Importance of Environmental Education in the Context of Natural Sustainability

Karel Llopiz-Guerra [1*] (iD) , Daline Urdanivia Ruiz [2] (iD) , Ronald M. Hernández[3] (iD) , Valia Luz Venegas Mejia [4] (iD) , Jadira Del Rocío Jara Nunayalle [5] (iD) , Karla Robalino Sanchez [6] (iD)

[1*] Universidad Central Marta Abreu De Las Villas, Santa Clara, Villa Clara.
E-mail: kllopiz@uclv.cu

[2] Universidad Central Marta Abreu De Las Villas, Santa Clara, Villa Clara.
E-mail: dalineur@uclv.edu.cu

[3] Universidad Privada Norbert Wiener, Lima, Perú. E-mail: ronald.hernandez@outlook.com.pe

[4] Universidad Nacional Federico Villarreal, Lima, Perú. E-mail: vvenegas@unfv.edu.pe

[5] Universidad Tecnológica Del Perú, Lima, Perú. E-mail: c17076@utp.edu.pe

[6] Universidad César Vallejo, Lima, Perú. E-mail: krobalino@ucvvirtual.edu.pe

Abstract

Anthropogenic activities are causing degradation in the environment at an alarming pace, which in turn causes a host of environmental challenges including acid rain, rising sea levels, incorrect monsoons, and global warming. There are many great things about science and technology, but we are paying an extremely high "price" for them. Industrialization alone is not enough to sustain economic growth. Scientific knowledge and technological advancement can only play a supporting role in the movement toward a more sustainable global environment; they cannot provide the solution on their own. Therefore, individuals need to be empowered with vital information and education if we are to attain an acceptable degree of global environmental sustainability. It is feasible to bring about tremendous changes in the public's thinking via educational institutions since they are the locations where society is most closely encountered. Encouraging learner awareness of ambient conditions in their area and their active engagement in fixing local issues makes environmental education a useful preventative measure to save youngsters living in polluted regions. The impact of environmental education on environmental sustainability is the focus of this study. The literature provides essential understanding into the ways in which Environmental Education (EE) might encourage pro-environmental behaviour via studies that concentrate on the link between various experiences and learning outcomes. In accordance with the importance of environmental education for sustainable development, this research aims to

---

Corresponding Author: Karel Llopiz-Guerra, E-mail: kllopiz@uclv.cu

conduct a survey on the effectiveness of an intervention called EESD (Environmental Education Suitability Development) in improving students' environmental knowledge.

Keywords

Introduction

One aspect of environmental sustainability is the protecting of natural resources and the preservation of global ecosystems. Both the present and the future health and happiness of individuals will be improved by this. Since many actions impacting the environment do not have an immediate effect, looking forward is an essential component of environmental sustainability.

The Earth as a whole is a "commons," just like that sheep field. We, the people on Earth, depend on the planet's resources for everything. We need water to drink, air to breathe, plants to eat, and metal and wood to build things (Pushpavalli et al., 2024). Our energy sources, from fossil fuels that are bad for the environment to sustainable energy sources like wind, sun, water, biomass, and wave energy, all come from nature or are driven by natural processes (Javvaji et al., 2022). There are also a huge number of other materials that modern businesses depend on (Culpa et al., 2021, Rao et al., 2021)).

However, if we utilize these things up too quickly, future people won't be able to use them. We need to learn how to use our species in a way that doesn't harm them if we want them to live and do well. Like the sheep farmers, we need to change how we use things so they don't hurt the earth. That's what it means to be environmentally sustainable. It has to do with making sure we have enough tools for tomorrow and what we need today.

The word "sustainable" is often used as a synonym for "green" or "eco-friendly," although it really refers to more than just those two concepts. A green action, way of life, or community does the least amount of damage to the earth right now. A healthy action, way of life, or society, on the other hand, is one that can go on forever.

As a result, sustainable growth seems like an unwise choice for many countries around the world. Humans need to learn how to be more sensitive to nature and build a strong environmental education (EE) system right now to protect the environment and make it survive.

Environmental Education (EE)

People can learn about different environmental problems, contribute to resolving them, and take steps to preserve and enhance the environment through this process. People learn more about environmental issues and how to solve them through environmental education. They also gain the knowledge and skills they need to make responsible choices. It is made up of several elements. Here are some of them:

- Knowledge of the environment and care for natural problems and issues.
- Environmental awareness and familiarity with ecological issues.
- An understanding for the environment and a desire to keep, protect, or improve the quality of the environment.

- People who care about the environment and want to keep it in a good state and make it better should have certain skills. These skills can help people find and solve environmental problems.
- Doing things and doing actions that contribute to solving environmental problems.

Environmental education doesn't support a single point of view or activity over another. Instead, environmental education educates people how to think critically about different sides of an issue. It also helps the person get better at making decisions and resolving issues. The National Environmental Education Act of 1990 says that the Environmental Protection Agency must lead the way in teaching people more about the environment across the country. To run this program, the Environmental Protection Agency set up a Department of Environmental Education.

