	This undermines the calls for comprehensive environmental management education that effectively integrates all key sustainability dimensions. Various sustainability models, mostly founded on the pillars of sustainability, have consequently evolved.
4.	Anubha Goel, et all (2023)	India	Quantitative method	Yes	Students show willingness for knowledge enhancement and action. Students perceive climate change as a significant threat.
5.	Anshuman Khare, Brian Stewart (2024)	England	Qualitative method	Yes	Raise awareness about sustainability Prepare future leaders for addressing critical sustainability issues.
6.	Carolyn N. Stevenson, et all (2022)	England	Literature review	Yes	Increased awareness and understanding of environmental challenges and ways to make a positive impact. Promotion of environmental awareness in communities through hands-on

					experiential learning projects.
7.	Ismail Bello, et all (2022)	India	Quantitative method with study case in India	Yes	Active teaching in environmental education enhances sustainable development.
8.	Meiai Chet et all (2021)	China	Systematic literature review	Yes	This study supports the development of sustainability education (SE) at the college level by providing new insights into college students' psychological characteristics in relation to the SDGs.
9.	Mamie Griffin (2022)	England	Qualitative method	Yes	HEIs can effect change in achieving environmental sustainability. Effective partnerships are crucial for creating awareness.
10.	Joseph Owuondo, et all (2023)	England	Literature review	Yes	Fostering environmental consciousness and action necessitates seamlessly integrating sustainable practices and educational principles into prevailing frameworks.
11.	Akito Kisoshita, et all (2019)	Indonesia	Quantitative method	Yes	This suggested that the sustainability education program focusing on city sustainability successfully enhanced the motivation of learners to contribute toward a more sustainable future.
12.	Daniel Olsoon, et all (2022)	Sweden	Quantitative method	Yes	knowledge about the effects of sustainability education (SE) as an approach to teaching to foster students' environmental citizenship in terms of action competence for sustainability, where SE could be defined by holism (the approach to the sustainability content) and pluralism (the approach to teaching).
13.	Zizka (2019)	Switzerland	Literature review	Yes	To prepare today's students to be tomorrow's leaders, HE institutions must find more effective means of teaching sustainability principles and concepts that resonate with students and create authentic engagement with sustainability practices which will be continued upon graduation.
14.	Baron, J., Lawrence, et all	England	Quantitative method with questioner	Yes	The study recommends that higher educational institutions need to play a more critical role in educating students

	(2024)				about the SDGs and need to infuse sustainability within the curriculum.
15.	H.Almazroa, et all (2024)	England	Literature review	Yes	In alignment with the research objectives, the study provided SDG-specific inputs for teacher education/training programs developed to train pre-service teachers and upskill academics currently teaching at various levels.
16.	Macarena Esteban Ibanez, et all (2022)	Spain	The descriptive, cross-sectional and quantitative methodology	Yes	The results show that many of the students have previous concepts about the environment, and they consider that environmental education is required to solve environmental issues.
17.	Wang, Y, et all (2022)	China	Quantitative method	Yes	The results also reveal that developing students' competences on sustainability mindset/framework is directly related to their belief in the NEP and PEBs. To develop an integrative pedagogical approach requires understanding how a HEI's engagement in sustainability can impact students' attitudes and behaviors, but little research has actually measured the development of students' competences.
18.	Vasiliki Kioupi (2020)	England	Qualitative review	Yes	The application of the tool can generate empirical evidence on the effectiveness of university programmes and establish a strong argument regarding the potential of education as a tool for achieving the SDGs.
19.	Arruda Filho, et all (2019)	England	Quantitative research	Yes	The data show a considerable impact of education in developing a new mindset for sustainability leadership as there is a big variation students' average knowledge of the themes that made up the sustainability mindset suggesting that the students' exposure to the content in the school environment helps increase their knowledge.

