



PRACTICAL ASPECTS OF THE METHODOLOGY FOR DEVELOPING ECOPEDAGOGICAL COMPETENCIES IN PRIMARY SCHOOL TEACHERS

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Abstract

The article reveals the theoretical and methodological foundations for improving the methodology for developing ecopedagogical competencies among future primary school teachers. Particular attention is paid to preparing future teachers for environmentally oriented professional activities and developing their environmental knowledge, ecological thinking, environmental values, responsibility, and practical skills. The significance of the principles of scientific validity, systematicity, integrativity, consciousness, activity, unity of theory and practice, visualization, harmony, and modeling in improving the model for developing ecopedagogical competencies is substantiated.

The content of the motivational-cognitive, activity-practical, reflective-analytical, innovative-integrative, and professional-creative stages of implementing the developed model is revealed. The methodological potential of project-based learning, problem-based learning, Case Study, WebQuest, STEAM technologies, digital educational platforms, virtual laboratories, environmental monitoring, and artificial intelligence-based tools is considered.

It is substantiated that the proposed model contributes to the systematic, staged, and integrative development of ecopedagogical competencies among future primary school teachers and ensures their readiness to organize an environmentally oriented educational process.



Keywords: Ecopedagogy, ecopedagogical competencies, future primary school teachers, environmental education, ecological culture, ecological thinking, environmental responsibility, competency-based approach, pedagogical model, innovative educational technologies, STEAM, digital education, sustainable development.

Introduction

One of the priority tasks of the modern higher education system is the comprehensive preparation of future teachers for professional activity, the development of modern pedagogical competencies, and the assurance of educational quality in accordance with international requirements. Effective implementation of these tasks requires modernization of the higher education system, improvement of educational content based on the competency-based approach, introduction of innovative pedagogical technologies, and support for the professional and personal development of future specialists.

In this context, a multilevel model of education is being developed in the higher education system of the Republic of Uzbekistan, educational programs are being diversified, and the system of continuous professional training is being improved in accordance with international standards. This process is based on the fundamental principles established in the Law of the Republic of Uzbekistan "On Education." These include recognition of the priority of education, freedom to choose the form of education, prevention of discrimination in education, ensuring equal opportunities to receive education, integration of national and universal human values into the content of education and upbringing, the humanistic and democratic nature of education, continuity and consistency of education, ensuring quality education based on state educational standards, differentiated and unified approaches to the selection of educational programs, ensuring the individual's right to lifelong education, social protection of teachers' professional activities, preservation of the secular nature of the education system, promotion of knowledge, abilities and talents, harmonious combination of state and public administration, as well as openness and transparency in the field of education.

Under contemporary environmental challenges, particular importance is attached to the environmental orientation of the professional training of future teachers.



The development of ecopedagogical competence among future primary school teachers is directly related to contemporary requirements for environmental education, the need to integrate environmental values into pedagogical activity, and the implementation of sustainable development ideas in educational practice. The formation of environmentally oriented competencies among future teachers should be considered one of the priority areas of modern teacher education, since primary school teachers are among the key actors in developing environmental awareness, ecological culture, responsible attitudes toward nature, and understanding of sustainable development principles among young learners. Therefore, there is a need to improve the methodology for developing ecopedagogical competencies among future primary school teachers based on modern methodological approaches, didactic principles, innovative pedagogical technologies, and practice-oriented activities.

The purpose of the study is to theoretically substantiate and develop a model for improving the methodology for developing ecopedagogical competencies among future primary school teachers, ensuring the consistent formation of environmental knowledge, values, practical skills, professional experience, and reflective abilities.

Methodology

The methodological basis of the study consists of competency-based, systemic, integrative, and learner-centered approaches. Their interrelationship ensures the holistic development of ecopedagogical competence among future primary school teachers and creates conditions for integrating environmental knowledge, values, practical skills, and professional experience.

Within the framework of the study, ecopedagogical competence is considered an integrative professional competence of a future primary school teacher that ensures the ability to integrate environmental knowledge into pedagogical activities, develop students' ecological culture and ecological thinking, introduce sustainable development ideas into the educational process, analyze environmental problems from a pedagogical perspective, and effectively organize environmentally oriented educational activities.



The following didactic principles form the methodological basis for developing the model.

The principle of scientific validity ensures the formation of modern scientific understanding among future teachers in the field of environmental education and sustainable development, an understanding of ecological regularities, and scientifically grounded comprehension of environmental problems. Environmental knowledge is acquired in connection with international and national scientific achievements, environmental policy, and the concept of sustainable development.

The principle of systematicity implies the staged and interconnected development of ecopedagogical competencies. Environmental knowledge, skills, and values are acquired in logical interrelationship, while previously formed knowledge is enriched with new environmental content.