Figure 1 shows how important environmental education is for making nature sustainability. A lot of people think that education is important for supporting sustainable development and changing how people think about and act on problems of development and the environment (Franzolin et al., 2021; Sousa et al., 2016; Muralidharan, 2020). A few research studies have examined into this, even though education has a big impact on how people think about and feel about protecting species (Pržulj et al., 2022). Environmental education has been around since the 1800s, and it has dealt with issues like protecting nature, changing people's behaviour, and fighting pollution, among others (Sotnikova et al., 2022). However, it looks like not much has been done to educate people about natural suitability (Duan et al., 2022). This study wants to fill in this knowledge gap by looking into a survey on how important EE is for natural sustainability. In the direction of natural suability, this can help lead strategies and policies (Radmanović et al., 2018).
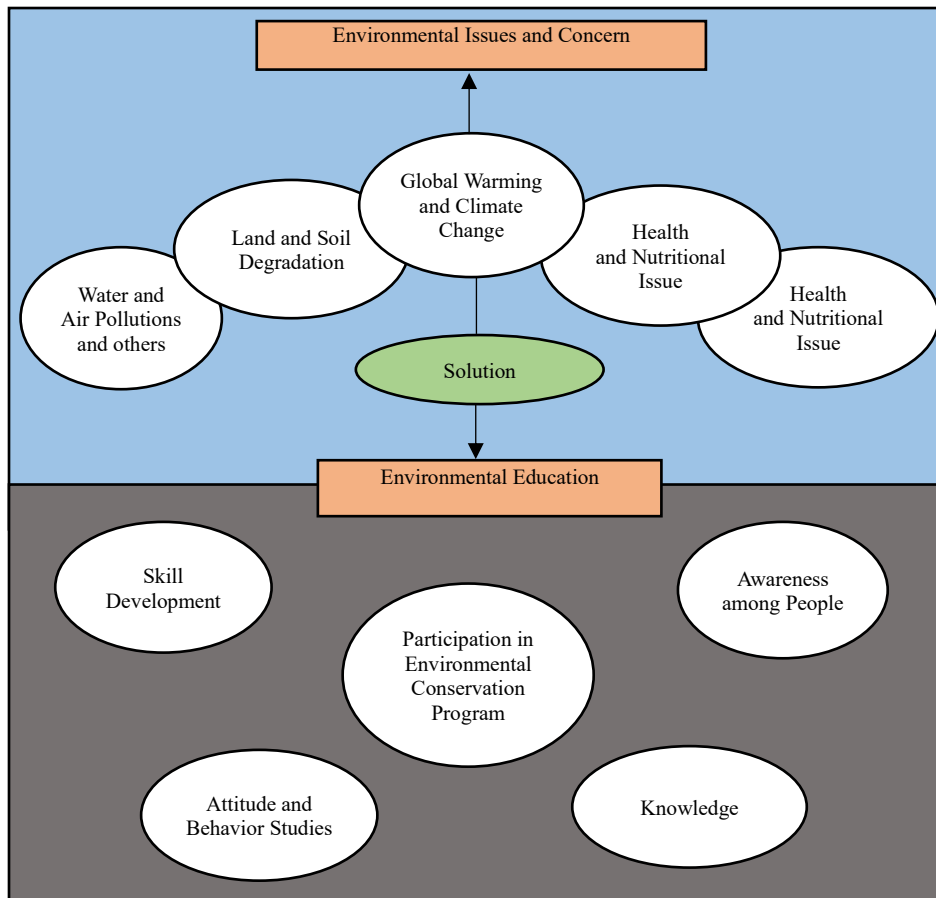

Figure 1. Impact of EE on Natural Sustainability

EESD (Environmental Education for Sustainable Development)

