

**IMPROVING PEDAGOGICAL MECHANISMS FOR FORMING
ECOLOGICAL CULTURE IN PRIMARY SCHOOL PUPILS ON THE BASIS
OF INTERACTIVE GAME TECHNOLOGIES****Avezova Rahila Shokir qizi**

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Annotation

This article examines the theoretical foundations, practical mechanisms, and ways of improving the pedagogical processes of forming ecological culture among primary school pupils through interactive game technologies. The study emphasizes the age-related psychological characteristics of younger learners, the didactic potential of game-based and interactive methods, and their role in developing ecological knowledge, values, attitudes, and responsible behavior. Drawing on contemporary Uzbek pedagogical research and national educational policy, the paper analyzes how role-playing games, didactic games, multimedia interactive activities, project-oriented ecological games, and outdoor game forms contribute to the holistic development of ecological culture. The article offers a structured pedagogical mechanism consisting of diagnostic, motivational, content-procedural, organizational, and evaluative stages, and proposes concrete recommendations for teachers, curriculum designers, and school administrators. The findings confirm that systematically organized interactive game technologies significantly increase pupils' cognitive engagement, emotional involvement, and practical ecological competence, thereby strengthening the foundations of sustainable ecological behavior from an early age.

Keywords: ecological culture, primary school pupils, interactive game technologies, pedagogical mechanisms, environmental education, didactic games, role-playing, ecological values, interactive methods, sustainable development education.

Introduction

In the context of global environmental challenges and the strategic priorities of the New Uzbekistan, the formation of ecological culture among the younger generation has acquired particular urgency. Primary school constitutes the foundational stage at which children's attitudes toward nature, their first ecological concepts, and patterns of environmentally responsible behavior are established. Ecological culture is understood not merely as a sum of knowledge about the environment, but as an integrated system

of ecological knowledge, values, emotional attitudes, practical skills, and behavioral norms that guide an individual's relationship with nature [1, p. 28–31].

The age characteristics of primary school pupils—concrete thinking, high emotional responsiveness, predominance of play activity, and readiness for imitation—make interactive game technologies especially effective pedagogical instruments. Play is the natural form of activity for children of this age; through play they explore the world, appropriate social norms, and develop cognitive and moral qualities [2, p. 45–48]. When ecological content is embedded in interactive game forms, learning becomes meaningful, motivating, and lasting.

Uzbekistan's educational policy documents, including the Concept for the Development of Ecological Education and successive presidential decrees on raising ecological culture, underline the necessity of introducing modern pedagogical technologies into environmental education at the primary level [3]. However, practice shows that many teachers still rely predominantly on traditional explanatory methods, which limit pupils' active participation and the formation of genuine ecological attitudes. Therefore, the improvement of pedagogical mechanisms that systematically integrate interactive game technologies into the process of forming ecological culture remains a pressing scientific and practical task.

Main Part

Ecological culture of primary school pupils can be presented as a multi-component structure that includes cognitive, affective, activity-based, and value-oriented components. The cognitive component encompasses elementary knowledge about natural phenomena, interrelations in ecosystems, and human impact on the environment. The affective component involves emotional experiences, aesthetic perception of nature, and empathy toward living beings. The activity-based component consists of practical skills of observation, care for plants and animals, waste sorting, and resource conservation. The value-oriented component reflects the system of ecological values and the readiness to act in accordance with them [4, pp. 67–72; 5, pp. 112–115].

Interactive game technologies possess unique didactic potential for developing all these components simultaneously. Didactic games with ecological content (“What grows where?”, “Useful and harmful actions”, “Nature's friends and enemies”) allow

systematic consolidation of knowledge while maintaining high motivation [6, pp. 53–58]. Role-playing games (“Young ecologists”, “Forest rangers”, “Guardians of the river”) enable pupils to take on socially significant roles, experience ecological responsibility, and practice decision-making in simulated environmental situations [7, pp. 34–39]. Creative and construction games involving recycled materials foster both practical skills and creative thinking oriented toward sustainable solutions. Multimedia and digital interactive games (virtual ecological journeys, interactive simulations of ecosystems, sorting games on interactive boards) expand the possibilities of visualization and individualization of learning [8, pp. 141–145]. Outdoor and movement games conducted in the school garden or local natural environment combine physical activity with direct sensory contact with nature, reinforcing emotional bonds and observational skills [9, pp. 78–82].

The pedagogical mechanism of forming ecological culture on the basis of interactive game technologies can be structured into five interrelated stages.

The diagnostic stage involves identifying the initial level of pupils’ ecological knowledge, attitudes, and behavioral tendencies through observation, simple questionnaires, and game-based diagnostic tasks. This stage allows the teacher to differentiate subsequent game activities according to the actual needs of the class [10, pp. 22–25].