20.	Klaudia Zwolin, et all ska (2022)	Poland	Literature review	Yes	Present the results of a study on young people's awareness of sustainable development and their opinion on the implementation of SDGs in curricula. The publication responds to the demand of technical students for educational content related to sustainable development and a greater integration of economic, social, and environmental issues.

Target of Paper

Table 3. Target of Paper

Journal	20	100%
Prociding	0	0%

Based on the type of journal, this research is divided into two, namely proceedings and scientific journals. scientific journal. Based on these two types of research findings, a total of 15 studies with a total percentage of 100%.

Distribution Paper Based on Years

Table 4. Distribution Paper Based on Years

Year	Total	Percentage
2019	3	15%
2020	1	5%
2021	1	5%
2022	7	35%
2023	3	15%
2024	5	25%

Based on the 2019-2024 research year, there were 20 journal publications with a total percentage of 100%. In 2018 and 2023 there were 3 journal respectively with a percentage of 15%. In the following year 2020 - 2021the number of journals published was 1 journals with a percentage of 5%. Meanwhile, in 2022 and 2024 there were 7 and 5 journals with a percentage of 35% and 25%.

Distribution Paper Based on Developing Countries

Table 5. Paper Based on Developing Countries

Countries	Total	Percentage
England	9	45%
Australia	1	5%

China	2	10%
Indonesia	1	5%
Sweden	1	5%
Switzerland	1	5%
Spain	1	5%
India	2	10%
Poland	1	5%

Based on the distribution of countries, the research reviewed in this study was published in several countries including the England, Australia, China, Indonesia, Sweden, Switzerland, Spain, London, India, and Poland. Based on the findings of these countries, the highest country for the publication of journal articles is England with 9 journals each and a percentage of 45%.

Distribution Paper Based on Method

Tabel 6. **Distribution Paper Based on Method**

Method	Total	Percentage
Qualitative method	3	15%
Systematic literature review and literature review	8	40%
Quantitative method	8	40%
Mix method	1	5%

Based on the findings of the methods in the journals reviewed, qualitative, quantitative, literature study, and mixed methods were found. The method used most is quantitative and literature review as many as 8 journals with 40%.

4. DISCUSSION

Environmental education has become an important component in efforts to achieve the 2030 sustainable development goals (SDGs). At the tertiary level, environmental education programs aim to develop critical awareness, knowledge, and skills necessary for students to face global environmental challenges (M. Esteban Ibáñez, D. Musitu Ferrer, L. V. Amador Muñoz, F. M. Claros, and F. J. Olmedo Ruiz, 2020). It is important to assess the extent to which these programs are able to improve students' knowledge and skills in sustainability. In addition, the influence of these programs on changes in student behavior in supporting the SDG 2030 agenda is also a major concern. By evaluating the various approaches used in environmental education programs.

3.1 Effectiveness of Environmental Education Programs for Students Based on The Sustainable Development Goals (SDGs) 2030

The effectiveness of environmental education programs for students based on the 2030 Sustainable Development Goals (SDGs) lies in their ability to increase students' awareness, knowledge and action on environmental issues. These programs are designed to integrate sustainability principles in the curriculum, so that students can understand the impact of human behavior on the environment and the importance of maintaining a balanced ecosystem. In addition, effective environmental education helps students develop critical and analytical skills to solve environmental problems, which is in line with achieving the goals of the 2030 SDGs, such as action on climate change, preservation of marine and terrestrial life, and sustainable consumption and production. Thus, environmental education integrated with the 2030 SDGs not only plays a role in improving students' understanding, but also in creating a generation that is more responsible for the future of the earth (R. Oltra-Badenes, V. Guerola-Navarro, J.-A. Gil-Gómez, and D. Botella-Carrubi, 2023).

