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INTERDISCIPLINARY APPROACH AS A MEANS OF DEVELOPING ENVIRONMENTAL COMPETENCIES IN FUTURE PRIMARY SCHOOL TEACHERS

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Abstract: This article examines the theoretical and practical aspects of developing environmental competencies in future primary school teachers through an interdisciplinary approach. The relevance of the study is determined by the growing need to prepare teaching professionals capable of providing environmental education and fostering environmental awareness among primary school pupils in accordance with the principles of sustainable development.

The purpose of the study is to identify the potential of the interdisciplinary approach for enhancing the environmental competencies of future primary school teachers.

The research employed the methods of scientific and pedagogical literature analysis, pedagogical observation, questionnaire surveys, diagnostic tasks, and a pedagogical experiment. Particular attention was paid to integrating environmental content into professional training disciplines, including pedagogy, methods of teaching the native language, literary reading, and methods of introducing pupils to the surrounding world.

The findings indicate that the interdisciplinary approach contributes to improving students' environmental knowledge, developing environmental thinking, fostering problem-solving skills related to environmental issues, and preparing future teachers to provide effective environmental education for primary school pupils.

Keywords: environmental competence; interdisciplinary approach; future teacher; primary education; sustainable development; environmental education; professional training.

Introduction

Today, environmental problems have become global in scale and exert a profound influence on the development of society. Climate change, environmental pollution, depletion of natural resources, and biodiversity loss require the formation of a new environmental worldview and environmentally responsible behaviour. These challenges have transformed environmental education into one of the strategic priorities of contemporary educational systems.

International organizations such as UNESCO, UNEP, and the United Nations recognize education as one of the most effective instruments for achieving the Sustainable Development Goals (SDGs). Within this context, teacher education occupies a central position, as teachers play a decisive role in fostering environmental awareness, ecological culture, and responsible attitudes toward nature among younger generations.

In the professional preparation of future primary school teachers, environmental education has traditionally been confined to a limited number of ecology-related disciplines. However, current educational requirements emphasize the integration of environmental content throughout the entire teacher education curriculum. Such integration enables future teachers to acquire not only ecological knowledge but also the professional competencies necessary to incorporate environmental education into various school subjects and extracurricular activities.

In this regard, the interdisciplinary approach has gained particular significance. It facilitates the integration of knowledge, teaching methods, and practical experience from different academic

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disciplines, thereby ensuring the comprehensive development of students' environmental competencies. Rather than treating environmental education as an isolated field of study, the interdisciplinary approach promotes a holistic understanding of environmental issues and prepares future teachers to address them effectively in their professional practice.

The development of environmental competencies among future primary school teachers is especially important because primary education lays the foundation for children's environmental awareness, values, and behaviour. Teachers who possess well-developed environmental competencies are better equipped to cultivate pupils' respect for nature, encourage environmentally responsible decision-making, and contribute to the implementation of education for sustainable development.

Therefore, the integration of interdisciplinary principles into teacher education represents an important direction for improving the quality of professional training and preparing future educators capable of responding to contemporary environmental challenges.

Literature Review

The issue of environmental education has attracted considerable attention from both national and international scholars. The theoretical foundations of environmental education have been extensively developed in the works of I.D. Zverev, A.N. Zakhlebny, S.N. Glazachev, L.V. Moiseeva, and G.P. Sikorskaya, whose studies established the conceptual principles and educational objectives of environmental education.

The development of environmental culture as an essential component of personal development has been examined by V.A. Yasvin, N.N. Moiseev, and I.T. Surantaev. These scholars emphasize that environmental education should extend beyond the acquisition of ecological knowledge to include the formation of environmental values, responsible attitudes toward nature, and a willingness to participate actively in environmental protection. Their research demonstrates that environmental awareness and ethical responsibility constitute fundamental prerequisites for environmentally responsible behaviour.

Within the field of teacher education, the development of environmental competencies has been investigated by E.V. Borodina, O.V. Kuzmina, and A.V. Petrov. Their studies highlight the necessity of designing specialized pedagogical methods, instructional technologies, and educational strategies that enable future teachers to acquire the knowledge, skills, and professional competencies required for effective environmental education. These researchers argue that environmental competence should be regarded as an integral component of teachers' professional competence rather than as an isolated educational outcome.

Recent studies increasingly emphasize the importance of interdisciplinary learning as an effective approach to developing environmental competencies. The interdisciplinary approach enables students to integrate ecological knowledge with pedagogical, psychological, social, and methodological perspectives, thereby fostering systems thinking and a comprehensive understanding of environmental issues. Such integration enhances the practical relevance of environmental education and prepares future teachers to address environmental challenges within diverse educational contexts.

Despite the growing body of research devoted to environmental education and competency-based teacher training, the development of environmental competencies among future primary school teachers through an interdisciplinary approach remains insufficiently explored. Existing studies primarily focus either on environmental education in general or on separate aspects of professional teacher training, while relatively little attention has been paid to the comprehensive integration of environmental content across professional disciplines. Consequently, there is a clear need for further theoretical justification and practical implementation of interdisciplinary approaches within contemporary teacher education programs.

