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# Application of Innovative Methods in Physics Lessons

Tursunmaxatov Kahramon Irisbayevich

Head of the Department of Physics, Faculty of Information Technology and Physics-Mathematics, Gulistan State University, PhD in Physical and Mathematical Sciences, Uzbekistan

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**Abstract:** The application of innovative methods in physics lessons is one of the important directions in modern education to make the learning process more effective and engaging for students. This topic discusses the use of advanced pedagogical technologies, interactive methods, and digital tools in teaching physics. Innovative methods such as experiment-based learning, virtual laboratories, simulation programs, and project-based education are analyzed for their potential to increase student interest in physics and develop their critical thinking skills. Additionally, the article discusses effective classroom implementation strategies for teachers and the possible challenges they may face. The goal is to modernize physics education according to contemporary requirements and prepare students for success in the field of science. The article provides information about the significance and advantages of applying modern innovative methods in physics teaching.

**Keywords:** Information, technology, computer, model, process, principle, program, action, presentation, audio, video, animation, physics education, innovative methods, interactive teaching, virtual laboratories, digital technologies, project-based learning, critical thinking, experiment-based learning, simulation programs, pedagogical technologies.

**Introduction:** Physics is often considered one of the most difficult subjects. The saying, "There are no difficult subjects, only difficult ways of teaching," reflects this perception. Today, interactive methods, which are elements of advanced pedagogical technologies, are widely used. Utilizing interactive methods in physics lessons enhances both the effectiveness of teaching and students' interest in the subject. The word "interactive" comes from the English word "inter," meaning "between," referring to the activity and engagement between the teacher and the student.

Interactive methods aim to increase student-teacher engagement, activate students' learning, and develop their personal qualities. In education, interactive methods refer to strengthening the learning relationship between students and teachers. These methods help improve lesson effectiveness through collaboration and encourage independent thinking. "Interactive" also means increasing the effectiveness of a lesson by encouraging cooperation between teachers and students, fostering critical thinking, discussion, and debate.

Each student actively participates, works alone, in pairs, or in groups to find answers, think, write, speak, and explain issues with reasoning. This leads to long-lasting learning. When acquiring new information, they develop critical and analytical thinking skills. The teacher acts as a facilitator—providing guidance, organization, and observation. There are many interactive methods; below is a description of the "Wheel" (Charxpalak) technology and examples of how it is applied in physics.

**"Wheel" (Charxpalak) Technology**

Description: This method is designed to help students recall previously learned material, think logically, answer questions independently, practice self-assessment, and allow teachers to quickly evaluate students' knowledge.

Purpose: To develop students' logical thinking, independent expression, self-evaluation, teamwork, respect for others' opinions, and the ability to select necessary ideas from many.

Application: This method can be used at the beginning or end of a lesson, after a topic section, for repetition,

consolidation, or for midterm and final assessment. It can be conducted individually, in small groups, or collectively.

Procedure:

- Students are divided into groups based on circumstances.
- They are introduced to the goals and rules of the activity.
- Handouts are distributed to group members.
- Within the allotted time, each student completes their tasks independently.
- Students write their group number in the top right corner and draw a symbolic mark in the top left corner of their paper.
- Completed tasks are rotated to another group following the "wheel" principle.
- The new group members review and revise the tasks individually.
- The reviewed tasks are again exchanged between groups as per the wheel direction (this continues depending on the number of groups).

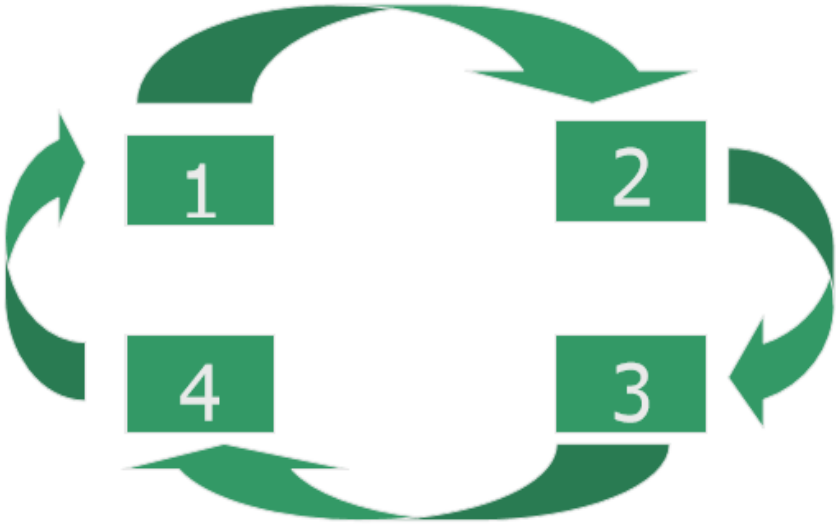


**Figure 1: "Wheel" technology illustrated**

- After the final rotation, each student retrieves their original sheet using their group number and symbol.
- They compare their original answers with corrections made by others and analyze the differences.
- The teacher reads the tasks aloud and discusses correct answers with the class or presents them via screen if available.
- Each student identifies differences between their answers and the correct ones, calculates their score, and self-assesses.
- The teacher collects all papers and records the grades in the class journal.

**Purpose in Physics Lessons**: The aim of using this method in physics is to promote collaboration between teacher and student regardless of the lesson format or location. The teacher must involve students in solving relevant problems, encourage their activity, and ensure comprehension. The teacher remains a facilitator—guiding, observing, and concluding the session. This method fosters independent thinking, free expression, decision-making, emotional control, and positive critical analysis.

Innovative methods help increase students' intrinsic motivation. For example, through gamification, students perceive the learning process as a game, which increases their engagement. From the perspective of cognitive development, methods such as VR and AR enhance students' spatial imagination abilities.

For instance, the topics we propose contribute to the development of students' intellectual abilities. When teaching the topic of electromagnetic induction, PhET simulations are used. Students change the strength of the magnetic field and test Faraday's law in practice. For example, by observing the electric current generated by changes in the magnetic field, students come to understand the principle of electromagnetic induction.

Divided into groups, students design a small device that uses solar energy (e.g., a solar oven or water heater). This project allows students to apply concepts such as

energy transformation, heat transfer, and energy efficiency in practice.

With the help of virtual reality, students observe the movement of planets in space in 3D format. For example, studying Kepler's laws in a VR environment by visually tracking planetary orbits simplifies complex concepts for students.

The use of innovative methods in physics lessons significantly improves the quality of education. Research shows that interactive simulations and project-based learning can improve students' academic performance by 20–30%. In the future, artificial intelligence (AI) and machine learning technologies are expected to be integrated into physics lessons. For example, AI-based learning platforms can develop lesson plans tailored to the individual needs of students.

**CONCLUSION**

The application of innovative methods in physics classes plays an important role in improving education quality and increasing students' interest in science. Interactive simulations, project-based learning, gamification, VR/AR, and flipped classrooms make the learning process more effective and engaging. Constructivism and the TPACK model are used as methodological foundations. For successful implementation of these methods, teacher training, provision of technological resources, and continuous monitoring are essential. In the future, artificial intelligence and other new technologies will open up new opportunities in physics education.

In conclusion, the method studied enables students to assess themselves. Nowadays, self-assessment is one of the distinctive features of using interactive methods. Applying this method in physics classes yields good results. We recommend using this method mainly at the end of a chapter or unit.

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