The principle of integrativity ensures the organic integration of environmental education content with pedagogy, psychology, natural sciences, social sciences and humanities, and information and communication technologies. Interdisciplinary integration contributes to a comprehensive analysis of environmental problems and the application of knowledge from different fields in environmental and pedagogical activities.

The principle of consciousness ensures the conscious acquisition of environmental knowledge by future teachers, a deep understanding of the essence of environmental phenomena and processes, and the ability to connect theoretical knowledge with real-life situations. This principle is an important factor in developing environmental responsibility, ecological thinking, and ecological culture.

The principle of activity is aimed at ensuring students' active participation in educational and cognitive activities. Project-based and problem-based learning, environmental cases, research activities, practical classes, field observations, environmental campaigns, and interactive methods contribute to the formation of experience in environmentally oriented activities.

The principle of unity of theory and practice presupposes an organic relationship between environmental knowledge and practical pedagogical activity. Students acquire experience in applying theoretical knowledge in real



pedagogical situations through environmental projects, teaching practice, environmental monitoring, research work, and socio-environmental initiatives.

The principle of visualization ensures the perception of environmental phenomena and processes through visual tools, digital technologies, multimedia resources, virtual laboratories, GIS maps, environmental models, infographics, and direct study of natural objects.

The principle of harmony ensures the interrelationship of all structural components of the model—goals, content, methods, means, forms, pedagogical conditions, and assessment criteria. This principle ensures the integrity and consistency of the process of developing ecopedagogical competencies.

The principle of modeling contributes to the development of future teachers' competencies in preliminary design of environmental and pedagogical situations, modeling solutions to environmental problems, planning the environmental education process, and making pedagogical decisions.

The study also employed theoretical analysis of scientific and pedagogical literature, analysis of regulatory and legal documents, systematization and generalization of scientific approaches, pedagogical modeling, pedagogical observation, diagnostic tasks, self-assessment, expert evaluation, and monitoring of the results of environmental and pedagogical training.

Research Results

Based on theoretical analysis and the conceptual provisions of the study, a model for improving the methodology for developing ecopedagogical competencies among future primary school teachers was developed.

The developed model represents a holistic, open, and dynamically developing pedagogical system functioning according to the logic of “**input — process — result — feedback.**” This structure ensures the interrelationship of goals, content, methods, means, pedagogical conditions, assessment criteria, and professional training outcomes.

The input block of the model includes the regulatory and legal foundations of education, international requirements in the field of environmental education and sustainable development, including UNESCO ESD, OECD 2030 and SDGs, as



well as the initial level of environmental and pedagogical training of future teachers.

The central procedural block of the model includes six interrelated components of ecopedagogical competence:

- cognitive-knowledge component;
- motivational-value component;
- methodological-didactic component;
- practical-research component;
- social-communicative component;
- reflective-evaluative component.

The cognitive-knowledge component includes a system of knowledge in the fields of ecology, ecopedagogy, environmental education, environmental safety, and sustainable development.

The motivational-value component is characterized by environmental values, a responsible attitude toward nature, professional motivation, and awareness of the social significance of environmental education.

The methodological-didactic component reflects the ability of future teachers to select and apply effective methods, forms, and technologies of environmentally oriented teaching.

The practical-research component involves the ability to organize environmental projects, observations, research, monitoring, and practical environmental protection activities.

The social-communicative component ensures interaction between the future teacher and students, parents, teachers, public organizations, and other actors involved in environmental education.

The reflective-evaluative component includes the ability to conduct self-assessment, professional reflection, analysis of the results of one's own activities, and identification of directions for further professional development.

The development of these components is carried out through five interconnected stages.

The first stage — motivational-cognitive. This stage is aimed at developing students' scientific knowledge of the theoretical foundations of environmental



education, ecopedagogy, the concept of sustainable development, environmental safety, ecological culture, and environmental values. At the same time, positive motivation to address environmental problems, environmental responsibility, and professional interest are developed. At this stage, problem-based lectures, seminars, Case Study, brainstorming, concept maps, debates, SWOT analysis, clustering, INSERT, and interactive methods based on digital educational platforms are used.

The second stage — activity-practical. Its content is aimed at applying ecopedagogical knowledge in real pedagogical situations and developing competencies in designing and organizing environmental education. Students develop plans for environmentally oriented lessons and environmental projects, participate in field observations, environmental monitoring, environmental campaigns, and teaching practice, perform environmental tasks based on STEAM elements, and participate in research activities. The main methodological tools include the project method, problem-based learning, role-playing and business games, training sessions, collaborative learning, group work, the research method, reflective analysis, and digital environmental simulations.