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Research Methodology

The study was conducted at Namangan State University with the participation of third-year students enrolled in the Faculty of Primary Education. The research was designed to evaluate the effectiveness of an interdisciplinary approach in developing the environmental competencies of future primary school teachers.

To achieve the objectives of the study, a combination of theoretical and empirical research methods was employed.

Literature analysis was carried out to examine national and international scientific publications addressing environmental education, interdisciplinary learning, and the development of professional competencies in teacher education. This analysis provided the theoretical foundation for the research.

Pedagogical observation was used to monitor the educational process, focusing on how students acquired environmental knowledge across different academic disciplines and how they participated in curricular and extracurricular environmental activities.

Questionnaire surveys were conducted to assess students' environmental knowledge, attitudes toward environmental issues, and perceptions of the teacher's role in environmental education. The survey data made it possible to identify students' initial level of environmental competence and to evaluate changes during the experimental work.

Diagnostic tasks were designed to assess the level of environmental competence among the participants. These tasks included solving environmental case studies, analysing texts related to environmental issues, and designing lesson plans incorporating environmental content appropriate for primary school education.

A **pedagogical experiment** constituted the central component of the research. The experimental work involved the design, implementation, and evaluation of interdisciplinary instructional modules that integrated environmental content into professional teacher education courses. The experiment consisted of diagnostic, formative, and control stages, allowing the researchers to evaluate the effectiveness of the proposed interdisciplinary approach.

The collected data were analysed using comparative and qualitative analysis. The findings obtained through observations, questionnaires, diagnostic tasks, and the pedagogical experiment served as the basis for evaluating the effectiveness of the proposed model for developing environmental competencies in future primary school teachers.

Theoretical Foundations of the Interdisciplinary Approach to Developing Environmental Competencies

An interdisciplinary approach to education involves the integration of knowledge, teaching methods, and research perspectives from different academic disciplines in order to achieve a more comprehensive and holistic understanding of the phenomena under study. In the context of preparing future primary school teachers, this approach provides an effective means of overcoming the fragmented nature of environmental knowledge and fostering a systems-based understanding of the complex relationships between humans and the natural environment.

According to the findings of the present study, the environmental competence of a primary school teacher should be regarded as an integrated professional and personal construct that encompasses the following interrelated components:

1. **Cognitive component** – a well-structured system of knowledge concerning fundamental ecological principles, the current state of the environment, the causes and consequences of environmental problems, and possible strategies for their prevention and solution.

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2. **Value–motivational component** – the development of a positive attitude toward nature, recognition of its intrinsic value, a strong sense of environmental responsibility, and sustained motivation to engage in environmentally responsible behaviour and professional practice.

3. **Operational (practical) component** – the ability to apply methods and techniques of environmental education in primary schools, including planning and conducting environmentally oriented lessons and extracurricular activities, integrating environmental content into different subjects, and fostering ecological culture among pupils.

The interdisciplinary approach promotes the balanced development of all these components. Integrating environmental content across professional disciplines enables students to recognize the relevance of environmental issues in different fields of knowledge and everyday life, thereby strengthening both their theoretical understanding and their practical teaching competence.

Within **pedagogy**, students examine the psychological and educational foundations of environmental awareness, age-related characteristics of children's perception of environmental issues, and effective methods of environmental education in primary schools.

Within **literary reading and language teaching**, students analyse literary works that explore the relationship between humans and nature. Such texts contribute to the development of environmental values, empathy, and emotional responsiveness toward the natural world while simultaneously improving students' ability to use literature as a pedagogical tool for environmental education.

Within the **Methodology of Teaching the Surrounding World**, students investigate natural phenomena, ecosystems, biodiversity, and local environmental conditions. They acquire practical experience in conducting environmental observations, organising simple research activities, and applying inquiry-based learning methods appropriate for primary school pupils.

Environmental topics are also incorporated into studies of local ecosystems, the impact of human activities on the environment, the sustainable use of natural resources, creative projects based on natural materials, and interdisciplinary educational projects related to environmental protection. Such integration enables future teachers not only to acquire scientific knowledge but also to apply it effectively in their future professional practice. Consequently, the interdisciplinary approach contributes to the development of a holistic environmental worldview, systems thinking, and the professional competencies required for implementing environmental education in primary schools.

Practical Implementation of the Interdisciplinary Approach

As part of the pedagogical experiment, a model for the professional training of future primary school teachers based on an interdisciplinary approach to developing environmental competencies was designed and implemented. The model consisted of the following sequential stages.

Stage 1. Initial Diagnosis

The first stage involved assessing students' initial level of environmental knowledge, practical skills, and value orientations. This diagnosis made it possible to identify their readiness for environmental education and to determine the baseline level of environmental competence.