Teaching people about the environment and the problems it faces, providing them with the tools they need to solve those problems, and encouraging them to make responsible choices based on that information are all goals of environmental education (UNESCO, Tbilisi Declaration, 1977). In contrast to sustainable development, which seeks to address current needs without affecting those of future generations, education for sustainable development (ESD) teaches people how to think critically about issues, gather relevant information, and put their knowledge into practice in a way that benefits both themselves and others, both now and in the future. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) (2005) defines sustainable development as an approach to progress that takes into account all aspects of a society, including but not limited to: people, places, and things. It also recognizes the importance of addressing issues like poverty, inequality, human rights, health, education, and intercultural dialogue. The impact of EE on nature sustainability is illustrated in Figure 2.
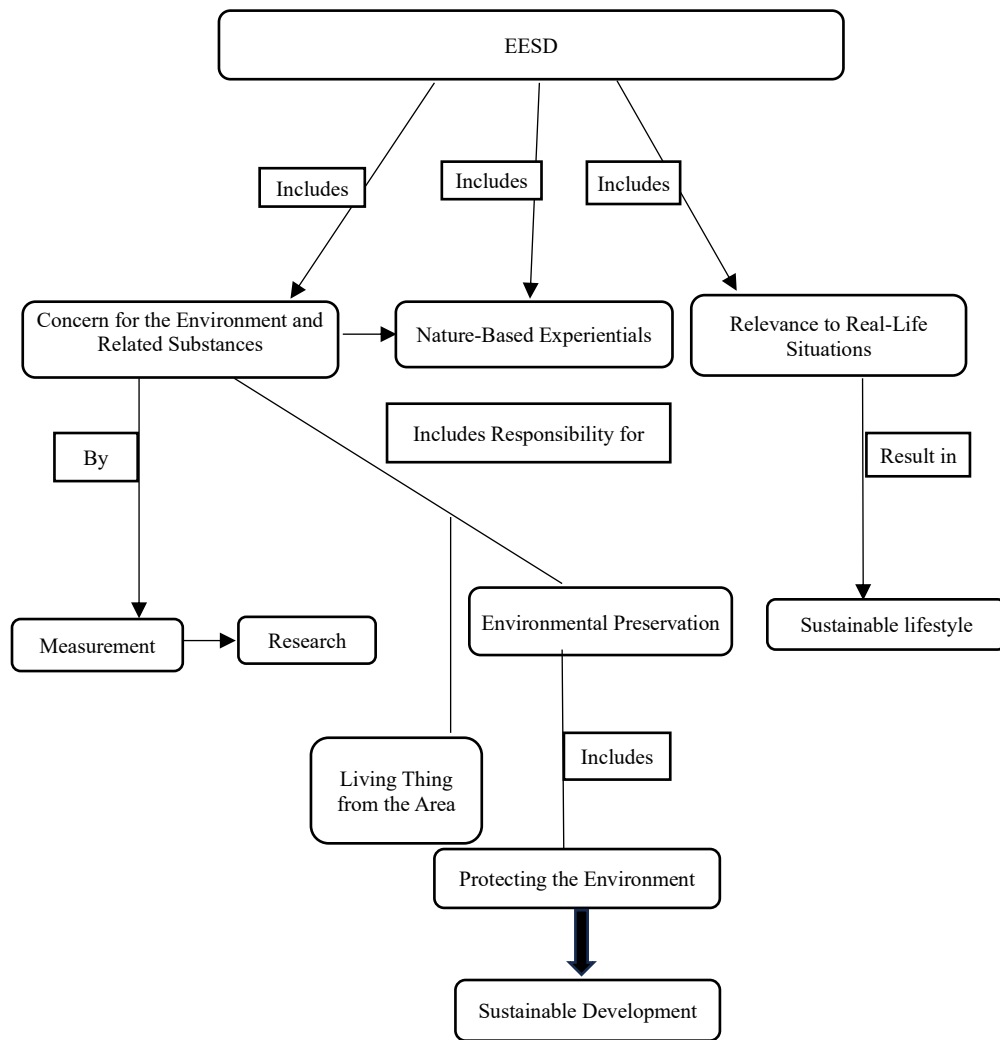

Figure 2. Diagrammatic Structure of EESD

Despite a great deal of literature on environmental education and related topics, there is a lack of literature on environmental education and sustainable development (EESD). In spite of these constraints, this chapter endeavours to provide a brief literature overview on the current state of EESD in national and

international research fields conducted in education system. After a thorough examination of various sources, we have a greater understanding of what it means to be environmentally educated. This includes not only knowing about environmental issues and ecological systems, but also having the necessary cognitive abilities, attitudes, and knowledge to respond appropriately to these challenges (Hungerford & Volk 1990; Simmons, 2004; Sumithra & Sakshi, 2024; Doig et al., 2022; Grant, 1997).

1. Active Teaching Learning Approach for EESD

Dynamic teaching and learning processes are important to EESD. The foundation of active learning lies in pedagogic theory, which holds that lecture-based courses have their limits (Gardiner, 1994; ACAR & Yüksekdağ, 2023). Research conducted (McLeish, 1968; Davis & Alexander, 1977; Saunders, 1980; Doris et al., 2023; Bonwell & Eison, 1991) indicates that lectures do not effectively aid students in learning, retention, problem-solving, and self-directed study. More studies show that students remember more when they take an active role in their own education rather of only receiving information (Stefanov, 2018; Cooper et al., 2000; Grant, 1997; Rahmawan et al., 2023). Regarding this issue, the work of (Fink, 2003) on "important learning experiences" is demonstrating. Both the process and the result of learning may be enhanced via meaningful experiences. Students can acquire fundamental topic knowledge while also having the chance to manage complicated projects, use critical thinking, and build inquiry skills that are applicable in real-world situations. The focus is on learning as a process and creating environments that allow for substantial learning to take place (Fink, 2003; Navya & Sunandini, 2021). Reading for enjoyment has been the subject of a large body of research from throughout the globe. An up-to-date assessment of leisure reading is what this research is all about. To pave the way for future studies, this study also discusses libraries' functions in encouraging leisure reading (Sakib Biswas, 2023).
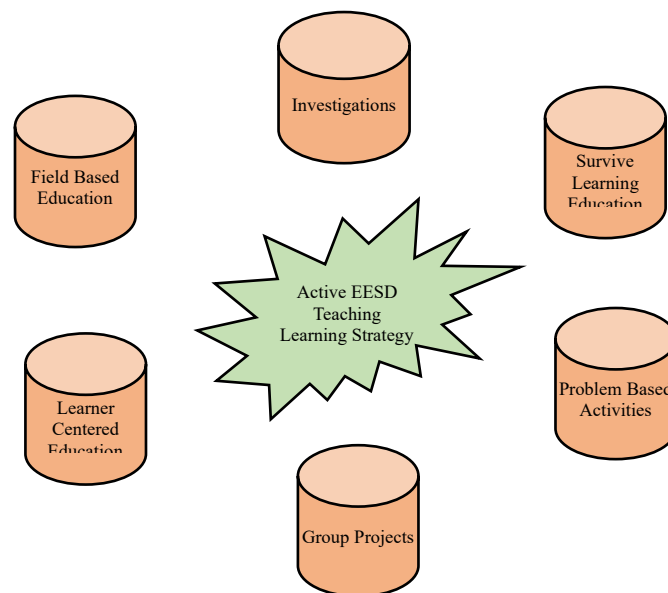
Figure 3. EESD Active Learning Strategy

