



ENVIRONMENTAL PROTECTION AND SUSTAINABLE PRACTICES IN SECONDARY SCHOOLS THROUGH EMPOWERING YOUTH WITH CLIMATE EDUCATION

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<p>ARTICLE INFO</p> <p>Keywords: Environmental protection, Cognitive development, Psychomotor domain, Affective domain, Sustainability education</p> <p>Corresponding Author: Dr. Shazia Zamir, Assistant Professor, Department of Educational Sciences, National University of Modern Languages, Islamabad, Email: szamir@numl.edu.pk</p>	<p>ABSTRACT</p> <p>The goal of the current study was to examine sustainable practices and environmental preservation in order to empower children via climate education in secondary schools. This was accomplished by conducting a content study of Pakistan Studies textbooks for grades IX and X published by the Punjab Curriculum and Textbook Board, Lahore, in both English and Urdu. The topic was thoroughly studied by the researchers, who focused on environmental concerns related to climate change, the greenhouse effect, and global warming. The findings showed that the Punjab Curriculum and Textbook Board, Lahore's textbook for grades IX and X does not adequately handle environmental protection topics related to climate change, the greenhouse effect, and global warming. Pakistan Studies textbooks for grades IX and X provide a strong focus on developing students' cognitive abilities. A partial representation of the psychomotor and affective domains' objectives has been made. The material in the textbooks is not enough to develop sustainable practices and approach them from a scientific standpoint. It is advised that the writers have adequate training in order to properly utilize the scope of the textbooks, and the integrated materials may highlight the objectives of environmental education. Students' textbooks may include real-world sustainability projects and courses.</p>
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INTRODUCTION

Addressing global issues including pollution, climate change, and ecological deterioration requires environmental education (EE) (Salazar et al., 2024). The hydrological cycle was impacted by climate change, which had an adverse effect on freshwater and terrestrial ecosystems. It affects

mental health and adaptability as well. To combat the adverse effects of climate change, climate-resilient pathways are crucial. However, in addition to the reunification of worldviews through inclusive and participative interactions among governance actors, climate-resilient policies rely on society values and interests (IPCC, 2022). Given the growing worldwide demand for carbon reduction, green transformation may be quite important. According to Huang et al. (2024), the Fintech Ecosystem (FES) is helping to lower carbon emissions in cities, which is a positive step toward the green economic transformation. The main players in the environment are people. It is crucial that they play a positive part in lowering environmental issues in order to save the environment for the future as well as for the present (Sitorus & Wiyarni, 2024). In the framework of environmental education, a number of stakeholders have brought attention to the problem of Education for Sustainable Development (ESD) in recent years. In order to solve ESD issues, school leaders are essential (Zainal-Abidin et al., 2023). Since the community acts as the curriculum in this situation, what we educate about climate emergencies is crucial (Cormier, 2024). Children and young people live in a world that is changing due to climate change. People have recently experienced the effects of climate change. To address human, social, and environmental concerns, transformative techniques that incorporate climate science, global justice, and collective civic action may be used in climate change education. In this sense, child-centered interaction might be beneficial (Waldron et al., 2020). Initiatives to improve ecological sustainability implementation methodologies are necessary for environmental education in the context of climate change. Regardless of the existence of taxonomies and frameworks, environmental education must thoroughly examine implementation techniques (Prosser et al., 2025). The greatest issue facing the world now is climate change, and those who are most impacted are not doing anything to lessen it. People feel helpless in these situations because they lack the authority to deal with the climate emergency (Hickman et al., 2021).

Additionally, environmental education material and teaching techniques should be emphasized in teacher training programs, with a particular emphasis on ecological literacy, environmental issue perspectives, and hands-on teaching strategies. Using a UNESCO framework, Ishaque et al. (2025) examined the B.Ed. curriculum and found that it included fundamental teaching techniques. They found that there is a need to integrate community engagement-focused practical approaches into both pedagogy and content. The relationship between environmental education, SDGs, sustainable education, and environmental circumstances has been the subject of several studies. However, in order to effectively address environmental concerns and foster ecological awareness

in children, a comprehensive curriculum that emphasizes critical thinking, sustainable behaviors, and community engagement is needed. To improve sustainable behaviors and ecological literacy among new teachers, the curriculum has to be updated with practical elements (Ishaque et al., 2025). The development of justice-centered pedagogies is necessary to empower and educate activism in order to support institute-wide and multidisciplinary approaches. But one of the problems with this is that instructors don't have the tools, assistance, and abilities needed to offer climate education effectively (Howard-Jones et al., 2021). Watts et al. (2021) talked about how climate change affects the social, political, and economic domains, putting the welfare of living things in jeopardy. Due to human activity, climate change has emerged as a major worldwide issue. People, governments, and society are all at risk from it (Everth & Bright, 2022).

