Pedagogical Cluster- Journal of Pedagogical Developments
PCJPD: Volume 4 Issue 02, February, 2026, online: ISSN 2956-896X

PEDAGOGICAL CLUSTER
JOURNAL OF PEDAGOGICAL DEVELOPMENTS

Website: https://euroasianjournals.org/index.php/pc/index

Promoting Environmental Safety Culture Through Education: Global Trends And Perspectives

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Annotation: At the contemporary stage of global development, guaranteeing an environmentally safe living space for humanity has become an issue of paramount importance. The growing scale of environmental pollution and the weakening of the balanced interaction within the "Nature–Society–Human" system require comprehensive reflection and scientifically grounded responses. In this context, fostering students' environmental safety culture through modern interdisciplinary approaches is regarded as an essential demand of the present era. This article explores the nature of global environmental challenges by focusing on the conceptual foundations of "ecology," "security," "culture," and "environmental safety culture." Special attention is given to identifying the distinctive characteristics of environmental safety and substantiating the necessity of scientific inquiry based on a robust theoretical and methodological framework.
Keywords: environmental safety, ecology, security, culture, interdisciplinary trends, environmental safety culture, global environmental problems, sustainable development.

Introduction

At the present stage of global development, ensuring that humanity lives within an environmentally safe space has emerged as one of the most pressing challenges of our time. Intensifying environmental threats, the progressive degradation of natural ecosystems, and the disruption of the "Nature–Society–Human" nexus compel nations worldwide to reconsider their relationship with the natural environment. In this context, the growing deterioration of environmental conditions on a planetary scale highlights the urgent need to rethink existing approaches to environmental protection and sustainability.

From this perspective, the development of environmental safety culture among students through innovative interdisciplinary approaches has become a contemporary educational priority. Addressing environmental safety as a global issue requires not only recognizing its significance, but also conducting in-depth

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scientific analysis to clarify its conceptual foundations, identify its distinctive characteristics, and explore effective educational mechanisms for its formation.

Environmental problems are inherently complex and multidimensional, as they permeate nearly all spheres of human activity. Therefore, their resolution demands a systematic and scientifically grounded approach that integrates ecological, social, cultural, and educational dimensions. In order to ensure the effectiveness of research and practical initiatives in this field, it is essential to begin with a conceptual examination of fundamental notions such as "ecology," "security," "culture," and "environmental safety culture."

The term *ecology* originates from the Greek words *oikos* (meaning "home" or "habitat") and *logos* (meaning "study" or "science"), and it denotes the scientific study of interactions among living organisms as well as between organisms and their surrounding environment within the biosphere. The concept was introduced into scientific discourse by the German biologist Ernst Haeckel (1834–1919) in the late nineteenth century, marking the foundation of ecology as an independent scientific discipline [6; p. 15].

Literature Review

Ecology emerged as an independent scientific discipline in the early twentieth century, although its conceptual development began earlier, at the turn of the nineteenth and twentieth centuries. The incorporation of ecological ideas into national scientific and educational practice occurred gradually, reflecting the evolving understanding of human–environment interactions. During this formative period, numerous prominent scholars contributed significantly to the advancement of ecological thought. Among them were J. Burdon-Sanderson and H. Spencer in England; S. Forbes and K. Schröter in the United States; E. Haeckel, K. Möbius, and K. Troll in Germany; E. Suess in Austria; E. Warming in Denmark; H. Gams in Switzerland; and E. Leroy in France. Later, ecological research was further developed by scholars such as A. Tansley, F. Clements, W. Shelford, R. Lindeman, E. and H. Odum, J. Forrester, D. Meadows, and B. Commoner in the United States, as well as D. N. Kashkarov, V. N. Sukachev, V. I. Vernadsky, and N. F. Reimers in Russia, whose works laid the theoretical and methodological foundations of modern ecology [2, p. 283].

Over time, ecology has expanded beyond the boundaries of purely biological sciences and has evolved into an interdisciplinary field encompassing social, economic, cultural, and technological dimensions. This transformation is largely driven by the increasingly evident negative consequences of rapid scientific and technological progress on the natural environment. As environmental problems became global in scale and complexity, the scientific

discourse began to incorporate broader perspectives, leading to the emergence and widespread use of concepts such as "human ecology," which emphasizes the interdependence between humans and their surrounding environment [3].

In this regard, Ernst Ulrich von Weizsäcker, Director of the European Institute for Environmental Policy (Germany), emphasizes that technology—having become an inseparable component of culture, entrepreneurship, and overall development—represents an unavoidable subject of contemporary discourse [4]. He argues that in the future, the ecological paradigm will gradually prevail over the economic paradigm and begin to regulate it. Accordingly, the twenty-first century is increasingly characterized as the century of ecological security [5, p. 12].

Similar ideas are reflected in the lectures of Abdel-Hamed Silamon, Professor at Staffordshire University (United Kingdom), who addresses modern challenges of environmental security. He highlights the recognition of the limits of human existence, the necessity of understanding that human life is not infinite, and the importance of living in harmony with nature and the universe. According to his perspective, human life cannot be conceptualized independently of the natural environment, as the two are fundamentally interconnected.

Analysis and Results

In the context of escalating global environmental challenges, it has become increasingly evident that respect for and protection of nature must be cultivated from early childhood. Environmental problems affect all members of society without exception, and their consequences transcend geographical, social, and economic boundaries. Therefore, the formation of an environmental safety culture is essential for understanding and preventing ecological catastrophes caused by human activities, including air and water pollution, global warming, uncontrolled disposal of household waste, acid rain, the greenhouse effect, and large-scale deforestation. In this regard, acquiring contemporary ecological knowledge, developing genuine environmental awareness, and fostering a high level of ecological culture should be regarded as an ongoing and vital necessity of human life [1, p. 26].

