# PSYCHOLOGICAL AND PEDAGOGICAL FOUNDATIONS OF ENVIRONMENTAL COMPETENCE FORMATION AMONG FUTURE PRIMARY SCHOOL TEACHERS

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**Abstract:** The article examines the psychological and pedagogical foundations of environmental competence formation among future primary school teachers. The relevance of the study is determined by the growing importance of environmental education in the context of global ecological challenges and national educational reforms in Uzbekistan. The paper considers environmental competence as an integrative professional and personal quality that includes ecological knowledge, practical pedagogical skills, value-based attitudes toward nature, motivation for environmental activity, and reflective readiness for professional self-development. Special attention is paid to the role of primary school teachers in shaping the initial ecological worldview of children, since the foundations of environmental culture are formed at the early stages of education.

The study analyzes theoretical approaches to the concepts of "environmental competence" and "environmental competency", identifies their structural components, and substantiates the importance of cognitive, activity-based, value-motivational, and reflective elements. The article also emphasizes the significance of the national context of Uzbekistan, including the need to connect environmental education with regional ecological problems, cultural traditions, and the tasks of sustainable development. The author argues that the formation of environmental competence should not be limited to the transmission of ecological knowledge, but should include practical, interdisciplinary, project-based, and reflective forms of training.

The results of the study may be used in the modernization of pedagogical education programs, the development of diagnostic tools for assessing environmental competence, and the improvement of methodological training of future primary school teachers.

**Keywords:** environmental competence, environmental education, future teachers, primary education, pedagogical training, ecological culture, sustainable development, Uzbekistan.

## Introduction

In the modern world, environmental problems have become one of the most urgent challenges affecting the development of society, education, culture, and human consciousness. Climate change, water scarcity, land degradation, pollution, biodiversity loss, and irrational use of natural resources require not only technological and economic solutions, but also deep changes in the system of education and upbringing. In this regard, environmental education is increasingly considered as an important condition for the formation of a responsible personality capable of understanding the relationship between human activity and the state of the natural environment.

The problem of environmental education is especially relevant for Uzbekistan, where ecological issues are closely connected with regional natural, social, and economic conditions. The consequences of the Aral Sea crisis, desertification, water resource problems, soil salinization, and the need for rational use of natural resources make the formation of environmental culture one of the important priorities of education. Therefore, modern pedagogical education should prepare specialists who are able not only to understand ecological problems, but also to transmit environmental values to the younger generation.

The future primary school teacher occupies a special place in this process. Primary education is the stage at which children develop their first systematic ideas about nature, society, human behavior,

responsibility, and moral attitude toward the environment. At this age, ecological knowledge is not yet perceived as an abstract scientific system; it is formed through observation, emotional perception, practical actions, games, communication, and personal example of the teacher. Therefore, the environmental competence of the primary school teacher has both professional and educational significance.

Environmental competence of future teachers should be understood as an integrative quality that combines knowledge, skills, values, motivation, and reflection. It includes the ability to explain ecological phenomena, organize environmentally oriented lessons and activities, develop pupils' careful attitude toward nature, use interdisciplinary approaches, and evaluate one's own pedagogical activity from the standpoint of environmental responsibility. Thus, environmental competence is not limited to knowledge of ecology; it is directly related to the professional readiness of the teacher.

The relevance of this article is determined by the need to scientifically substantiate the psychological and pedagogical foundations of environmental competence formation among future primary school teachers. Although various aspects of environmental education have been studied in pedagogical literature, the problem of forming environmental competence as a holistic professional quality of future primary school teachers still requires further theoretical and methodological development.

The purpose of the article is to analyze the psychological and pedagogical foundations of environmental competence formation among future primary school teachers and to identify its main structural components in the context of modern pedagogical education.

To achieve this purpose, the following tasks are defined:

1. to clarify the essence of the concept of environmental competence in pedagogical education;
2. to identify the main components of environmental competence of future primary school teachers;
3. to analyze the psychological and pedagogical conditions for its effective formation;
4. to determine the role of national and regional factors in the development of environmental competence in Uzbekistan.

The scientific significance of the study lies in the systematization of theoretical approaches to environmental competence and in the substantiation of its structure as a combination of cognitive, activity-based, value-motivational, and reflective components. The practical significance is associated with the possibility of using the proposed ideas in the development of curricula, methodological recommendations, diagnostic criteria, and educational technologies for teacher training institutions.

**Materials and Methods**

**Research Design**

The present study is based on a qualitative theoretical research design aimed at identifying the psychological and pedagogical foundations of environmental competence formation among future primary school teachers. The study adopts a competence-based approach, which considers environmental competence as an integrated professional characteristic that combines ecological knowledge, practical teaching skills, environmental values, motivation, and reflective abilities.