The IPCC (2022) claims that climate change is reached its peak due to the highest levels of CO₂, which caused the earth's average temperature to rise by 1.8° to 5.6° C. Extreme weather events will result from it, and there is a good chance that the Antarctic and Greenland regions may melt. As a result, immediate action is needed to address the global climate emergency. Strategies for adaptation and mitigation can lower greenhouse gas emissions (Lorenzo & Bueno, 2020). By encouraging people's awareness and comprehension of climate change and the environment, environmental education can help accomplish these goals (Feldbacher et al., 2023). Climate emergency necessitates effective scholastic evaluation from universities regarding their function, curriculum enterprise and connection among communities, educationalists, and students (Chandler et al., 2024). Action-oriented teaching has the potential to transform students' knowledge of the environment. To inspire students to adopt sustainable lives, environmental educators should think about their own instructional approaches. In a climate emergency, merely presenting scientific data on species loss and climate change won't be beneficial (Ikonen et al., 2025). The climate emergency's unpredictability necessitates the development of fresh, solution-focused strategies. In this context, knowledge generation and sharing activities will be crucial. Teachers can no longer assert that they have all the answers and that climate education is only about facts. While climate education is included in the curriculum, it is typically dispersed over several topics, with some of the material being taught in other fields. The issue that has to be addressed immediately is climate change (UNESCO, 2019). A reexamination of educational institutions' roles in curriculum creation and stakeholder relations is necessary in light of the climate emergency. All parties involved must promote climate education (Chandler et al., 2024). Myth-based pedagogies have the potential to be an appealing alternative. According to Matthew

Farrelly's method, mythical tales from the Hebrew Bible, Nordic folklore, the Quran, and the New Testament can all contribute to the development of environmental consciousness by offering a variety of alternative ways for students and teachers to connect with nature and facilitate reflection. Students can envision sustainable worlds with the aid of Paul Ricoeur's hermeneutical theory. Through critical discussions, exposing pupils to mythological tales can foster the development of positive worldviews (Ikonen et al., 2025).

It's critical to include technology into environmental education lessons. In this sense, Indigenous games may assist teachers teach things in a meaningful way, which will help students develop a sustainable mindset. Indigenous games may be used to teach about environmental degradation issues. Students are empowered to utilize their knowledge to protect the environment when they participate in recycling, reusing, and waste reduction initiatives. Students may apply their knowledge in real-world situations with the support of culturally relevant learning activities. With limited resources, technology can help instructors teach environmental education curriculum (Matsekoleng et al., 2024). Sustainability in environmental education requires attention. Teachers' and schools' dedication to and regularity in environmental education would be beneficial in this respect. Students don't care about the environment. There is no specific environmental education taught in schools. Textbooks and curriculum goals do not adequately address environmental substantiality. The majority of environment education instruction is informational and devoid of hands-on activities. Even students are not given the knowledge and resilience to cope with environmental concerns, and department leaders are not prepared in handling them. In order to teach the environment subject, teachers must also encourage students to use practical teaching methods. In this sense, curricula should be created to help students grow in their understanding of and commitment to environmental ideals. on addition to educating teachers and creating an inclusive curriculum for environmental sustainability, there should be enough instruction on environmental sustainability policies and principles. Environmental sustainability necessitates appropriate methods, values, and content (Kariuki-Githinji et al., 2022). Every educational institution should prioritize environmental education. According to Forsler et al. (2024), the majority of schools lack open green areas, an environmental education vision and mission, and environmental programs and extracurricular activities.