Figure 3 shows how active learning techniques prioritize constructive features in knowledge processing, such as self-directed inquiry and the organization and reorganization of existing information. A problem-solving perspective, a critical approach, and knowledge assessment are also necessary for the processing of information in active learning. A learner's capacity to use cognitive processes to generate new information and to clarify on existing knowledge is the pinnacle of knowledge processing. The most recent

theories of learning suggest that students' capacity to direct their own learning, cultivate their own habits of inquiry, and regulate and reflect upon their own learning processes are also important to their success in learning. According to (Niemi, 2002) meta-cognitive abilities are fundamental.

All levels of educational system suffer from an absence of meta-cognitive knowledge and an absence of understanding about active learning methodologies and strategies. Schools are failing to provide their students with sufficient meta-knowledge about learning. Rather than isolating pupils, active learning involves developing their abilities and giving them freedom. In order to uphold the value of active learning, younger teachers need a lot of support. During their time as future teachers, they should have more chances to engage in active learning (Niemi, 2002).

The fieldwork environment is so unique and distinctive that it has the potential to improve long-term memory (Rickinson et al., 2004). A person's personal development and social abilities may be enhanced by well-executed fieldwork, especially residential experience. The most crucial part is that the cognitive and emotional domains may reinforce one another, with one domain impacting the other and laying the way for higher-order learning (Rahmawan et al., 2023).

2. Research on Environmental Education

Finding, predicting, and controlling environmental behaviour factors were the primary focus of environmental education research in the '60s and '80s (Palmer & Suggate, 2004; Hammad, 2020) Environmental knowledge, awareness of environmental issues and questions, actions, understanding, and participation have all been the subject of research in the past ten years. These studies include those (Sherburn & Devlin, 2004; Zimmer et al., 1994; Morgil et al., 2004; Doris et al., 2023; Myeongjoo et al., 2024)).

Sample Study	N	Country	Methods and Purposes
(Nicolaou et al., 2009)	12	Greece	Exploring the evolution of environmental knowledge and decision-making abilities using qualitative research
(Shobeiri et al., 2007)	991	India -Iran	Two nations' environmental consciousness levels compared
(Barraza & Walford, 2002)	246	Mexico - UK	Analysing the data to see what factors may be impacting people's understanding of and actions toward the environment
(Jinliang et al., 2004)	1179	China	Quantitative research that examines the nature and level of environmental awareness
(Korhonen & Lappalainen, 2004)	212	Madagascar	Research using quantitative methods to investigate sustainable development
(Negev et al., 2008)	3101	Israel	Evaluation of pupils' "environmental literacy" using a quantitative study
(Said et al., 2007)	306	Malaysia	Results from quantitative research on the effects of environmental education on student behaviour
(Duan & Fortner, 2005)	108	China	Research using quantitative methods explores how children perceive both the internal and external elements influencing environmental issues
(Palmer & Suggate, 2004)	322	UK	Research that tracks people over time to see how their environmental education develops
(Tuohino, 2003)	586	Finland	Findings from a quantitative survey on people's perspectives on environmental sustainability
(Haigh, 2006)	450	UK	Analysing a Non-Governmental Organization
(Dresner & Gill, 1994)	28	USA	Research on camping along with environmental education using quantitative methods
(Evans & Gill, 1996)	173	UK	Perspectives and an environmental focus as measured quantitatively
(Hammad, 2020)	88	Turkey	Statistical analysis of the impact of online environmental education on students' understanding and sensitivity to environmental issues
(Uzunboylu et al., 2009)	41	North Cyprus	Quantitative research on the relationship between sustainable development and mobile technology usage
(Day, 2004)	23	USA	Research using quantitative methods to investigate the impact of art on promoting sustainability among students
(Heo, 2004)	NA	Korea	The purpose of this quantitative research is to examine the relationship between online storytelling and environmental education.
(Pacheco et al., 2006)	NA	USA	Evaluating the relationship between environmental education and gaming

Perceptions of Professionals Regarding EE

1. Instruction and Instructor Preparation

In order to advance environmental education activities and the environmental literacy of the next generation, teachers play critical responsibilities (World Council for Education and Development, 1987). According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO), one of the crucial aspects that contributes to the failure of environmental education initiatives along with environmental education curriculum is inadequate teacher training. Providing future educators with comprehensive courses on environmental education is vital in order to assist them in developing and implementing successful environmental educational programs (Spork, 1992). Cross-cultural research was carried out (De Chano, 2006) with participants hailing from various countries. The findings of the study revealed that there was no significant correlation between the environmental knowledge of the respondents and their views on the environment attitude. Through the use of a psychometric model, (Dillon & Gayford, 1997; Sesmiarni et al., 2023) examined the potential relationships between environmental attitudes, behavioural intentions, principles, and understanding of environmental issues among future teachers. Although attitudes were shown to be a highly consistently linked variable to behavioural intentions, they also found that individual perceptions as well as perceived behavioural control had strong connections.