The third stage — reflective-analytical. This stage involves analyzing the development of ecopedagogical competencies, self-assessment, professional reflection, monitoring the results of environmental and pedagogical activities, and identifying individual strategies for professional development. Electronic portfolios, reflective journals, expert evaluation, diagnostic tasks, competency-oriented criteria, and monitoring tools are used.

The fourth stage — innovative-integrative. This stage is aimed at developing the innovative and digital competencies of future teachers. STEAM technologies, digital educational platforms, virtual laboratories, GIS technologies, multimedia resources, and artificial intelligence tools are integrated into the educational process. Interdisciplinary integration contributes to the development of future teachers' systemic and critical thinking.

The fifth stage — professional-creative. This stage is aimed at developing future teachers' ability to independently design and implement environmentally oriented educational initiatives. Students develop environmental projects,



participate in research and socio-environmental activities, exchange experience, and develop ecopedagogical leadership skills.

The results of the study indicate that the development of ecopedagogical competencies is most effective when modern educational technologies are used in an integrated manner. Project-based learning contributes to the formation of practical experience in solving environmental problems; problem-based learning develops critical and systemic thinking; Case Study enables the analysis of specific environmental and pedagogical situations; WebQuest develops skills in independent information search and analysis; and gamification increases students' cognitive activity and motivation.

The use of the **STEAM approach** is of particular importance, as it enables the integration of natural science, technological, engineering, artistic, and mathematical components of education. Its application creates conditions for developing interdisciplinary environmental tasks and projects.

Another important result of the study is the substantiation of the potential of digital technologies in environmental and pedagogical training. Digital educational platforms, virtual laboratories, GIS maps, multimedia resources, and artificial intelligence tools make it possible to model environmental situations, visualize environmental processes, conduct virtual research, and organize students' independent work.

In accordance with the developed model, the outcome block reflects changes at the levels of the **teacher, student, and society**. At the level of the future teacher, the result is expressed in the formation of ecopedagogical competencies and readiness for environmentally oriented professional activity. At the level of the student, the expected outcome is the formation of ecological culture, ecological thinking, and a responsible attitude toward the environment. At the level of society, the result is associated with the dissemination of environmental values and principles of sustainable development.

To determine the effectiveness of the developed methodology, a criterion-based assessment system was proposed, including motivational-value, cognitive, activity-practical, and reflective-evaluative criteria.

The **motivational-value criterion** reflects the level of development of environmental values, professional motivation, and environmental responsibility.



The **cognitive criterion** characterizes the scope and depth of environmental and ecopedagogical knowledge. The **activity-practical criterion** determines the ability to apply acquired knowledge in pedagogical and research activities. The **reflective-evaluative criterion** reflects the future teacher's ability to conduct self-assessment, analyze, and improve their professional activities.

Thus, the research results demonstrate that the developed model ensures the systemic integration of environmental content into the professional training of future primary school teachers and creates conditions for the consistent formation of environmental knowledge, values, practical skills, professional experience, and reflective abilities.

Conclusion

The study theoretically substantiated and developed a model for improving the methodology for developing ecopedagogical competencies among future primary school teachers.

The developed model represents a holistic, systemic, and integrative pedagogical framework aimed at preparing future teachers for environmentally oriented professional activities. Its substantive foundation consists of environmental knowledge, ecological thinking, environmental values, environmental responsibility, practical experience, and innovative pedagogical competencies.

The effectiveness of the model is ensured by the interconnected application of competency-based, systemic, integrative, and learner-centered approaches, as well as the principles of scientific validity, systematicity, integrativity, consciousness, activity, unity of theory and practice, visualization, harmony, and modeling.

The staged implementation of the model—motivational-cognitive, activity-practical, reflective-analytical, innovative-integrative, and professional-creative—ensures the consistent development of the main components of ecopedagogical competence among future teachers.

Of particular importance is the integration of environmental content with pedagogical, psychological, natural science, and social and humanitarian disciplines. This approach ensures a transition from the simple acquisition of



environmental knowledge to its practical application in professional pedagogical activities.

The application of project-based and problem-based learning, Case Study, WebQuest, STEAM technologies, digital platforms, virtual laboratories, GIS technologies, multimedia resources, and artificial intelligence tools expands the opportunities for environmental and pedagogical training and contributes to the development of future teachers' innovative, research, and digital competencies.

Overall, the developed model creates methodological conditions for preparing a competent, environmentally responsible, creative, and professionally developed primary school teacher capable of integrating the ideas of environmental education and sustainable development into the educational process.

Consequently, the development of ecopedagogical competencies should be considered not as an isolated element of professional training but as an integrative component of the system of preparing future primary school teachers, ensuring the formation of ecological culture, ecological thinking, environmental responsibility, and readiness to organize a modern environmentally oriented educational process.

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