The responsibilities of schools and instructors are essential to the formulation and successful execution of environmental education's vision, goal, and curriculum, as well as related initiatives. Teachers' knowledge and abilities in environmental education will be further enhanced by training

sessions. Additionally, educators must integrate environmental education into other courses and disciplines. More significantly, instructors are not supposed to acquire environmental information so they may use it in their daily life. At several levels, environmental education must be taught in schools. Schools should include environmental sustainability into its vision, purpose, goals, and core curriculum. Sustainable environmental issues may be the subject of extracurricular activities. Teachers can improve their environmental education knowledge and teaching techniques by participating in workshops that support their professional development (Husin et al., 2025).

Objectives

1. To analyze the content of environmental protection in relation to climate change, greenhouse effect and global warming are addressed in the textbook of grade IX and X designed by the Punjab Curriculum and Textbook Board, Lahore.
2. To assess the extent to which sustainable practices in the context of climate change, greenhouse effect, and global warming are promoted by the Punjab Curriculum and Textbook Board, Lahore.
3. To identify gaps in the environmental education related to climate change, greenhouse effect and global warming in the textbook of grade IX and X designed by the Punjab Curriculum and Textbook Board, Lahore.
4. To develop a module for Environmental Protection and Sustainable Practices for Empowering Youth at grade IX and X studying textbook of Pakistan Studies designed by the Punjab Curriculum and Textbook Board, Lahore.

Literature Review

The need to reform society in order to lessen the effects of anthropogenic climate change presents an extraordinary educational challenge. For school leadership in particular, responding to the climate emergency and society's growing climate activism creates a challenging scenario. Here, we present the results of our study conducted in Aotearoa, New Zealand, with teachers and students who are climate activists. We contend that the establishment of successful climate change education in schools and the facilitation of teacher and student agency depend heavily on school leadership.

We conceptualize schools and their leadership as dynamic assemblages using assemblage thinking, placing it within the new materialisms. We also analyze the experiences of teachers and students as players within these assemblages. We arrive to the conclusion that education may be a catalyst for the cultural shift in society that the climate emergency requires if educational institutions and their leadership styles are deterritorialized and decoded. Bright and Everth, 2023.

At first, the natural environment could withstand the harmful effects of human activity, but as time went on, the devastation escalated to the level of an environmental catastrophe. Even while occasionally actions were made to address environmental issues, they were insufficient, and the problems kept getting worse. Education should be prioritized in the battle against environmental issues as it is the simplest, most cost-effective, and long-lasting solution. Raising an ecologically conscious generation is a must for a habitable environment.

Therefore, the very vital early infancy period should be the primary objective. Increasing children's exposure to nature, fostering a love and protection of it, and developing their attitudes and abilities to contribute to it are all essential investments in our future. What are the responsibilities of educators and families in this context, and what can we do to create a more sustainable, living, and ecological environment? (2025) Yıldırım, B. Despite the current "climate catastrophe," there is broad consensus that we need to change our environmentally damaging behaviors before it's too late. However, knowledge of climate change by itself does not appear to be sufficient to alter our way of life. If we want to drastically alter how we relate to our surroundings, we need to make deeper-level adjustments (Laininen 2019). This open access book examines the essential elements of a future educational framework that will empower people, communities, and educational institutions to meet the twin problems of sustainability and human well-being in the twenty-first century. Western educational institutions educated students to prosper in comparatively predictable environments, enter the workforce, and contribute to society during the majority of the 20th century.

People are in charge of the earth today, making choices that are fundamentally altering social, economic, and environmental systems on a worldwide basis. In this new environment, what is the purpose of education? What do we need to learn today, and how? Each chapter is framed by the instability and unpredictability brought on by globalization, digitization, and climate change. In order to assess how our knowledge and practice of education need to change, chapter writers examine several facets of learning and education system design through the lenses of sustainability and human well-being using case studies from Finland and the US. The authors offer fresh strategies for preparing students for a new, risky, and exciting chapter in human history by drawing on their academic studies and practical experience. Cook (2019).

Acid rain, increasing sea levels, improper monsoons, and global warming are just a few of the environmental problems brought on by our activity, which are creating environmental deterioration at an alarming rate. Although science and technology have many wonderful aspects, we are paying

a very high "price" for them. Economic expansion cannot be maintained by industrialization alone. Technological development and scientific understanding alone cannot solve the problem of a more sustainable global environment; they can only contribute to it. Therefore, if we are to achieve a satisfactory level of environmental sustainability on a worldwide scale, people must be equipped with essential knowledge and education.