Effective environmental education programs play a crucial role in enhancing students' awareness, knowledge, and actions concerning environmental issues, aligning with the objectives of the 2030 Sustainable Development Goals (SDGs). These programs are designed to incorporate sustainability principles into the curriculum, enabling students to grasp the impact of human activities on the environment and the significance of maintaining ecological balance (G. D. Boca and S. Saraçlı, 2019). By integrating SDGs into the educational framework, students not only gain a deeper understanding of environmental challenges but also develop critical thinking and problem-solving skills necessary to address these issues. Furthermore, environmental education fosters a sense of responsibility among students, contributing to the creation of a more environmentally conscious and proactive generation (L. Dunlop and E. A. C. Rushton, 2022).

Environmental education integrated with the 2030 Sustainable Development Goals (SDGs) is crucial for enhancing students' comprehension of environmental issues and cultivating the skills and mindset necessary for contributing to a sustainable future. Education for Sustainable Development (ESD) has emerged as a pivotal campaign aimed at fostering sustainability through formal and informal educational initiatives (A.-K. Holfelder, 2019). This approach emphasizes the importance of equipping individuals with the knowledge, skills, and values essential for promoting sustainable practices and behaviors (Y. Echegoyen-Sanz and A. Martín-Ezpeleta, 2021). Furthermore, incorporating sustainability into Higher Education Institutions (HEIs) is highlighted as a key strategy to instill sustainability knowledge and practices among students (S. M. Carungay and L. Lasian, 2023).

Research underscores the significance of environmental education in developing

environmental awareness among students (A. Mustofa and S. Sueb, 2023). By promoting responsible behaviors, encouraging critical thinking, and nurturing sustainability attitudes, these programs play a vital role in shaping a generation committed to safeguarding the planet (Y. Echegoyen-Sanz and A. Martín-Ezpeleta, 2021). UNESCO emphasizes the role of education in achieving Sustainable Development Goals (SDGs) and sustainability skills, particularly focusing on SDG 4 on quality education and SDG 8 on decent work and economic growth (M. Istrate, R. Horea-Serban, and I. Muntele, 2019). Moreover, sustainable learning and education (SLE) principles advocate for a curriculum founded on sustainability principles to educate students on balancing environmental preservation with economic and social needs (J. Hays and H. Reinders, 2020).

Environmental education integrated with the 2030 SDGs not only enhances students' understanding of environmental issues but also equips them with the necessary skills and mindset to contribute towards a sustainable future. By fostering environmental awareness, promoting responsible behaviors, and encouraging critical thinking, these programs play a pivotal role in nurturing a generation committed to safeguarding the planet for years to come.

3.2 Challenges and Barriers Faced Especially in The Environment and Student Education

In the context of higher education, challenges and obstacles in environmental education are becoming increasingly complex and diverse. Higher education plays an important role in shaping critical thinking and environmental awareness among students, who will become future leaders (I. Žalėnienė and P. Pereira, 2021). However, the implementation of environmental education in higher education often faces challenges such as the lack of holistic integration between environmental issues and other disciplines.

The integration of environmental education faces multifaceted challenges. While higher education institutions are pivotal in cultivating critical thinking and environmental consciousness among students, the incorporation of environmental education encounters hurdles like the lack of comprehensive integration with other disciplines (C. Howlett, J.-A. Ferreira, and J. Blomfield, 2016). This deficiency underscores the necessity for substantial changes in curricula and pedagogical practices to challenge prevailing epistemologies and foster a reevaluation of environmental perspectives (C. Howlett, J.-A. Ferreira, and J. Blomfield, 2016). Moreover, the specialized programs and courses in environmental studies, sustainability science, and green technology offered in higher education equip students with the expertise required to tackle global environmental issues (I. M. D. M. Adnyana, K. A. Mahendra, and S. M. Raza, 2023).

In conclusion, the challenges facing environmental education in higher education necessitate a reevaluation of curricula, pedagogical practices, and the integration of environmental perspectives across disciplines. Overcoming these obstacles requires a concerted effort to instill environmental consciousness, critical thinking, and sustainability principles in students across all academic disciplines.