Stage 2. Motivation and Awareness Development

At the second stage, students' awareness of contemporary environmental challenges and the importance of environmental competence in their future professional activities was enhanced through introductory lectures, seminars, and discussions devoted to global environmental problems, sustainable development, and the role of primary school teachers in environmental education.

Stage 3. Integration of Environmental Content into Professional Disciplines

The core stage of the experiment involved integrating environmental topics into professional teacher education courses. This was achieved through several complementary activities:

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- incorporating environmental modules into the curricula of professional disciplines;
- designing interdisciplinary assignments requiring students to apply knowledge from different subject areas to solve environmental problems;
- organizing discussions, round-table sessions, business games, simulations of environmental situations, and educational visits to natural sites and environmental protection institutions;
- using environmental case studies in methodology courses and developing teaching materials with an environmental focus.

This stage enabled students to recognize the interdisciplinary nature of environmental education and its practical relevance to future teaching practice.

Stage 4. Practice-Oriented Training

The fourth stage focused on the practical application of the competencies developed during the training process. Students designed and delivered environmentally oriented lessons and extracurricular activities for primary school pupils during their teaching practice. They also participated in environmental campaigns, community-based ecological projects, tree-planting activities, waste collection initiatives, and the development of methodological materials intended for primary school teachers.

These activities strengthened students' professional confidence and enabled them to apply theoretical knowledge in authentic educational settings.

Stage 5. Evaluation of Environmental Competence

The final stage involved evaluating the level of environmental competence achieved by the participants. The same assessment methods employed during the diagnostic stage—including questionnaires, diagnostic tasks, and pedagogical observation—were used to ensure the comparability of results. The evaluation made it possible to determine the effectiveness of the proposed interdisciplinary model and to identify areas requiring further improvement.

Results

The findings of the pedagogical experiment demonstrated a positive impact of the interdisciplinary approach on the development of environmental competencies among future primary school teachers.

Students in the experimental group exhibited a substantially higher level of environmental knowledge, a more systematic understanding of environmental issues, and an improved ability to analyse cause-and-effect relationships between human activities and environmental conditions.

The interdisciplinary approach also contributed to the development of critical thinking, systems thinking, and the ability to propose comprehensive solutions to environmental problems. Participants demonstrated greater readiness to integrate environmental content into various school subjects and to employ innovative teaching methods in environmental education.

The experiment further revealed significant improvements in students' practical teaching skills. Participants successfully designed environmentally oriented lesson plans, organized environmental observations and educational activities, and developed teaching materials appropriate for primary school pupils.

Questionnaire responses and diagnostic assessments indicated increased motivation toward environmental education, greater confidence in professional abilities, and a stronger awareness of teachers' responsibility for fostering environmental culture among younger generations.

A comparative analysis of the control and experimental groups revealed statistically significant differences in favour of the experimental group, confirming the effectiveness of the proposed interdisciplinary model for developing environmental competencies in future primary school teachers.

Conclusion

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The findings of the present study confirm that the interdisciplinary approach is an effective means of developing environmental competencies in future primary school teachers. The integration of environmental content into professional teacher education courses ensures the comprehensive development of the cognitive, value–motivational, and practical components of students' environmental competence.

The preparation of primary school teachers with a high level of environmental competence is a prerequisite for effective environmental education and the successful cultivation of environmental awareness among primary school pupils. In the long term, this contributes to the development of an environmentally responsible society and supports the achievement of the Sustainable Development Goals.

The results demonstrate that the interdisciplinary approach not only enhances students' environmental knowledge but also strengthens their professional readiness to integrate environmental education into the teaching and learning process. Such an approach promotes systems thinking, critical analysis, responsible decision-making, and the ability to organize environmentally oriented educational activities.

Consequently, environmental competence should be regarded as an essential component of the professional competence of future primary school teachers, while the interdisciplinary approach should be considered one of the most effective pedagogical strategies for its development.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Introduce interdisciplinary modules focused on environmental competence development into the curricula of teacher education institutions.
2. Develop methodological guidelines, university textbooks, and instructional materials that facilitate the implementation of interdisciplinary environmental education within teacher training programmes.
3. Organize continuous professional development programmes for university instructors working in pedagogy and primary education departments to enhance their understanding of interdisciplinary teaching methods and environmental education.
4. Strengthen the practice-oriented component of teacher education by providing students with opportunities to participate in authentic environmental projects, conduct educational research, and develop teaching resources for environmental education in primary schools.
5. Encourage and support research activities conducted by university students and academic staff in the fields of environmental education, sustainability, and interdisciplinary teacher education.
6. Establish long-term partnerships between teacher education institutions and environmental organizations, nature reserves, ecological centres, museums, and governmental agencies to organize field trips, practical training, and joint environmental initiatives.
7. Develop and maintain digital educational resources, including websites, blogs, online platforms, and professional communities, dedicated to environmental education and interdisciplinary approaches in teacher preparation.

The implementation of these recommendations will contribute to improving the quality of teacher education, strengthening environmental competence among future primary school teachers, and enhancing the effectiveness of environmental education in general secondary schools.

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