Environmental degradation is occurring at an alarming rate due to human activities, causing issues including acid rain, rising sea levels, unsuitable monsoons, and global warming. We are paying a very expensive "price" for science and technology, despite the fact that they have many good qualities. Industrialization is not enough to sustain economic growth. Scientific knowledge and technological advancements by themselves can only help address the issue of a more sustainable global environment. Therefore, people need to be educated and provided with the necessary information if we are to attain a desirable degree of environmental sustainability on a global basis. This study attempts to survey the efficacy of an intervention known as EESD (Environmental Education Suitability Development) in enhancing students' environmental knowledge in light of the significance of environmental education for sustainable development (Llopiz-Guerra et al., 2024). In order to fulfill its expected role in environmental education, the formal education system needs the same basic requirements as any other educational program: political and financial support at the state level; a curriculum or program that can help achieve the desired goals; teachers and other human resources; materials and equipment; and support from the local community. The most important of these "essentials" for the environmental education endeavor are the appropriate instructors, particularly as they are supposed to be role models for the ideals they seek to instill in their pupils. Glasgow and associates, 2024.

It is anticipated that climate change would negatively affect wellbeing and significantly jeopardize mental health. Food safety will be harmed by climate change in a number of ways. Aquatic food provisioning services will be drastically changed by climate change, which will directly affect those who are food insecure. 4. It is anticipated that the effects of climate change on marine ecosystems would cause significant alterations and irreversible losses in many areas, which will have detrimental effects on human lifestyles, economies, and cultural identities (IPCC, 2022).

Even though environmental issues are widespread, Kenyan school curricula do not adequately address environmental sustainability, despite global indicators showing that environmental degradation in developing nations is clearly causing biodiversity loss, carbon emissions to rise, climate change, and a generally lower quality of life (UNESCO, 2016). Effective strategies to

encourage environmental sustainability among Kenyan schoolchildren were identified via research on values education and environmental sustainability. Low awareness and action toward sustainability were thought to result from inadequate environmental values education. (Githinji and Kariuki, 2022).

Environmental education becomes a pressing issue when environmental issues worsen and governments enact environmental regulations. Its possible effects on education and the environment worry a number of parties. According to this pilot research, the principals identified four primary problems with ESD: fostering passion and positive thinking, learning about ESD, cultivating system thinking, and curriculum adaptability. The results of this study indicate that in order to effectively manage ESD in their schools, school administrators must work together to establish best practices, include support networks, and investigate creative collaborations (Zainal-Abidin et al., 2023). To guarantee that education is delivered for sustainable development, schools engage in a variety of activities in distinctive ways. According to the results, educators are creative in how they include environmental education into their courses and extracurricular activities to raise students' understanding of environmental issues. The study disclosed the methods used as well as the difficulties faced by educators and students in the context of environmental education in elementary schools. The researcher recommended that Environmental Education be widely implemented as a subject based on the findings (Phindile & Msezane, 2025).

Methodology:

Researchers carried out the content analysis of the Pakistan Studies textbooks written in both English and Urdu for grades IX and X by the Punjab Curriculum and Textbook Board, Lahore. The researchers carefully examined the subject matter, concentrating on environmental issues pertaining to global warming, the greenhouse effect, and climate change. Finding out whether or not the textbooks of Pakistan Studies for grades IX and X incorporate environmental protection-related topics, such as climate change, the greenhouse effect and global warming. Additionally, a content analysis was also conducted to evaluate how well the textbooks' coverage of the material encourages interactive experiential learning and gives students the chance to take part in environmental protection activities that center on sustainable practices. The Pakistan Studies textbook for grades 9 and 10, which is available for download at <https://pctb.punjab.gov.pk/E-Books>, was chosen using the purposive sampling approach.

Content Analysis

The researchers examined the Pakistan Studies textbooks used in classes IX-X and conducted a detailed analysis of the content, concentrating on environmental protection -related content, i.e., climate change, greenhouse effect, and global warming, and moreover, it was also analyzed to assess the integration of environmental protection through sustainable practices in the textbook of Pakistan Studies at grade IX-X by the Punjab Curriculum and Textbook Board, Lahore. Content analysis identified that environmental education related topics, such as climate change, the greenhouse effect and global warming is not available in the textbooks of Class X, but one chapter related to land and the environment is added in the Pakistan Studies textbook at grade IX, containing page numbers 59-94, but no content related to environmental protection and sustainable practices is added in the subject of Pakistan Studies at grades IX and X.