The strategies that are used by both the instructor and the students are directly connected to the level of success that is achieved in environmental education (EE). The whole educational paradigm is always shifting as a result of the unending changes in social and technical conditions (Gang, Ph, 1989). This is because we live in an era when knowledge is constantly expanding. Several issues that are associated with effective teaching are currently being investigated. These issues include learners working together in small teams (Carlson, 2003), arguing (Christudason, 2003), collaborative learning (Gwee, 2003), cooperation and competition, topic, meaningful education, group projects, resolving issues (Meyer-Hole, 2003), discussions (Toy, 2003), inspiration (Lines, 2003), and evaluating teachers (Monahan, 2000). As educators, it is their responsibility to organize, lead, guide, assist, and provide support for the cognitive activity of pupils who are curious. Within the context of the educational process, the student is the focal point (Marzano, 1997). It is no longer sufficient for a teacher to have a great deal of knowledge; rather, he or she must be able to present the material in a manner that is both easy to understand and exciting fields and they must also possess a unique personality. Learning should be facilitated and directed by him or her by encouraging learners to ask inquiries, responding to their responses, assisting students in accepting challenges and conflicts, discussing inconsistencies thinking critically, and offering innovative solutions (Kostova, 1998).

2. How Educators Think about, Approach, and Act in Relation to EE

In the study (Shahnawaj, 1990), the researchers investigated the concern for the environment and environmental views of teachers working in secondary and upper secondary schools. It was shown that 95 % of instructors had favorable opinions about the environment. The environmental views of instructors who had received training and those who had not received training were identical. The study (Patel & Patel, 1994) investigated the environmental consciousness of 120 primary school teachers who taught students in grades I to IV. The researchers discovered that male instructors who had been teaching for a longer period of time and who worked in metropolitan areas had a greater understanding of environmental education (Patel & Patel, 1995). A research that was conducted on one hundred teachers working in secondary schools discovered that there was no significant variation in environmental awareness among instructors in relation to their previous history of experience. A study conducted (Pradhan, 1995). when compared the environmental knowledge of

124 students who were enrolled in two different teacher education institutions. The researchers discovered that there were significant differences in environmental awareness between urban and rural teacher trainees, as well as between those who held degrees in master's and bachelors' degrees, and between trainees' subject backgrounds. education survey, concept mapping, and interviews, (Todt, 1995) conducted an investigation on the environmental education of teachers in south central Ohio. The findings revealed that there was a significant knowledge gap among the instructors about ecological systems among the teachers. According to the findings of his research on primary school teachers in the Dang region of Gujarat, (Patel, 1999). came to conclusion that these instructors had a high degree of environmental awareness. In addition to this, he discovered that male instructors, teachers with more than 35 years of experience, and teachers with graduate degrees had a greater knowledge of the environment than their counterparts who were female, had less experience, and were participants in Primary instructors Training.

Owens, (2000). conducted an evaluation of the environmental literacy of urban and middle school teachers of nominal background. It was discovered that there were significant differences among instructors in terms of their racial or ethnic origin, the subject areas they taught, and the number of years they had been teaching. It would seem that environmental courses, both pre-service and in-service, have a favourable influence on environmental behaviour, environmental sensitivity, environmental awareness, and environmental values; however, it does not appear that environmental knowledge is affected by these courses. (Sahoo & Gupta, 2000) discovered that academic success has a considerable impact on the environmental awareness of pupils in higher secondary education in the state of Rajasthan. It was also shown that students who had a strong scientific attitude scored higher in environmental awareness than their counterparts who had a poor scientific attitude. This was the case in the majority of the occasions. Researchers in two cities in Pakistan set out to characterize the extent to which residents in areas with varying degrees of formal education were taught about environmental issues (Daudi, 2000).

Researchers in the field of environmental education discovered that secondary school teachers lacked enough environmental understanding in research that looked at this same topic (Pradhan, 2002). Environmental consciousness was not significantly different between male and female teachers, but it was significantly different between scientific, social science, and language teachers, and also between teachers in urban and rural areas. irrespective of whether they follow the same or a different curriculum, (Tripathi, 2002) found no significant difference between central schools and other schools when comparing the environmental awareness of pupils attending other schools at the tenth standard level. But there was a huge disparity between the sexes, as well as among the arts and sciences majors. Findings from the study that looked at secondary school students' environmental interest in relation to their environmental beliefs (Abraham & Arjunan, 2005) showed that these students were not very concerned about the environment.

Recommendations

The design of strategies, logistics, and extensive support systems at various levels, both within the school system and outside of it, would be required in order to meet the requirements for the introduction and execution of environmental education as an independent topic.

Not only should the textbooks on environmental science include sections on the natural and physical environments, but they should also include sections on the social environments, since a child's life encompasses the family, the school, the neighbourhood, and the community within which they live. It is not necessary for the material of the textbook to be exhaustive. Instead of a shallow and information-heavy treatment of a wide range of subjects, the stress should be a treatment of chosen themes that are exciting and meaningful. This will

ensure that the kid is not burdened by the stress. It is expected that the curriculum and the teaching and learning process would result in socialization and assist in the creation of attitudes. Lakes, ponds, woods, animals, and environmental challenges are some examples of local natural habitats and resources that should be included in the curriculum for environmental education at the middle school level. As part of the environmental literacy curriculum in schools, students should be required to participate in service learning in order to increase their understanding of local environmental issues and their participation in local environmental preservation activities.

