

## **THE IMPORTANCE OF PROJECT-BASED LEARNING TECHNOLOGY IN THE PROCESS OF ECOLOGICAL EDUCATION**

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**Annotation:** The article analyzes the pedagogical significance of project-based learning (PBL) technology in the process of ecological education. Based on constructivist and humanistic learning theories, PBL is presented as an innovative approach that enhances students' ecological knowledge, critical thinking, and environmental responsibility. The study discusses the role of PBL in forming ecological culture by integrating theory and practice through real-life environmental projects. Legal and policy frameworks of the Republic of Uzbekistan — including the Law “On Education” (2020), the Law “On Nature Protection” (1992, revised), and the Concept for Improving Ecological Culture of the Population until 2030 (Presidential Decree No. PP-184, 2025) — provide the foundation for introducing project-based technologies in schools. The results highlight that PBL not only develops ecological literacy but also cultivates sustainable attitudes and values among students, contributing to the goals of national green development and the UN Sustainable Development Agenda.

**Keywords:** project-based learning; ecological education; ecological culture; sustainable development; interactive pedagogy; environmental responsibility; Uzbekistan education policy.

In the 21st century, environmental issues have become one of the most urgent global challenges, requiring nations to cultivate ecological awareness and sustainable lifestyles among citizens from an early age. Education, therefore, plays a decisive role in shaping students' environmental consciousness, values, and behaviours. Within this framework, the implementation of project-based learning (PBL) technologies in ecological education is considered an effective pedagogical innovation that promotes active participation, critical thinking, and problem-solving abilities in addressing real-world environmental issues.

In the Republic of Uzbekistan, ecological education and upbringing are recognized as state priorities aimed at ensuring sustainable development and environmental security. The Constitution of the Republic of Uzbekistan (2023, Article 54) guarantees every citizen's right to a favorable environment and obligates the state to preserve natural resources and maintain ecological balance. These principles are further detailed in the Law “On Nature Protection” (1992, revised), which establishes the legal, economic, and organizational foundations for environmental protection and rational use of natural resources.

The Law “On Education” (2020) also underscores the importance of integrating ecological culture and sustainable development principles into the educational process. Article 7 of the law emphasizes the need to form a “harmoniously developed and socially responsible individual” through innovative teaching methods that reflect modern pedagogical technologies. This legal foundation provides schools and teachers with the authority and responsibility to implement project-based learning and other interactive methods that foster students' ecological thinking and environmental responsibility.

Furthermore, the Presidential Decree No. PP-184 (May 15, 2025) — “On the Concept for Improving Ecological Culture of the Population until 2030” — highlights the strategic importance of ecological education in forming a new generation that respects nature and contributes to the sustainable development of the nation. This concept prioritizes the introduction of modern educational technologies and project-based learning to strengthen environmental knowledge and practical ecological competencies among students.

Project-based learning (PBL), as a learner-centered educational technology, enables students to engage in long-term projects that explore and solve environmental problems within their local communities. Unlike traditional methods, PBL encourages independent research, teamwork, and the integration of scientific knowledge into practice. Through ecological projects, students not only acquire knowledge about environmental issues but also develop the skills and attitudes necessary for sustainable living — such as responsibility, collaboration, creativity, and civic initiative.

Therefore, within the legal and pedagogical framework of Uzbekistan, the application of project-based learning technology in ecological education represents a powerful means of nurturing ecological literacy and environmental culture. It transforms ecological education from theoretical instruction into practical, action-oriented learning that contributes directly to achieving the national goals outlined in Uzbekistan’s Green Development Strategy (2023–2030) and the United Nations Sustainable Development Goals (SDGs).

Project-based learning (PBL) is an innovative educational technology that centers the learning process on the student’s active participation in real-world problem-solving. Rooted in the theories of John Dewey and William Kilpatrick, PBL promotes learning through meaningful projects that integrate knowledge, skills, and personal experience. According to Thomas (2000), project-based learning engages students in complex tasks, based on challenging questions or problems, that require design, investigation, and reflection.

In the context of ecological education, PBL enables learners to research environmental issues, design solutions, and present their findings to real audiences. Such authentic learning experiences connect school activities with the local environment and community life, transforming ecological knowledge into personal responsibility and action.

The theoretical foundation of project-based learning draws from constructivist and humanistic educational paradigms. Constructivism, developed by Piaget (1972) and Vygotsky (1978), posits that knowledge is actively constructed through experience and social interaction. In ecological education, this means that students build environmental understanding through direct engagement with nature, inquiry, and collaborative investigation.

Key pedagogical principles of PBL include:

- Learner autonomy: students plan and manage their projects independently, promoting responsibility and self-regulation.
- Collaboration: teamwork fosters communication, empathy, and collective problem-solving.
- Interdisciplinarity: projects combine scientific, social, and moral aspects of environmental issues.
- Reflection and evaluation: learners assess their progress, outcomes, and ecological impact.

From a psychological standpoint, project-based learning stimulates intrinsic motivation, creativity, and emotional connection with the subject matter—factors essential for sustainable ecological behaviour.

Ecological education aims not only to provide environmental knowledge but also to cultivate ecological consciousness, ethical awareness, and sustainable behaviour. Project-based learning fully supports this mission by transforming ecological topics into experiential learning processes. For example, students may organize waste-recycling campaigns, study water quality, create eco-gardens, or develop community awareness projects about climate change. Such activities bridge theory and practice, linking education to real ecological challenges.

This approach aligns with the Education for Sustainable Development (ESD) principles set by UNESCO (2019), which encourage participatory learning methods that develop critical thinking, systems thinking, and environmental citizenship. Through project-based learning, ecological education becomes more than instruction—it becomes a form of social practice that empowers students to act as agents of environmental change.

Uzbekistan's recent educational modernization emphasizes the integration of innovative pedagogical technologies and competency-based learning. The State Program for Education Development (2022–2026) promotes digital, interactive, and project-oriented teaching as key tools for improving learning outcomes and fostering creativity among youth.

In ecological education, project-based learning serves as a bridge between these reforms and the national goals defined in the Concept for Improving Ecological Culture of the Population until 2030. By applying PBL, teachers not only fulfill curricular objectives but also contribute to shaping environmentally literate, proactive, and socially responsible citizens—consistent with the country's Green Development Strategy (2023–2030) and the UN Sustainable Development Goals (SDG 4.7 and SDG 13).

The theoretical model underpinning this research can be summarized as follows:

Project-Based Learning Technology → Active and Collaborative Learning → Development of Ecological Knowledge, Values, and Behaviour → Formation of Ecological Culture.

In this model, project-based learning acts as the transformative mechanism that connects ecological knowledge with real-life ecological responsibility. It operationalizes ecological education not as memorization, but as action, experience, and moral development.

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