The textbook of Pakistan Studies taught in grade 9, designed by the Punjab Curriculum and Textbook Board, Lahore, has four chapters, and the below-mentioned learning outcomes mentioned on page 59 in chapter 3 are about land and the environment.

Student's Learning Outcomes

After studying this chapter, students will be able to:

1. Identify the location of Pakistan with reference to its latitudes and longitudes and its neighbours, with the help of a physical map.
2. Describe the major landform features of Pakistan (Mountain ranges, Plateaus, Plains etc.)
3. Identify the major climatic regions of Pakistan and briefly describe the characteristics of every region.
4. Identify the location of major glaciers and rivers of Pakistan and highlight their importance.
5. Discuss major types of forests, their distribution, importance and protection.
6. Identify the wildlife of Pakistan, their habitat and efforts to protect wildlife in Pakistan.
7. Describe the characteristics of major natural Regions of Pakistan and human environment in them.
8. Discuss the nature and importance of environmental hazards of Pakistan and their associated problems and solutions.
9. Describe the problems associated with the conservation of water, land, natural vegetation and wildlife.

Moreover, this chapter 3 covers the following contents: location of Pakistan, importance of location, physical features of Pakistan, climate of Pakistan, impact of climate on human life, major glaciers and rivers of Pakistan, canals of Pakistan, forests, wildlife in Pakistan, natural regions of Pakistan, major environmental hazards, and their remedies. pollution, deforestation, desertification, salinity, and water logging. problems associated with the conservation strategies for water, land, natural vegetation, and wildlife, but no objectives and contents were added related to climate change, the greenhouse effect, and global warming. The picture below was taken from the textbook of Pakistan Studies, Grade 9, Page 85, which was under review.

Major Environmental Hazards and their Remedies

“Environment means the surroundings or conditions in which a person, animal or plant lives or operates. The environment, including landforms, climate, soil and natural vegetation, etc. has a deep impact on human life. Environment also impacts all activities of human beings in a region whether these are economic, political, social, religious, or financial. Environmental hazards are such problems that arise from inappropriate or unsuitable environment, which adversely affect not only human life but also wildlife, vegetation and aquatic life.

A brief overview of the textbook's contents related to land and the environment is presented here, which explains that human needs have grown, leading to the rapid use of natural resources and causing environmental problems. Pakistan is facing pollution, deforestation, desertification, salinity, and water logging, as well as other environmental hazards in this age of technology.

Details of the following environmental hazards are also mentioned in the textbook of Pakistan Studies, which includes pollution that focuses on scientific advancements that have provided numerous human benefits, but they also lead to environmental pollution, a harmful mixture of contaminants into the natural environment. Environmental pollution is classified into three types: air, land, and water pollution. Air pollution, caused by increased harmful gases like carbon dioxide and sulphur oxide, from factories and vehicles, harms the environment, depleting the ozone layer, and raising global temperatures, leading to diseases like lung cancer and skin diseases.) Human development can reduce air pollution by reducing toxic and harmful gases emissions, using fuels like CNG, growing trees, installing filtration plants, and banning harmful gases like chlorofluorocarbon. Smog, a mixture of smoke and fog, causes eye, lungs, and skin diseases. Water pollution occurs when toxic chemicals from factories are mixed into water, contaminating rivers, canals, and oceans. This contamination harms human life, vegetation, and aquatic life. To prevent contamination, factories should clean wastewater before discharging it into rivers or canals.

Land pollution, caused by toxic waste from households, factories, and hospitals, harms the environment and affects the beauty of the earth. Solutions include solid waste management techniques, recycling, and manure conversion.

Uncontrolled deforestation reduces oxygen production and increases harmful gases in the atmosphere, deteriorating the environment and increasing global temperatures. This leads to climate change, decreased rainfall, floods, and adverse effects on agriculture. To combat climate change, we should protect existing trees and plant more forests, while also reforestation involves planting new forests to replace deforestation.

