

**TECHNOLOGIES FOR DEVELOPING METACOGNITIVE SKILLS THROUGH  
ENVIRONMENTAL EDUCATION IN PRIMARY SCHOOL STUDENTS**

**Nazarova D.N.**

Independent researcher, Namangan state university

E-mail: [nazarovadilorom\\_86@gmail.com](mailto:nazarovadilorom_86@gmail.com)

DOI: <https://doi.org/10.5281/zenodo.20496168>

***Annotation:** This article explores the pedagogical technologies aimed at developing metacognitive skills in primary school students through environmental education and upbringing. In modern educational systems, the formation of environmentally responsible and intellectually independent learners has become one of the leading priorities. Metacognitive skills enable learners to regulate, monitor, evaluate, and improve their own cognitive activities. Environmental education, due to its interdisciplinary and practice-oriented nature, creates favorable conditions for the development of such skills. The article analyzes theoretical foundations, pedagogical approaches, interactive technologies, and innovative methods that contribute to the integration of ecological education with metacognitive learning processes. The study also highlights the role of teachers, reflective practices, project-based learning, and STEAM technologies in enhancing pupils' self-awareness and independent thinking abilities.*

***Keywords:** environmental education, metacognition, primary education, ecological culture, cognitive development, reflective learning, project-based learning, pedagogical technologies, critical thinking, STEAM education.*

In the context of globalization, environmental degradation, climate change, and increasing ecological problems, the education system is expected not only to provide academic knowledge but also to develop environmentally responsible individuals capable of independent thinking and conscious decision-making. Modern pedagogy increasingly emphasizes learner-centered education, where students become active participants in the learning process rather than passive recipients of information.

One of the most important competencies in contemporary education is metacognitive competence. Metacognition refers to an individual's awareness and regulation of their own thinking

processes. It includes planning, monitoring, evaluating, and reflecting upon one's learning activities. Developing metacognitive skills at the primary education level is particularly significant because cognitive habits and learning strategies begin to form during early childhood.

Environmental education offers rich opportunities for developing such competencies. Ecological topics naturally encourage observation, experimentation, inquiry, problem-solving, and reflection. Through environmental activities, students learn to analyze their actions, evaluate consequences, and make responsible decisions regarding nature and society.

This article examines the theoretical and practical foundations of forming metacognitive skills in primary school students through environmental education technologies.

Metacognitive skill development technologies are considered one of the most important directions of the modern education system. Today, it is no longer sufficient to provide students only with ready-made knowledge during the educational process. Students should be able to think independently, manage their own learning, monitor their educational activities, and analyze the results of their work. Therefore, special attention is being paid to the development of metacognitive skills in pedagogy. The concept of "metacognition" refers to a person's ability to understand and control their own thinking processes. This concept was introduced into scientific research by the American psychologist John H. Flavell and literally means "thinking about thinking." Metacognitive skills include processes related to planning one's activities, monitoring learning, identifying mistakes, evaluating outcomes, and improving future performance.

Technologies aimed at developing metacognitive skills help students build independent learning competencies. Through these technologies, learners consciously approach their own learning process. They identify which methods are effective, recognize their weaknesses, and search for ways to improve them. As a result, students develop critical thinking, analytical approaches, reflection, and creativity. The formation of these skills is especially important in primary education because this period is crucial for the development of children's thinking abilities, attitudes toward learning, and independent working habits.

One of the most effective types of metacognitive technologies is problem-based learning technology. In problem-based learning, students are not provided with ready-made information; instead, they are placed in problem situations. Students analyze the problem, identify its causes, propose hypotheses, and attempt to find solutions. During this process, they learn to monitor and

regulate their own thinking processes. For example, the question “What consequences may arise from environmental pollution?” encourages students to think critically and analytically. By analyzing causes and consequences, students independently construct knowledge, which strengthens their metacognitive activity. Project-based learning technology also plays a significant role in developing metacognitive skills. During project activities, students independently work on a particular topic. They choose project themes, create plans, collect information, analyze results, and present their findings. This process contributes to the development of metacognitive components such as planning, monitoring, and evaluation. For example, projects like “Green School” or “Save Water” help students study environmental problems while learning to control and evaluate their own activities. At the same time, project-based learning increases students’ sense of responsibility and independence.

Reflective technologies occupy a special place in metacognitive development. Reflection allows students to analyze their activities, identify mistakes, and evaluate themselves. At the end of lessons, students may answer questions such as: “What did I learn today?”, “Which task was difficult for me?”, and “What should I improve in the future?” Through such reflective activities, students develop self-management and independent learning skills. Reflection helps learners become aware of their own thinking processes and improve their learning strategies.

Interactive methods are also effective tools for developing metacognitive skills. Methods such as brainstorming, clustering, debates, and the FSMU technique encourage active thinking and participation. Through these methods, students freely express their ideas, analyze others’ opinions, and draw conclusions. For example, in the clustering method, students identify relationships between concepts, which develops logical thinking. In debates, students learn to defend their opinions and make evidence-based conclusions. During these processes, learners observe and evaluate their own thinking strategies.

In modern education, STEAM technology is considered one of the innovative approaches to developing metacognitive skills. The STEAM approach integrates science, technology, engineering, art, and mathematics. This technology promotes creative and systematic thinking among students. For example, when students create useful objects from recyclable materials, they analyze problems, develop plans, evaluate results, and draw conclusions. Such activities increase students’ metacognitive engagement and problem-solving abilities. Information and communication technologies also positively influence metacognitive development. Interactive platforms, virtual laboratories, electronic

assignments, and multimedia tools enable students to work independently, monitor their progress, and quickly identify mistakes. Digital technologies support students in managing their own learning and improve the effectiveness of education.

The role of the teacher is extremely important in effectively organizing metacognitive technologies. A modern teacher is not simply a provider of ready-made knowledge but rather a facilitator and motivator. Teachers create problem situations, ask guiding questions, encourage independent thinking, and organize reflective activities. Through these processes, students develop the ability to manage and regulate their own cognitive activities.

In general, technologies for developing metacognitive skills play a vital role in students' intellectual growth and personal development. Through these technologies, learners become independent thinkers, critical analyzers, self-regulated learners, and effective problem-solvers. This corresponds to one of the primary goals of contemporary education.

#### **References:**

1. Ishmukhamedov R., Yo'ldoshev M. Ta'lim va tarbiyada innovatsion pedagogik texnologiyalar. – Toshkent: Noshir, 2017.
2. Tolipov O', Usmonboeva M. Pedagogik texnologiyalarning nazariy va amaliy asoslari. – Toshkent: Fan, 2006.
3. Azizxo'jaeva N.N. Pedagogik texnologiya va pedagogik mahorat. – Toshkent: O'zbekiston yozuvchilar uyushmasi adabiyot jamg'armasi nashriyoti, 2006.
4. Saidahmedov N. Yangi pedagogik texnologiyalar. – Toshkent: Moliya, 2003.
5. Mavlonova R., Rahmonqulova N. Boshlang'ich ta'lim pedagogikasi, innovatsiya va integratsiya. – Toshkent: O'qituvchi, 2013.