**Methodological Framework**

The research is grounded in several complementary methodological approaches.

The **competence-based approach** serves as the principal methodological framework. It allows environmental competence to be interpreted not merely as a body of ecological knowledge but as an integrated professional quality that determines a teacher's readiness to organize environmental education effectively.

The **systemic approach** makes it possible to analyze environmental competence as a complex system consisting of interconnected cognitive, operational, value-motivational, and reflective components. These components function as a unified structure within the professional preparation of future teachers.

The **personality-oriented approach** emphasizes the importance of individual development, professional values, and students' personal responsibility for environmental protection. This approach considers environmental competence as an essential characteristic of future teachers' professional identity.

The **activity-based approach** focuses on practical educational activities that facilitate competence development through project work, problem-solving, field observations, environmental campaigns, and pedagogical practice.

**Research Methods**

To achieve the objectives of the study, several complementary scientific methods were employed.

**Analysis and synthesis** were used to examine domestic and international scientific literature concerning environmental education, competence-based learning, teacher education, and sustainable development.

**Comparative analysis** enabled the identification of similarities and differences between national and international approaches to environmental competence formation.

**Content analysis** was applied to educational policy documents, scientific publications, and pedagogical literature to determine the structural characteristics of environmental competence.

**Systematization and generalization** were employed to classify the main psychological and pedagogical components of environmental competence and to develop an integrated conceptual model suitable for teacher education.

**Sources of Information**

The theoretical basis of the study includes:

1.international scientific publications devoted to environmental education and competence-based teacher training;

2.educational policy documents related to sustainable development and environmental education;

3.normative documents regulating teacher education in the Republic of Uzbekistan;

4.psychological and pedagogical research concerning professional competence formation;

5.publications of Uzbek and foreign scholars on ecological culture and environmental competence.

Particular attention was paid to contemporary studies addressing environmental competence within higher pedagogical education.

**Theoretical Model of Environmental Competence**

Based on the conducted analysis, environmental competence of future primary school teachers is considered as an integrated professional-personal construct consisting of four interrelated components:

**Cognitive component.** This component reflects the system of ecological knowledge, understanding of environmental processes, awareness of global and regional environmental problems, and knowledge of sustainable development principles.

**Operational component.** It includes practical pedagogical skills required for planning, organizing, and evaluating environmentally oriented educational activities using modern teaching technologies.

**Value–motivational component.** This dimension characterizes environmental values, positive attitudes toward nature, professional responsibility, internal motivation, and readiness to promote ecological culture among schoolchildren.

**Reflective component.** It represents teachers' ability to evaluate their own professional activities, analyze educational outcomes, improve teaching practices, and continuously develop environmental competence.

These four components interact continuously and determine the overall level of environmental competence among future teachers.

**Reliability of the Study**

The reliability of the theoretical conclusions is ensured through the analysis of a wide range of scientific publications, comparison of different pedagogical concepts, critical evaluation of existing theoretical approaches, and synthesis of contemporary research findings. The integration of psychological, pedagogical, and environmental perspectives provides a comprehensive understanding of environmental competence formation within teacher education.

The methodological framework proposed in this study creates a theoretical basis for further empirical investigations aimed at assessing environmental competence among university students preparing for careers in primary education.

## Results and Discussion

### Psychological and Pedagogical Structure of Environmental Competence

The analysis of contemporary psychological, pedagogical, and environmental education research demonstrates that environmental competence should be regarded as a multidimensional professional characteristic rather than a simple accumulation of ecological knowledge. The effectiveness of environmental education depends on the interaction of cognitive, behavioral, motivational, and reflective factors, all of which determine the teacher's ability to organize environmentally oriented educational activities.

Future primary school teachers require a high level of environmental competence because they establish children's first systematic understanding of nature, environmental responsibility, and sustainable behavior. At the primary education level, pupils acquire basic ecological concepts, develop emotional attitudes toward nature, and learn responsible patterns of environmental behavior through observation, communication, and practical activities. Consequently, the environmental competence of primary school teachers directly influences the development of ecological culture among future generations.

The conducted theoretical analysis indicates that environmental competence develops gradually throughout professional education. It cannot be formed through isolated ecological disciplines alone but requires interdisciplinary integration throughout the teacher education curriculum. Environmental knowledge should be systematically connected with psychology, pedagogy, teaching methodology, ethics, and practical training.

From the standpoint of professional pedagogy, environmental competence performs several interrelated functions.

**Educational function.** It provides future teachers with scientific knowledge concerning ecological systems, environmental problems, biodiversity conservation, and sustainable development.

**Developmental function.** Environmental competence promotes critical thinking, ecological awareness, systems thinking, creativity, and problem-solving abilities required for addressing environmental challenges.