Desertification is a process caused by human activities like cattle grazing, tree cutting, and repeated

crop cultivation, which leads to barren, infertile, and uncultivable land. Pakistan's rich agricultural land is being turned into a desert due to poor cultivation methods and water scarcity.

The land is becoming barren due to water waste from canal irrigation and increased industries, causing a water shortage for irrigation. Salinity and water logging are also described in the textbook that emphasizes that Pakistan's agricultural sector relies heavily on canal irrigation, which is boosting production. However, the canal system is causing water logging, where underground water levels rise, making the soil saline and uncultivable. This condition can be remedied by cultivating grass and fodder to produce good yields. Water logging occurs when underground water levels rise further, creating swamps and causing land to become barren. Many agricultural lands in Pakistan have lost their productive capacity due to these issues.

Kullar grass is being planted on water-logged agricultural lands in Pakistan to improve cultivation. Water channels and canals are being cemented to prevent water wastage and protect land from water logging. Eucalyptus and poplar trees are being planted in areas with high salinity to absorb more water and transfer it into the atmosphere. However, conservation strategies face challenges. Lack of resources and proper arrangements lead to pollution of river and sea water, causing a shortage of irrigation water. Canals are losing water due to lack of lining, and dams are not being built. Traditional irrigation methods are wasting water, necessitating education and training for farmers.

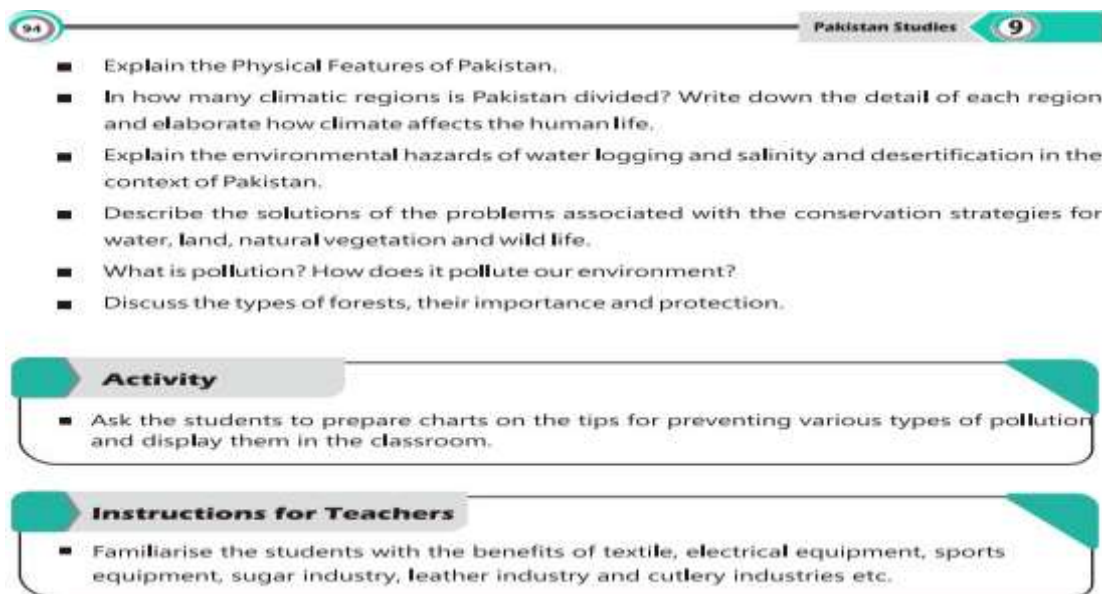
Reducing salinity and water logging is crucial for land conservation in Pakistan. Implementing tube wells and limiting human activities can help conserve land. Disposing of garbage and using innovative cultivation methods can also help maintain fertility.

Trees are crucial habitats for animals and birds, but humans are cutting them for housing, fuel, and furniture. Revising vegetation protection rules, promoting awareness campaigns, and controlling environmental pollution are essential for securing its future and preventing unnecessary tree cutting.

Pakistan faces serious wildlife issues including illegal hunting, reduced pastures due to herding/grazing, public ignorance, and deforestation. Awareness programs and encouraging hunters to seek other income sources are needed to address these issues.