5. CONCLUSIONS

Based on the research results in the journals reviewed in this study, environmental education in higher education that is integrated with the 2030 Sustainable Development Goals (SDGs) plays an important role in building students' understanding, skills, and critical awareness of complex global environmental issues. This education programme aims to improve students' knowledge, critical thinking skills, and innovative solutions to environmental challenges. Despite its great potential to drive positive change, the implementation of environmental education in higher education has challenges, such as the lack of holistic integration with other disciplines, limited resources, and inadequate policy support. Therefore, strong collaborative efforts from across academia are needed to overcome these barriers. This is so that environmental education can function effectively in creating a generation that is more responsible, sustainable, and ready to contribute to a more environmentally conscious future.

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REFERENCES

Amador-Alarcón, M. P., Torres-Gastelú, C. A., Lagunes-Domínguez, A., Medina-Cruz, H., & Argüello-Rosales, C. A. (2022). Perceptions of environmental protection of university students: A look through digital competences in Mexico. *Sustainability, 14*(18), 11141. https://doi.org/10.3390/su141811141

Ansah-Mensah, K., Osman, A., Yalley, C. E., & Adu-Boahen, K. (2023). Global outlook of the multiplier effect of research and development on environmental sustainability. *PLoS One, 18*(9), e0291370. https://doi.org/10.1371/journal.pone.0291370

Aulya, A. F., Suparman, N., & Kaunain, S. N. (2022). Evaluation analysis of educational programs. *Journal of Quality Assurance in Islamic Education, 2*(1), 1–8.

https://doi.org/10.47945/jqaie.v2i1.605

Bello, I., & Kazibwe, S. (2022). Multinational corporations, education and United Nations development goals: A literature review. *Problemy Polityki Społecznej. Studia i Dyskusje, 58*(3), 239–257. https://doi.org/10.31971/pps/156014

Camilleri, M. A., & Camilleri, A. C. (2020). The sustainable development goal on quality education. In *Sustainability: Concepts and Applications* (pp. 261–277).

Cengiz, B., & Bahar, Z. (2023). The characteristics of university students on environmental attitude and environmental literacy level: Example of Faculty of Nursing. *Fenerbahçe Üniversitesi Sağlık Bilimleri Dergisi, 3*(2), 161–174. https://doi.org/10.56061/fbujohs.1210065

Chankseliani, M., & McCowan, T. (2021). Higher education and the sustainable development goals. *Higher Education, 81*(1), 1–8. https://doi.org/10.1007/s10734-020-00652-w

Chen, M., Jeronen, E., & Wang, A. (2021). Toward environmental sustainability, health, and equity: How the psychological characteristics of college students are reflected in understanding sustainable development goals. *International Journal of Environmental Research and Public Health, 18*(15), 8217. https://doi.org/10.3390/ijerph18158217

Davino, C., & D'Alesio, N. (2023). Sustainable development goals: Classifying European countries through self-organizing maps. In *European Review of Sustainable Development Goals* (pp. 95–100).

Goel, A., et al. (2023). Student perceptions of environmental education in India. *Sustainability, 15*(21), 15346. https://doi.org/10.3390/su152115346

González-Salamanca, J. C., Agudelo, O. L., & Salinas, J. (2020). Key competences, education for sustainable development and strategies for the development of 21st-century skills: A systematic literature review. *Sustainability, 12*(24), 10366. https://doi.org/10.3390/su122410366

Greenland, S. J., Saleem, M., Misra, R., Nguyen, N., & Mason, J. (2023). Reducing SDG complexity and informing environmental management education via an empirical six-dimensional model of sustainable development. *Journal of Environmental Management, 344*, 118328. https://doi.org/10.1016/j.jenvman.2023.118328

Guevara-Herrero, I., Bravo-Torija, B., & Pérez-Martín, J. M. (2024). Educational practice in education for environmental justice: A systematic review of the literature. *Sustainability, 16*(7), 2805. https://doi.org/10.3390/su16072805

Hunashyal, A. M., Halyal, S., & R. A.K. (2024). Path to SDG 2030: Fostering sustainable development at the School of Civil Engineering, KLE Tech—A case study. In *Proceedings of the Research in Engineering Education Symposium* (pp. 228–235). https://doi.org/10.52202/073963-0029

Ketlhoilwe, M. J., Silo, N., & Velempini, K. (2020). Enhancing the roles and responsibilities of higher education institutions in implementing the sustainable development goals. In *SDGs in Higher Education Institutions* (pp. 121–130).