**Educational function.** It contributes to the formation of environmental values, moral responsibility, ecological ethics, and positive attitudes toward nature.

**Professional function.** Environmental competence prepares future teachers to integrate environmental topics into different school subjects, organize project-based learning, conduct outdoor educational activities, and encourage environmentally responsible behavior among pupils.

These functions demonstrate that environmental competence represents an essential component of overall professional competence rather than an independent educational objective.

**Structural Components of Environmental Competence**

Based on the synthesis of domestic and international pedagogical research, four major structural components of environmental competence were identified.

**Cognitive Component**

The cognitive component forms the theoretical basis of environmental competence. It includes ecological knowledge, understanding of environmental processes, awareness of regional and global ecological problems, and knowledge of sustainable development principles.

Future teachers should possess knowledge concerning:

1.ecological concepts and terminology;
2.ecosystems and biodiversity;
3.environmental pollution;
4.rational use of natural resources;
5.climate change;
6.environmental legislation;
7.environmental education methodology.

However, modern pedagogical research demonstrates that knowledge alone cannot ensure environmentally responsible behavior. Therefore, cognitive development should always be accompanied by practical and value-oriented learning.

**Operational Component**

The operational component reflects teachers' professional ability to apply ecological knowledge within educational practice.

Future primary school teachers should be capable of:

1.designing environmentally oriented lessons;
2.organizing ecological projects;
3.conducting field observations;
4.implementing inquiry-based learning;
5.using interactive educational technologies;
6.integrating environmental themes across different school subjects.

The operational component transforms theoretical knowledge into practical pedagogical competence.

**Value–Motivational Component**

The value–motivational component represents the psychological core of environmental competence.

It includes:

1.ecological values;
2.positive emotional attitudes toward nature;
3.intrinsic motivation;
4.professional responsibility;
5.environmental ethics;
6.willingness to participate in environmental protection activities.

Research consistently demonstrates that internal motivation has a stronger influence on environmentally responsible behavior than external control or formal assessment. Therefore, teacher

education programs should encourage personal environmental responsibility rather than simple knowledge acquisition.

**Conclusion**

The formation of environmental competence among future primary school teachers has become one of the strategic priorities of modern teacher education. Contemporary environmental challenges require educational institutions to prepare teachers who possess not only ecological knowledge but also professional skills, environmental values, and the ability to foster environmentally responsible behavior among younger generations.

The present study demonstrates that environmental competence should be understood as an integrated professional-personal characteristic that combines cognitive, operational, value–motivational, and reflective components. These components function as an interconnected system and collectively determine the effectiveness of environmental education in primary schools. The absence or insufficient development of any component significantly reduces the overall level of professional readiness of future teachers.

The theoretical analysis confirms that competence formation cannot be achieved through isolated ecological disciplines alone. Instead, environmental education should be integrated into the entire system of pedagogical training. Such integration promotes interdisciplinary learning, strengthens students' environmental awareness, and develops practical teaching skills necessary for organizing environmentally oriented educational activities.

Special attention should be given to the value–motivational component, as environmental responsibility is primarily determined by personal beliefs, ethical attitudes, and professional commitment. Future teachers should become active participants in environmental protection rather than passive transmitters of ecological information. Therefore, teacher education programs should include project-based learning, environmental volunteering, field practice, research activities, and reflective pedagogical tasks that encourage students' active engagement with environmental issues.

The study also highlights the importance of the national educational context of Uzbekistan. Regional environmental challenges, including water scarcity, desertification, and the consequences of the Aral Sea ecological crisis, require educational programs to integrate both global sustainability concepts and local environmental priorities. Such an approach increases the practical relevance of teacher education and contributes to the formation of environmentally responsible citizens.

Based on the conducted analysis, the following conclusions can be drawn:

1. Environmental competence represents an integrated professional quality consisting of cognitive, operational, value–motivational, and reflective components.
2. Effective environmental competence formation requires interdisciplinary integration throughout the teacher education curriculum rather than within separate environmental courses.
3. Psychological factors, including motivation, environmental values, and reflective thinking, play a decisive role in transforming ecological knowledge into environmentally responsible professional behavior.
4. Practice-oriented learning methods, project-based instruction, field observations, environmental campaigns, and pedagogical internships substantially improve the development of environmental competence among future teachers.
5. The modernization of pedagogical education in Uzbekistan should prioritize competency-based environmental education, strengthen methodological training, and establish comprehensive systems for assessing environmental competence.

The findings of this study contribute to the theoretical development of environmental pedagogy and may serve as a methodological foundation for improving teacher education programs, developing

educational standards, designing assessment criteria, and promoting sustainable environmental education in higher pedagogical institutions.

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