The above analysis of the content of the textbook of Pakistan Studies, Grade 9, shows that most of the contents are not related to the daily life of the students. Contents about climate change, global warming, the greenhouse effect and sustainable practices to protect environment are not addressed in this textbook. The natural environment receives the most attention, while the man-made

environment receives the least. Climate change, the greenhouse effect, and global warming are not addressed in the book, which is the major gap of the textbook. Students' activity and project assignments are totally absent in the textbooks. The following exercises and activities are taken from the textbook. The focus of textual exercises is just on the cognitive domain of students, not on the affective and psychomotor domains. Questions asked in the exercise are assessing the lower level of the cognitive domain of students. Exercise consists of six MCQs, five fill-in-the-blanks, and ten short answers, i.e. Define the term location. Name the four natural regions of Pakistan. Define waterlogging and salinity. Indicate any two benefits of forests. Name any three glaciers located in Pakistan. Write any three glaciers located in Pakistan. Define the term desertification. Name the types of canals in Pakistan. What kind of climate change is occurring due to rising earth temperature? Write down two disadvantages of deforestation. In addition to these five matching columns, they are added in a textual exercise. Whereas the detailed answer includes a description of the location of Pakistan and its significance, the rest of the questions are shown in the below picture taken from the textbook of Pakistan Studies that was analyzed.



Conclusion

The content of environmental protection in relation to climate change, greenhouse effect and global warming is not sufficiently addressed in the textbook of grade IX and X designed by the Punjab Curriculum and Textbook Board, Lahore. The emphasis of Pakistan Studies textbooks for grades IX and X is solely on enhancing the pupils' cognitive capacities. The goals of the psychomotor and emotional domains have been partially represented. The textbooks' content is

insufficient to create sustainable practices and address them scientifically. Environmental protection in relation to climate change, the greenhouse effect, global warming, and sustainable practices is not addressed, which is the major gap in the textbooks. Four theoretical and practical modules on environmental protection and sustainable practices were created, with an emphasis on pre- and post-tests to gauge students' comprehension. These modules included definitions and explanations of climate change, the greenhouse effect, and global warming, the effects of climate change on Pakistan, with an emphasis on sustainable practices and solutions for schools and students. These modules also added hands-on activities integrating low-cost sustainable practices and strongly recommended the formation of Eco-Clubs for student-led initiatives.

Recommendations

In order to fully use the breadth of the textbooks, the authors may have enough training, and the integrated materials may emphasize the goals of environmental education. Textbooks may incorporate real-world sustainability modules and projects for pupils. More examples from the learner's immediate surroundings may be preferable. It is necessary to examine the Punjab curriculum in light of climate policy. The environmental education framework of Punjab may be compared with others, such as UNESCO and the UN SDGs.

References

- Cook, J. W. (2019). *Sustainability, human well-being, and the future of education* (p. 425). Springer Nature.
- Chandler, K., Aristeidou, M., Ball, S., Charitonos, K., Kent, C., Perryman, L.-A., & Rets, I. (2024). Collaboration and care in climate education: Brave responses to an uncertain future. *The Curriculum Journal*, 00, 1–15. <https://doi.org/10.1002/curj.296>
- Cormier, D. (2024). *Learning in a time of abundance: The community is the curriculum*. Johns Hopkins University Press.
- Everth, T., & Bright, R. (2023). Climate change and the assemblages of school leaderships. *Australian Journal of Environmental Education*, 39(1), 17–36.
- Feldbacher, E., Waberer, M., Campostrini, L., & Weigelhofer, G. (2023). Identifying gaps in climate change education-a case study in Austrian schools. *International Research in Geographical and Environmental Education*, 33(2), 109–124.