The objective of all environmental educators is to enhance the educational viewpoint for environmental learning, and they must play a leading part in bringing the complexity of the environment and the challenges it poses to society to the attention of instructors. Environmental trainers may further enhance student learning about the environment by providing teachers and publishers with extra relevant environmental challenges as an example pertinent to scientific courses, as well as by giving chances for engaging problem-solving and service-learning. Educators should take their pupils out into natural surroundings and increase the amount of field practices they utilize in order to satisfy students' born interest about the environment and to assist them in understanding how what they learn in the classroom can be used in real-world situations. As the child develops, there is an urgent requirement for the methodical incorporation of environmental education into the curriculum of schools, beginning with the most basic environmental factors and progressing to national and global environmental concerns.

Conclusion

All parties involved must work together, including schools, NGOs, and local governments, to create long-term environmental projects that address pressing issues like water and conservation of biodiversity, pollutants in the air, garbage disposal, recycling, and reusing. Researchers, practitioners, and policymakers in the area of educational and developmental sciences need to forge stronger connections in order for the results of EESD studies to inform actual field practice and policymaking. The current research should be re-evaluated by policymakers together with their limitations in order to open up new avenues for the large-scale design and implementation of EESD initiatives.

Author Contributions

All Authors contributed equally.

Conflict of Interest

The authors declared that no conflict of interest.

References

Abraham, M., & Arjunan, N.K. (2005). Environmental interest of secondary school students in relation to their environmental attitude. *Perspective in Education*, 21(2), 100-105.

ACAR, B.Ç., & Yüksekdağ, Z. (2023). Beta-Glycosidase Activities of Lactobacillus spp. and Bifidobacterium spp. and The Effect of Different Physiological Conditions on Enzyme Activity. *Natural and Engineering Sciences*, 8(1), 1-17.

Barraza, L., & Walford, R.A. (2002). Environmental Education: A comparison between English and Mexican school children. *Environmental Education Research*, 8, 171–186.

Bonwell, C.C., & Eison, J.A. (1991). *Active Learning: Creating Excitement in the Classroom*. ASHE-ERIC Higher Education Report 1. Washington, D.C.: George Washington University.

Carlson, K. S. (2003). Small-group Work: Common Pitfalls. *Retrieved*, 15(2007), 23-26.

Christudason, A. (2003). The Debate as a Learning Tool classroom as a laboratory. *Marketing Education Review*, 3, 32-39.

Cooper, J.L., MacGregor, J., Smith, K.A., & Robinson, P. (2000). Implementing small-group instruction: Insights from successful practitioners. *New Directions for Teaching and Learning*, 2000(81), 63-76.

Culpa, E.M., Mendoza, J.I., Ramirez, J.G., Yap, A.L., Fabian, E., & Astillo, P.V. (2021). A Cloud-Linked Ambient Air Quality Monitoring Apparatus for Gaseous Pollutants in Urban Areas. *Journal of Internet Services and Information Security*, 11(1), 64-79.

Daudi, S.S. (2000). *Exploring environmental literacy in low-literate communities of Pakistan: A descriptive study to recommend strategies for planning environmental education programs*. The Ohio State University.

Davis, R.H., & Alexander. L.T. (1977). The Lecture Method. *Guides for the Improvement of Instruction in Higher Education, No. 5*. East Lansing, Michigan: Michigan State University.

Day, J. (2004). *Connections: Combining environmental education and artwork in the primary grades for sustainability*. Unpublished master thesis, University of Phoenix.

DeChano, L.M. (2006). A multi-country examination of the relationship between environmental knowledge and attitudes. *International Research in Geographical & Environmental Education*, 15(1), 15-28.

Dillon, P.J., & Gayford, C.G. (1997). A psychometric approach to investigating the environmental beliefs, intentions and behaviours of pre-service teachers. *Environmental education research*, 3(3), 283-297.

Doig, S.G.A., Ramírez, J.N.G., Ugaz, O.C., Hernández, R.M., Ortiz, J.B.F., Flores, L.A.G., & Larrea, Y.M.B. (2022). Educational Scenarios Using Technology: Challenges and Proposals During the Pandemic. *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications*, 13(4), 182-195.

Doris, F.G., Oscar, G.G.Z., Juan, S.T., Silvia, J.A.V., Miguel, A.S., & Ronald, M.H. (2023). An Ensemble-based Machine Learning Model for Investigating Children Interaction with Robots in Childhood Education. *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications*, 14(1), 60-68.

Dresner, M., & Gill, M. (1994). Environmental education at summer nature camp. *Journal of Environmental Education*, 25(3), 35-41.

Duan, H., & Fortner, R. (2005). Chinese college students' perceptions about global versus local environmental issues. *The Journal of Environmental Education*, 36(4), 23-32.

Duan, W., Su, N., Jiang, Y., & Shen, J. (2022). Impacts of Social trust on rural households' attitudes towards ecological conservation—Example of the Giant Panda Nature Reserves in China. *Forests*, 2022, 13, 53. https://doi.org/10.3390/f13010053

Evans, S.M., & Gill, M.E. (1996). School children as educators: The indirect influence of environmental education in schools on parents' attitudes towards the environment. *Journal of Biological Education*, 30(4), 243-248.

Fink, (2003). *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses*. San Francisco, California: Jossey-Bass. For the 21st Century. Education Manitoba. For the environment? set: Research information for teachers, 1, 4-9.