The continuing process of global warming and the associated climatic changes are expected to produce severe negative environmental impacts in the near future. An increase in the frequency and duration of warm periods disrupts natural water circulation and storage cycles, resulting in more frequent extreme weather events, prolonged droughts, and intensified precipitation. Rising temperatures accelerate the melting of glaciers and snow cover, which play a crucial role in regulating water flows within ecosystems. Consequently, these

processes pose serious threats to ecological balance and the stability of natural systems.

Addressing these challenges requires a fundamental transformation in human attitudes toward the natural environment. According to Will McCallum, Oceans Campaign Manager at Greenpeace UK, the current state of the planet sends a powerful message about the urgent need to reconsider humanity's relationship with nature. He emphasizes that human activities should be aligned with the laws of nature and that environmental changes should not undermine the living conditions of ecosystems and living organisms.

Similar views are expressed by H. Arthur Westing in his work on the environmental and social security dimensions of human ecology. He underscores the necessity of developing future generations' capacity to meet their needs without causing harm to the environment, highlighting the importance of rational and responsible resource use. Dennis Pirages and Theresa Manley also argue that environmental security and the growing emphasis on sustainable use of natural resources demonstrate that human security remains a consistently relevant global concern. In this context, the International Institute for Sustainable Development states that achieving security stabilization requires elevating human security to the global level through the rational management of the environment and natural resources. Although the development of energy-saving technologies, alternative energy sources, and innovative solutions has yielded positive outcomes, uncontrolled and unjustified interference in natural processes has simultaneously generated numerous adverse environmental consequences, raising serious concerns about ecological degradation.

The core principles of ecological education are embodied in the integrated unity of education, upbringing, and practical activity. This triad is reflected in three key directions of ecological engagement: the protection of ecosystems (both natural and anthropogenically transformed), the rational and sustainable use of ecosystem resources, and the restoration of degraded and damaged ecosystems. These directions collectively form the methodological basis for developing environmental safety culture and ensuring long-term ecological sustainability.

Although the formation of environmental culture has been widely addressed in pedagogical research, the interdisciplinary development of environmental safety culture among primary school students remains insufficiently explored as a distinct area of educational practice. The findings of this study indicate that strengthening environmental safety culture in primary education requires systematic curricular, methodological, and organizational improvements.

First, primary education curricula should be revised to explicitly integrate environmental safety components across related subjects. Subjects such as mother tongue and reading literacy, natural sciences, mathematics, technology, and civic education should include age-appropriate ecological concepts, environmental terminology, and value-oriented tasks. This integration should not be limited to theoretical knowledge but should emphasize practical, life-related examples that foster ecological awareness and responsibility.

Second, interdisciplinary lesson planning should be institutionalized within primary education programs. Teachers should be provided with methodological guidelines for designing integrated lessons based on common themes, such as water conservation, biodiversity, waste management, and climate change. Such thematic integration enables students to perceive environmental issues holistically and supports the development of systems thinking from an early age.

Third, experiential learning should become a core component of environmental education in primary schools. Curriculum frameworks should allocate time and resources for observations, simple experiments, project-based activities, and field-based learning, including school eco-gardens, nature corners, and community-based environmental actions. These practices enhance students' engagement and facilitate the transformation of ecological knowledge into environmentally responsible behavior.

Fourth, teacher professional development programs should place greater emphasis on environmental education and interdisciplinary methodologies. Continuous training courses should be organized to strengthen teachers' competencies in STEAM-based environmental projects, inquiry-based learning, and the use of digital and visual tools for explaining complex ecological processes in an age-appropriate manner.

Fifth, assessment systems in primary education should be expanded to include indicators of environmental literacy and environmental behavior. In addition to evaluating cognitive outcomes, formative assessment methods should capture students' attitudes, participation in ecological activities, and ability to apply environmental knowledge in everyday situations.

Finally, cooperation between schools, families, and local communities should be encouraged as part of primary education programs. Involving parents and community organizations in environmental initiatives reinforces learning outcomes and contributes to the formation of a sustainable environmental safety culture beyond the school environment.

In conclusion, the systematic integration of environmental safety culture into primary education programs—through interdisciplinary curriculum design,

experiential learning, teacher training, and community engagement—creates a strong foundation for nurturing environmentally responsible citizens capable of contributing to sustainable development in the long term.

Conclusion

Although the formation of environmental culture has been the subject of extensive research over many years, the interdisciplinary development of environmental safety culture among primary school students has not yet been sufficiently examined as an independent pedagogical research problem. In particular, the potential of interdisciplinary integration as a systematic approach to enhancing environmental safety awareness at the primary education level remains underexplored.

Within primary education, interdisciplinarity should be constructed through the meaningful integration of subjects that are conceptually and methodologically related. The effective organization of interdisciplinary lessons requires the careful identification of interconnected topics, the alignment of shared conceptual elements, and close consideration of existing curriculum frameworks. From this perspective, the implementation of interdisciplinary integrated learning activities in subjects such as mother tongue and reading literacy, moral and civic education, and natural sciences demonstrates significant pedagogical potential for fostering environmental safety culture among young learners.

These integrated instructional practices not only contribute to the holistic development of students' knowledge and skills but also create favorable conditions for the formation of environmentally responsible thinking, thereby supporting the long-term goals of sustainable development and environmental security.

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