- Forsler, A., Nilsson, P., & Walan, S. (2024). Capturing and developing teachers' pedagogical content knowledge in sustainable development using content representation and video-based reflection. *Research in science education*, 54(3), 393-412.
- Glasgow, J., Vale, R., Bay, R., & Ann, S. (2024). *Environmental education in the formal system: The training of teachers*. In A sourcebook for environmental education: A practical review based on the Belgrade Charter (pp. 72-91). CRC Press.
- Howard-Jones, P., Sands, D., Dillon, J., & Fenton-Jones, F. (2021). The views of teachers in England on an action-oriented climate change curriculum. *Environmental Education Research*, 27(11), 1660–1680.
- Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & Van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. *The Lancet Planetary Health*, 5(12), e863–e873.
- Huang, J., Duan, X., Dai, S., & Zhang, Z. (2024). The impact of fin tech ecosystem on urban carbon emissions: Evidence from China. *Environment, Development and Sustainability*, 1-27.
- Husin, A., Helmi, H., Nengsih, Y. K., & Rendana, M. (2025). Environmental education in schools: sustainability and hope. *Discover Sustainability*, 6(1), 41.
- Ikonen, E., Keränen-Pantsu, R., & Welz, C. (2025). Imagining sustainable worlds: the potential of mythical stories in environmental education. *Journal of Philosophy of Education*, 59(1), 59-78.
- IPCC, 2022: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp.
- Ishaque, B., Paul, I. A., & Fatima, H. (2025). Exploring Environmental Education Content and Pedagogical Skills for Trainee Teachers: A Study on Ecological Literacy, Environmental Issues, and Practical Teaching Approaches. *Open Journal of Social Sciences*, 13(1), 154-174.
- Kariuki-Githinji, S., Boyo, B., Bowen, M., & Kiambi, P. (2022). School curriculum and environmental sustainability. *Technium Soc. Sci. J.*, 32, 126.
- Laininen, E. (2019). Transforming our worldview towards a sustainable future. *Sustainability, human well-being, and the future of education*, 161-200.

- Llopiz-Guerra, K., Ruiz, D. U., Hernandez, R. M., Mejia, V. L. V., Nunayalle, J. D. R. J., & Sanchez, K. R. (2024). Importance of Environmental Education in the Context of Natural Sustainability. *Natural and Engineering Sciences*, 9(1), 57-71.
- Lorenzo, C., & Bueno, M. D. P. (2020). La conservación de la naturaleza en las relaciones Norte-Sur: El pago por los servicios ecosistémicos. *Revista de Estudios Sociales*, 71, 40–50.
- Matsekoleng, T. K., Mapotse, T. A., & Gumbo, M. T. (2024). The role of indigenous games in education: a technology and environmental education perspective. *Diaspora, Indigenous, and Minority Education*, 18(1), 68-82.
- Phindile, P. I., & Msezane, S. (2025). Initiatives in Schools to Promote Environmental Education Programmes: A case Study of Muden Schools: Promoting Environmental Education Programmes. *International Journal of Curriculum and Instruction*, 17(1), 265-282.
- Prosser, G., Rojas-Andrade, R., Aranguren, S., Caro Zúñiga, C., Schröder Navarro, E., & Romo-Medina, I. (2025). Compost for your seeds: implementation strategies for environmental education in Chile from the ERIC taxonomy. *International Research in Geographical and Environmental Education*, 34(1), 60-78.
- Salazar, C., Jaime, M., Leiva, M., & González, N. (2024). Environmental education and children's pro-environmental behavior on plastic waste. Evidence from the green school certification program in Chile. *International Journal of Educational Development*, 109, 103106.
- Sitorus, S., & Wiyarni, W. (2024). Addressing environmental, economic and social impact mining companies on Taliabu Island, North Maluku. *Technium Soc. Sci. J.*, 61, 270.
- UNESCO. (2019). Country progress on climate change education, training and public awareness: An analysis of country submissions under the United Nations Framework Convention on Climate Change. Education for Sustainable Development, United Nations Educational, Scientific and Cultural Organization.
- Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Beagley, J., Belesova, K., ... Costello, A. (2021). The 2020 report of the Lancet Countdown on health and climate change: Responding to converging crises. *Lancet (London, England)*, 397(10269), 129–170.
- Waldron, F., Mallon, B., Barry, M., & Martinez Sainz, G. (2020). Climate change education in Ireland: Emerging practice in a context of resistance. *Ireland and the climate crisis*, 231-248.

Yıldırım, B. (2025). *Preparing Children for the Future With Environmental Education. In Geography Education and Explorations on Human Development and Culture* (pp. 265-288). IGI Global Scientific Publishing.

Zainal-Abidin, M. S., Mokhtar, M., & Arsat, M. (2023). Education for sustainable development from the lenses of Malaysian school leaders: a preliminary study. *Asian Education and Development Studies*, 12(2/3), 150-165.