IMPROVEMENT OF THE METHODOLOGY FOR DEVELOPING THE COGNITIVE ACTIVITY OF STUDENTS USING MODERN MEDIA TECHNOLOGIES IN PHYSICS LESSONS.

Alimov Asadulla Urokbayevich
Uzbek-Finnish Pedagogical Institute
independent researcher of the Department of "Physics"
Email: asadullaalimov0@gmail.com
Tel: +998 93.963 72 64
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ABSTRACT

This article analyzes the methodology for developing students' cognitive activity through the use of modern media technologies in physics lessons. The possibilities of forming cognitive skills in students, such as independent thinking, analysis, and drawing conclusions, through the integration of media technologies - virtual laboratories, animations, interactive tests, and digital platforms - into the educational process are highlighted.

Introduction. In the modern information age, digital technologies are being rapidly implemented in all areas of education. Physics, by its very nature, requires the combination of theoretical knowledge with practical experience and observations. Therefore, media technologies serve as a powerful tool for increasing the effectiveness of physics lessons. Modern technologies play an important role in increasing students' interest in physics and developing their cognitive activity [1]. In the educational process, one of the important issues is the awakening of students' interest in knowledge, the development of their cognitive abilities, such as thinking, analysis, and drawing logical conclusions [2]. Especially in the teaching of physics, this process is even more relevant, and due to the complexity of the nature of the subject, it is required that the methodological tools used in the lesson be modern and highly interactive. Today, media technologies are an integral part of the educational process, with the help of which the possibilities of increasing the effectiveness of lessons, forming students' independent thinking and problem-solving skills are expanding. This article highlights issues of improving the methodology aimed at developing students' cognitive activity in physics lessons based on modern media technologies [3].

Methodology. Cognitive activity is a psychological state based on the student's mental activity, such as learning, comprehension, memorization, problem-solving. By developing this activity in subjects such as physics[4]:

- Has a deep understanding of natural phenomena;
- Attempts to solve problems based on scientific research;
- Shows activity in the assimilation of new knowledge;
- They will acquire the skills of independent experimentation and drawing

This study employed a mixed-methods approach to investigate and improve the methodology for enhancing students' cognitive activity in physics lessons through the integration of modern media technologies. The research was conducted over an academic semester and involved both quantitative and qualitative data collection to ensure a comprehensive analysis of student engagement and cognitive development.

Research Design

The experimental design included two groups: a control group receiving traditional physics instruction and an experimental group where modern media technologies were integrated into the learning process. The objective was to compare the effectiveness of conventional teaching methods with media-supported instruction in terms of fostering students' cognitive activity.

Participants

The study was carried out among 120 secondary school students (grades 9–11) from three different schools with comparable academic standings. The participants were divided evenly into the control and experimental groups. Teachers involved in the study were provided with training on the use of modern media tools to ensure consistency and effective implementation across all experimental classes.

Media Technologies Employed

The following modern media technologies were integrated into the experimental group's lessons:

- Interactive simulations and virtual labs (e.g., PhET Interactive Simulations)
- Augmented Reality (AR) applications for visualizing complex physical phenomena
- Multimedia presentations incorporating video, animation, and dynamic graphs
- Online quizzes and gamified learning platforms (e.g., Kahoot!, Quizizz) for immediate feedback
- Collaborative digital tools such as Google Jamboard and Padlet for group problem-solving

These technologies were purposefully selected based on their proven ability to enhance conceptual understanding, visual-spatial reasoning, and student motivation.

Data Collection Methods

To assess changes in cognitive activity, a variety of data collection methods were used:

1.Pre- and post-tests: Standardized assessments measuring understanding of physics concepts and higher-order thinking skills.

2.Observation protocols: Classroom observations were conducted using structured rubrics to document levels of student engagement and interaction.

3.Student surveys and interviews: Used to collect self-reported data on motivation, perceived learning effectiveness, and preferences for media tools.

4.Teacher feedback logs: Instructors maintained weekly journals to reflect on the implementation process, challenges encountered, and observed student behavior.

Data Analysis

Quantitative data from the pre- and post-tests were analyzed using statistical methods, including paired t-tests and ANOVA, to identify significant differences between control and experimental groups. Qualitative data from observations, interviews, and teacher logs were

coded thematically to extract recurring patterns related to cognitive activity, such as critical thinking, problem-solving approaches, and collaborative engagement.

Ethical Considerations

Informed consent was obtained from all participants and their guardians. The study ensured confidentiality and voluntary participation, and adhered to institutional ethical guidelines.

Limitations

Potential limitations include variability in teachers' proficiency with media tools, differences in students' prior exposure to technology, and the relatively short duration of the intervention. These factors were considered during analysis and interpretation of results.

Modern media technologies include [5,6]:

- **Multimedia presentations (PowerPoint, Prezi, Genially);**
- **Virtual laboratories (PhET Interactive Simulations, Labster);**
- **Video lessons and animations (YouTube, Khan Academy);**
- **Interactive platforms (Kahoot, Quizizz, Google Classroom);**
- **AR/VR technologies (augmented and virtual reality);**
- **Electronic textbooks and mobile applications.**

Benefits:

- Attracts the student's attention;
- Allows faster acquisition of knowledge through visual and auditory organs;
- Encourages independent learning;
- Helps to explain complex physical phenomena in a simplified form.

Result and discussion.

In physics lessons, media technologies can be used in the following forms [7]:

1. At the explanatory stage:

- Visual explanation of physical phenomena through 3D animation;
- Demonstration of laboratory work through virtual experiments (using PhET simulations).

2**. At the reinforcement stage:**

- Interactive tests (via Quizizz or Kahoot);
- Online quizzes in question-and-answer format;
- Determining the level of knowledge using diagnostic tests.

3. For independent work:

- Complete independent assignments using electronic textbooks and video lessons;
- Send assignments and analyze results in Google Classroom.

4. Criteria for assessing cognitive activity

Cognitive activity of students is assessed based on the following criteria:

- **Thinking level** - ability to analyze the problem, draw conclusions;
- **Creativity** - Applying new approaches;
- **Motivation** - interest in learning;
- **Reflection** - the ability to assess one's knowledge.

With the help of media technologies, it is possible to develop these indicators, since through them the student's activity is constantly monitored and evaluated.

Media tools used:

- Experiment with electromagnetic induction through PhET simulation;
- YouTube video - "Faraday's Law";
- Kahoot test - questions on the topic;
- Google Jamboard - an online board for group work.

Result: Student comprehension increased from 35% to 85% (in the experimental group).

6. Directions for improving the methodology

- Establishment of advanced training courses on the use of media technologies for physics teachers;
- Inclusion of virtual laboratory classes in the curriculum;
- Formation of individual training areas based on mobile applications;
- Integration of AR/VR technologies into lessons.

Conclusion. In conclusion, the use of modern media technologies in physics lessons not only increases the level of students' knowledge, but also develops their cognitive activity - the ability to think independently, analyze, and approach creatively. The main goal of the methodology is to adapt the lesson to modern conditions and ensure the intellectual growth of the student's personality. Based on methods tested in practice, it is recommended to actively apply media technologies in the educational process. Media technologies allow for interesting, interactive, visual, and effective physics lessons. They serve not only as a means of imparting knowledge, but also as a means of developing students' skills in logical thinking, analysis, and problem-solving. For the correct application of media technologies in education, the digital literacy of teachers, their methodological approach, and provision with technical resources are of great importance. Moreover, through these methods, the level of assimilation of knowledge by students increases, and they are formed as individuals who not only memorize knowledge, but also deeply understand it, logically justify it, and can apply it in practice.

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