Franzolin, F., Carvalho, G.S., Santana, C.M.B., Calegari, A.D.S., Almeida, E.A.E.D., Soares, J.P.R., & Lemos, E.R.S. (2021). Students' interests in biodiversity: Links with health and sustainability. *Sustainability*, 13(24), 13767. https://doi.org/10.3390/su132413767

Gang, Ph. S. (1989). Rethinking education; Dagaz Press, Atlanta, Georgia.

Gardiner, L. (1994). *Redesigning Higher Education: Producing Dramatic Gains in Student Learning*. ASHE-ERI Higher Education Report 7. Washington, D.C.: George Washington University.

Grant, R. (1997). A claim for the case method in the teaching of geography. *Journal of Geography in Higher Education*, 21(2), 171–185.

Gwee, M.C.E. (2003). Peer learning: Enhancing student learning outcomes.

Haigh, M.J. (2006). Promoting environmental education for sustainable development: The Value of links between higher education and non-governmental organizations (NGOs). *Journal of Geography in Higher Education*, 30(2), 327–349.

Hammad, J. (2020). Communication Technology Affecting Education Acquisition for the Girl Child: Examining the Case of Chuluni District, Kitui County. *International Journal of Communication and Computer Technologies (IJCCTS)*, 8(2), 13-18.

Heo, H. (2004). Inquiry on storytelling for the web-based environmental learning environment. *Association for Educational Communications and Technology*, 19-23.

Hungerford, H.R., & Volk. T.L. (1990). Changing learner behaviour through environmental education. *Journal of Environmental Education,* 21(3), 8-21.

Javvaji, V., Latesh, K.V., Mounika, K., & Musala, S. (2022). Implementation of water consumption and contamination detection system using arduino. *International Journal of Communication and Computer Technologies (IJCCTS),* 10(2), 11-14.

Jinliang, W., Yunyan H., Ya, L., Xiang, H., Xiafei, W., & Yaunmei W. (2004). An analysis of environmental awareness and environmental education for primary school and high school students in Kunming. *Chinese Education and Society*, 37(4), 24–31.

Korhonen, K., & Lappalainen, A. (2004). Examining the environmental awareness of children and adolescents in the Ranomafana region, Madagascar. *Environmental Education Research*, 10(2), 195-216.

Kostova, Z. (1998). How to learn successfully. *Sofia: Pedagog*, *6*.

Lines, M. (2003). *Motivation in Studies*.

Marzano, R.J. (1997). *Dimensions of Learning*. Teacher's Manual.

McLeish, J. (1968). *The Lecture Method*. Cambridge, England: Cambridge Institute of Education.

Meyer-Hole, H. (2003). *Problem-based Learning*.

Monahan, K.P. (2000). *Grading Your Teacher*.

Morgil, I., Arda, S., Secken, N., Yavuz, S., & Oskay, O.O. (2004). The influence of computer assisted instruction on environmental knowledge and environmental awareness. *Chemistry Education: Research and Practice*, 5(2), 99-110.

Muralidharan, J. (2020). Wideband Patch Antenna for Military Applications. *National Journal of Antennas and Propagation (NJAP),* 2(1), 25-30.

Myeongjoo, K. (2024). A Study on the Effect of Information and Communication Technology (ICT) on Trade in Services in the United States. *Journal of Internet Services and Information Security*, 14(1), 266-281.

Navya, D., & Sunandini, M. (2021). Secure Home Entry with Face Recognition and Notification via Telegram. *Journal of VLSI Circuits and Systems*, 3(1), 7-13.

Negev, M., Sagy, G., Garb., Salzberg, A., & Tal. A. (2008). Evaluating the environmental literacy of Israeli elementary and high school students. *The Journal of Environmental Education*, 39(2), 3-20

Nicolaou, C., Korfiatis, K., Evagorou, M., & Constantinou, C. (2009). The development of decision-making skills and environmental concerns through computer-based, scaffolded learning activities. *Environmental Education Research*, 15(1), 39-54.

Niemi, H. (2002). Active learning: A cultural change needed in teacher education and schools. *Teaching and Teacher Education*, 18(7), 763-780.

Owens, M.A. (2000). *The environmental literacy of urban middle school teachers* (Doctoral dissertation, Emory University).

Pacheco, P., Motloch, J., & Vann, J. (2006). Second chance game: local (university-community) partnerships for global awareness and responsibility. *Journal of Cleaner Production,* 14(9-11), 848-854.

Palmer, J.A., & Suggate, J. (2004). The development of children's understanding of distant places and environmental issues: report of a UK longitudinal study of the development of ideas between the ages of 4 and 10 years. *Research Papers in Education*, 19(2), 205-237.

Patel, D.G., & Patel, N.A. (1995). An investigation into the environmental awareness and its enhancement in the secondary school teachers. *Program Education*, 69(12), 256-259.

Patel, D.G., & Patel, N.A. (1994). Environmental awareness of the primary school teachers. *The Progress of Education*, 68(10-11), 234-236.

Patel, D.U. (1999). A Study of Environment Awareness of Primary Teachers in the Dang District of Gujarat. *Progress of Education*, 74(3), 60-63.

Pradhan, G.C. (1995). Environmental awareness among teacher trainees. *University News*, 33(40), 10-14.

Pradhan, G.C. (2002). Environmental awareness among secondary school teachers, a study. *The Educational Review*, 45(2), 25-27.