Khare, A., & Stewart, B. (2024). Guest editorial: Making an impact—UN sustainable development goals and university performance. *International Journal of Sustainability in Higher Education, 25*(5), 901–902. https://doi.org/10.1108/IJSHE-07-2024-607

Kinoshita, A., Mori, K., Rustiadi, E., Muramatsu, S., & Kato, H. (2019). Effectiveness of incorporating the concept of city sustainability into sustainability education programs. *Sustainability, 11*(17), 4736. https://doi.org/10.3390/su11174736

Klemow, K. M., Cid, C. R., Jablonski, L. M., & Haas, D. A. (2024). How a multidimensional ecology education approach can enhance college curricula to implement the United Nations sustainable development goals. *Sustainable Earth Review, 7*(1), 12. https://doi.org/10.1186/s42055-024-00082-x

Olsson, D., Gericke, N., & Pauw, J. B. (2022). Students' action competence for sustainability and the effectiveness of sustainability education. In *Proceedings of the iREEC 2022* (p. 11). https://doi.org/10.3390/environsciproc2022014011

Owuondo, J. (2023). Advancing sustainable development in the Global South: Aligning education with the SDGs for lasting impact. *International Journal of Research and Innovation in Social Science, VII*(X), 1166–1172. https://doi.org/10.47772/IJRISS.2023.701090

Ridayani, Saputra, N., Siagian, N., Owon, R. A. S., & Rawadhy, I. (2022). The correlation of environmental education, environmental knowledge, environmental involvement, and waste management behavior. *IOP Conference Series: Earth and Environmental Science, 1105*(1), 012008. https://doi.org/10.1088/1755-1315/1105/1/012008

Rodríguez-Zurita, D., Jaya-Montalvo, M., Moreira-Arboleda, J., Raya-Diez, E., & Carrión-Mero, P. (2024). Sustainable development through service learning and community engagement in higher education: A systematic literature review. *International Journal of Sustainability in Higher Education*. https://doi.org/10.1108/IJSHE-10-2023-0461

Sierra-Pérez, J., & López-Forniés, I. (2021). Collaborative methodologies for creative processes in the SDGs framework. In *SDG Collaboration and Creative Learning* (pp. 171–182).

Stevenson, C. N. (2022). Addressing the sustainable development goals through environmental education. In *Research Anthology on Measuring and Achieving Sustainable Development Goals* (pp. 441–462). IGI Global.

Trott, C. D., & Weinberg, A. E. (2020). Science education for sustainability: Strengthening children's science engagement through climate change learning and action. *Sustainability, 12*(16), 6400. https://doi.org/10.3390/su12166400

Wamsler, C., & Restoy, F. (2020). Emotional intelligence and the sustainable development goals: Supporting peaceful, just, and inclusive societies. In *The Role of Emotional Intelligence in Global Sustainable Development* (pp. 1–11).

Wynveen, B. J., Meyer, A. R., & Wynveen, C. J. (2019). Promoting sustainable living among college students: Key programming components. *Journal of Forestry, 117*(4), 353–359. https://doi.org/10.1093/jofore/fvz022

Zhou, L., Rudhumbu, N., Shumba, J., & Olumide, A. (2020). Role of higher education institutions in the implementation of sustainable development goals. In *Higher Education and SDGs* (pp. 87–96).

Zizka, L. (2019). Sustainability in higher education: Aligning sustainable development goals (SDGs) with curriculum/campus/community. In *EDULEARN Proceedings* (pp. 2116–2123). https://doi.org/10.21125/edulearn.2019.0811

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