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THE USE OF VARIOUS METHODS IN TEACHING NATURAL SCIENCES IN PRIMARY EDUCATION

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Abstract

This article comprehensively examines the theoretical and practical aspects of using various teaching methods in natural sciences education in primary school (grades 1–4). It analyzes traditional, interactive, project-based, STEAM, didactic game-based, and innovative methods within the framework of the integrated "Natural Sciences" (SCIENCE) curriculum introduced in the Republic of Uzbekistan starting from the 2021–2022 academic year. The article demonstrates the effectiveness of these methods in developing students' research skills, logical thinking, observation abilities, and ecological responsibility. Practical examples, advantages and disadvantages of the methods, as well as challenges specific to the Uzbekistani context are also discussed.

Keywords: Primary education, natural sciences, teaching methods, STEAM, interactive methods, project-based learning.

Introduction

Primary education is a fundamental stage in a child's personal development. During this period (ages 6–10), children have the opportunity to perceive their environment, understand the laws of nature, and form a scientific worldview. In

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the Uzbekistani education system, natural sciences are taught in an integrated manner, encompassing the basics of biology, physics, chemistry, and geography. The main goal of teaching natural sciences is to develop in children respect for nature, research skills, and independent thinking. Modern pedagogy (based on the theories of Piaget and Vygotsky) views the child as an active participant. Therefore, it is essential to use a variety of methods: traditional (verbal and visual) and innovative (interactive, project-based, and STEAM). This article provides a broad overview of the topic, offering theoretical foundations, practical applications, and recommendations.

In primary grades, natural sciences provide children with initial concepts about the environment: living and non-living nature, properties of substances, natural phenomena, and the basics of ecology. These subjects develop research and logical thinking skills. According to Uzbekistan's National Curriculum (introduced in 2021), natural sciences are taught based on a competency-based approach: knowledge, skills, competencies, and values. Students learn to observe nature, conduct experiments, and analyze results. For example, in grade 3, the topic "Predatory Animals" is studied through didactic games to explore the characteristics of the animal world. This plays a significant role in forming a scientific worldview. Children understand the laws of nature and develop ecological awareness. They learn to protect the environment (for instance, saving water and recycling waste). The subject is integrated with mathematics, native language, and fine arts (STEAM approach). It enhances independence, cooperation, creativity, and personal development.

International experience (TIMSS, PISA) shows that student outcomes in natural sciences are significantly higher when hands-on and inquiry-based methods are used. However, in Uzbekistani schools, traditional methods still predominate because they are simple and accessible. These methods are reviewed below:

1. Verbal methods: Storytelling and discussion. The teacher presents natural phenomena through vivid stories. For example, in the topic "The Arrival of

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Spring," a conversation is used to explain plant growth. Explanation: Delivering theoretical knowledge (states of matter: liquid, solid, gas).

2. Visual methods: Pictures, models, herbaria, and animal collections. Organizing a nature corner (plants, aquarium). Multimedia: videos and animations illustrating natural phenomena.

3. Practical methods: Observation and experimentation on the school experimental plot — planting plants and observing water evaporation. Laboratory work: simple experiments (magnet, water temperature).

Advantages of traditional methods: simplicity and applicability to large groups of students.

Disadvantages: low student activity and passive perception.

Modern methods place the child at the center and ensure active participation.

1. Interactive methods — group work, discussions, and role-playing. For example, pair discussions on the topic "Living and Non-living Nature." Brainstorming — solving problems (e.g., "How can we recycle waste?").

2. Project-Based Learning (PBL) — students prepare projects such as "My Garden," observing plant growth and preparing reports. This combines practice and theory, promoting teamwork.

3. Inquiry-Based Learning — Question → Experiment → Analysis. Example: "Why do leaves fall?" — observation and conclusion.

4. Didactic game technologies — "Word Finder," "Icebreaker," "Organizer" methods. Games for the topic "Predatory Animals" in grade 3. Mood reflection: "My mood is like the sun" — connecting with nature.

5. STEAM approach — Science + Technology + Engineering + Art + Mathematics. In primary grades, building simple models (e.g., a basic machine) integrates physics and mathematics.

6. Digital and multimedia methods — virtual laboratories, interactive whiteboards, mobile applications, and elements of distance learning

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(synchronous/asynchronous). These increase interest and strengthen skills, though they require resources (computers, materials).

Advantages, disadvantages, and comparison of different methods

- Traditional: Stable and reliable, but can be boring.
- Innovative: Active and engaging, but require teacher training and resources.
- Comparison table (example): Inquiry-based — high effectiveness, but time-consuming.

It is important to consider students' age characteristics: in grades 1–2, games and visual aids are preferred; in grades 3–4, projects and research activities are more suitable.

Practical application: Examples and lesson plans

Example 1: "States of Water" (Grade 2, practical + interactive)

- Visual demonstration: ice, water, steam.
- Experiment: heating water and observing evaporation.
- Game: "Where does water live?" — group discussion.

Example 2: "Life of Plants" (Grade 3, STEAM + project)

- Project: Planting seeds and daily observation of growth (keeping a journal).
- Integration: Drawing (Art), measurement (Math).
- Assessment: Self-monitoring sheet.

Example 3: Ecological project "My School is Clean"

- Brainstorming + practical work: Sorting waste and beautifying the school garden.

Practical activities (experiments and observations) in primary grades strengthen knowledge by 70–80%.

Since the natural sciences program in Uzbekistan is relatively new, several challenges exist: lack of resources (experimental equipment and laboratories), insufficient teacher preparation for innovative methods, and large class sizes (making interactive methods difficult).

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To address these issues, the following measures are recommended:
- Improving teachers' qualifications.
- Developing school nature corners.
- Supplying multimedia equipment through state programs.
- Creating methodological manuals based on scientific research.

Using various methods in teaching natural sciences in primary education is the foundation of modern teaching. When traditional methods serve as the base and are combined with innovative approaches (STEAM, projects, and games), children acquire scientific thinking, creativity, and ecological responsibility. Expanding this approach in Uzbekistan's education system can improve PISA/TIMSS results and prepare future generations to address global challenges.

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