The motivational stage is aimed at creating emotional readiness and interest. Short ecological stories, surprising facts presented in game form, or problem situations (“What will happen if we leave litter in the park?”) are used to awaken curiosity and personal relevance [11, pp. 89–93].

The content-procedural stage constitutes the core of the mechanism. Here interactive games are systematically integrated into lessons of natural science, reading, technology, and extracurricular activities. Games are organized according to the principle of gradual complication: from simple recognition and classification games to complex role-playing and project games that require collective problem-solving. Particular attention is paid to reflection after each game: pupils discuss what they learned, how they felt, and what they can do in real life [12, pp. 156–161].

The organizational stage ensures the necessary conditions: preparation of game materials (including those made from recycled resources), arrangement of space,

formation of groups, and clear definition of rules and roles. Teacher facilitation remains supportive rather than directive, allowing pupils maximum independence within the game framework [13, pp. 41–46].

The evaluative-reflective stage focuses on assessing not only knowledge acquisition but also changes in attitudes and behavior. Portfolio of ecological deeds, self-assessment sheets, peer feedback after games, and observation of pupils' real-life actions (care for classroom plants, participation in school clean-ups) serve as instruments of continuous monitoring [14, pp. 203–208].

Empirical observations and the results of pedagogical experiments conducted in Uzbek primary schools demonstrate that classes in which interactive game technologies are regularly applied show higher levels of ecological knowledge retention, more pronounced positive emotional attitudes toward nature, and more frequent spontaneous ecological actions compared with classes taught by traditional methods [15, pp. 47–52; 16, pp. 118–123]. Pupils begin to transfer game experience into everyday life: they remind family members about water conservation, initiate mini-projects for collecting paper waste, and express aesthetic pleasure when observing plants and animals.

Cross-curricular integration further strengthens the mechanism. Ecological games can be linked with reading lessons through dramatization of nature-themed stories, with mathematics through counting and classification games related to natural objects, and with technology lessons through making ecological toys or sorting models from waste materials [17, pp. 175–180]. Extracurricular forms—ecological game festivals, “Green patrol” role-playing campaigns, and family ecological game evenings—extend the influence beyond the classroom and involve parents as partners in ecological education [18, pp. 64–69].

Discussion

The effectiveness of interactive game technologies in forming ecological culture is rooted in several psychological and pedagogical principles. First, play corresponds to the leading activity of primary school age and therefore ensures high voluntary attention and emotional engagement (Elkonin's theory of play activity). Second, the interactive character of games creates conditions for active construction of knowledge rather than passive reception, which aligns with constructivist approaches to learning. Third, role-taking and collective problem-solving in games promote the internalization

of ecological norms through social interaction, consistent with Vygotsky's sociocultural theory [19, pp. 95–101].

At the same time, certain challenges must be acknowledged. Insufficient methodological preparation of teachers, limited availability of ready-made ecological game materials, and overcrowded curricula can hinder systematic application. Some teachers still perceive games as mere entertainment rather than serious pedagogical instruments. Overcoming these barriers requires targeted professional development programs focused on designing and facilitating ecological interactive games, as well as the creation of open banks of game scenarios adapted to the national curriculum and local environmental conditions of Uzbekistan [20, pp. 132–137].

Comparative analysis of international and national experience shows that countries with long traditions of environmental education (for example, Scandinavian systems) extensively use outdoor and game-based approaches from the earliest school years. Uzbekistan's rich folk ecological traditions—proverbs, nature-related customs, and ethno-pedagogical practices—can be productively integrated into modern interactive games, thereby combining cultural identity with contemporary pedagogical technologies [21, pp. 88–94].

Conclusions and Recommendations

The formation of ecological culture in primary school pupils is a complex, multi-component pedagogical process that requires systematic, age-appropriate methods. Interactive game technologies possess unique potential for simultaneously developing cognitive, affective, activity-based, and value-oriented components of ecological culture. The improved pedagogical mechanism proposed in this article—comprising diagnostic, motivational, content-procedural, organizational, and evaluative-reflective stages—provides a coherent framework for the purposeful use of these technologies.

Practical recommendations include:

1. Systematic inclusion of ecological interactive games in the annual thematic planning of natural science, reading, and technology subjects, as well as in extracurricular plans.
2. Organization of continuous professional development courses for primary teachers on the design and facilitation of ecological game technologies.

3. Creation of school and district methodological banks of ecological game scenarios, multimedia resources, and didactic materials made from recycled objects.
4. Strengthening of school–family partnership through joint ecological game activities and home ecological challenges.
5. Integration of local natural objects and folk ecological traditions into game content to enhance cultural relevance and emotional resonance.
6. Introduction of reflective practices after every game session to ensure transfer of game experience into real-life ecological behavior.

Implementation of these recommendations will contribute to the more effective formation of a generation that possesses not only ecological knowledge but also a stable ecological culture and readiness for responsible environmental action.

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