Pržulj, N., & Tunguz, V. (2022). Significance of Harvest Residues in Sustainable Management of Arable Land I. Decomposition of Harvest Residues. *Arhiv za tehničke nauke*, 1(26), 61–70.

Pushpavalli, R., Mageshvaran, K., Anbarasu, N., & Chandru, B. (2024). Smart Sensor Infrastructure for Environmental Air Quality Monitoring. *International Journal of Communication and Computer Technologies (IJCCTS)*, 12(1), 33-37.

Radmanović, S., Đorđević, A., & Nikolić, N. (2018). Humus Composition of Rendzina Soils in Different Environmental Conditions of Serbia. *Arhiv za tehničke nauke*, 2(19), 57–64.

Rahmawan, S., Tandiyo, R., Sugiharto & Heny, S. (2023). Software Development Tools with Android Base for Skills Data Collection in Physical Education. *Journal of Internet Services and Information Security*, 13(1), 22-33.

Rao, K.M., Bharadwaj, P.S., Vali, S.M., Mahesh, N., & Sai, T.T. (2021). Design Of Clocked Hybrid (D/T) Flipflop Through Air Hole Paradigm Photonic Crystal. *Journal of VLSI Circuits and Systems*, 3(2), 21-33.

Rickinson, M., Dillon, J., Teamey, K., Morris, M., Choi, M.Y., Sanders, D., & Benefield, P. (2004). A review of research on outdoor learning. *FSC occasional publication 87. Shrewsbury: Field Studies Council*, 18, 763–780.

Sahoo, P.K., & Gupta, M.P. (2000). Effect of scholastic achievement and scientific attitude on environmental awareness of+ 2 students of Rajasthan. *Journal of Indian Education*, 26(1), 31-41.

Said, A., Yahaya, N., & Ahmadun, F. (2007). Environmental comprehension and participation of Malaysian secondary school students. *Environmental Education Research*, 13(1), 17–31.

Sakib Biswas, M. (2023). Pleasure Reading and the Role of Libraries: A Review of the Literature. *Indian Journal of Information Sources and Services, 13*(1), 32–38.

Saunders, P. (1980). The lasting effects of introductory economics courses. *Journal of Economic Education*, 12(1), 1–14.

Sesmiarni, Z., Darmawati, G., Yuspita, Y. E., Yeri, S., & Ikhsan, I. (2023). Android-Based Augmented Reality: An Alternative in Mastering Tajweed for Student Learning. *Journal of Internet Services and Information Security*, 13(2), 30-47.

Shahnawaj, N. (1990). Environmental awareness and environmental attitude of secondary and higher secondary school teachers and students. *Fifth Survey of Educational Research*, 2(33), 1759.

Sherburn, M., & Devlin, A.S. (2004). Academic major, environmental concern and arboretum use. *The Journal of Environmental Education*, 35(2), 23-48.

Shobeiri, S.M., Omidvar, B., & Prahallada, N.N. (2007). A comperative study of environmental awareness among secondary school students in Iran and India. *International Journal of Environmental Reservation*, 1(1), 28-34.

Simmons, B. (2004). *Environmental Education Materials: Guidelines for Excellence*. Washington, D.C., USA.

Sotnikova, O., Zhidko, E., Prokshits, E., & Zolotukhina, I. (2022). Administration of Sustainable Development of Territories as One of the Approaches for Creating A Biosphere-Compatible and Comfortable Urban Environment. *Arhiv za tehničke nauke*, 1(26), 79–90.

Sousa, E., Quintino, V., Palhas, J., Rodrigues, A.M., & Teixeira, J. (2016). Can environmental education actions change public attitudes? An example using the pond habitat and associated biodiversity. *PloS one, 11*(5), e0154440. https://doi.org/10.1371/journal.pone.0154440

Spork, H. (1992). Environmental education: a mismatch between theory and practice. *Australian Journal of Environmental Education*, 8, 147-166.

Stefanov, V. (2018). Communication Technology-led Development in Kenya and Sub-Saharan Africa's Education Systems: A Cross Sectional Study. *International Journal of Communication and Computer Technologies (IJCCTS),* 6(2), 1-5.

Sumithra, S., & Sakshi, S. (2024). Exploring the Factors Influencing Usage Behavior of the Digital Library Remote Access (DLRA) Facility in a Private Higher Education Institution in India. *Indian Journal of Information Sources and Services*, 14(1), 78–84.

Todt, D. E. (1995). *An investigation of the environmental literacy of teachers in South-Central Ohio using the Wisconsin environmental literacy survey, concept mapping and interviews*. The Ohio State University.

Toy, V. (2003). Preparing for Presentations.

Tripathi, M. P. (2002). A comparative study of environmental awareness of students studying in central schools and other schools at 10? levels. *Indian Education Abstraction*, *2*(1).

Tuohino, A. (2003). Environmental awareness and environmentally friendly behaviour–case Sulkava Rowing Event. *Environment Papers Series*, 6(2), 1-11.

Uzunboylu, H., Cavus N., & Ercag E. (2009). Using mobile learning to increase environmental awareness. *Computers & Education*, 52, 381–389.

Zimmer, M.R., Stanfford, J.F., & Stanfford, R.M. (1994). Green issues: Dimensions of environmental concern. *Journal of Business Research*, 30(1), 63–74.