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Modern Methods Of Using Information Technologies In Teaching Physics In Academic Lyceums

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ABSTRACT

This article analyzes the didactic, methodological, and practical aspects of using modern information technologies in teaching physics in academic lyceums. The study highlights the role of digital educational resources, virtual laboratories, interactive simulations, multimedia presentations, and online learning platforms in the educational process. It scientifically substantiates that the use of modern information technologies contributes to the development of students' knowledge, skills, and competencies in physics, enhances independent thinking, and enables the visualization and clearer understanding of physical processes. In addition, the article discusses issues related to increasing the effectiveness of education, strengthening student motivation, and implementing innovative pedagogical approaches through the application of information technologies. The research results confirm that the systematic use of modern information technologies in teaching physics has a positive impact on improving the quality of knowledge and learning activity of academic lyceum students.

Keywords: Academic lyceum, physics education, modern information technologies, digital educational resources, virtual laboratory, interactive simulation, multimedia learning, innovative pedagogy.

INTRODUCTION

In the modern education system, the rapid development of information and communication technologies is bringing fundamental changes to the content, forms, and methods of education. Digitalization processes require revising traditional teaching approaches in educational institutions, introducing innovative pedagogical technologies, and increasing the effectiveness of the educational process. Today, the quality of education is determined not only by curricula and textbooks, but also by the level of effective use of modern information technologies.

Physics, in particular, stands out among natural sciences due to its reliance on complex theoretical concepts, mathematical models, and experimental activities. In academic lyceums, the shortage of real laboratory equipment, time and safety constraints, as well as the impossibility of directly observing certain physical processes may hinder students' full understanding of topics. Therefore, digital technology-based learning

environments serve as an important didactic tool in overcoming these challenges.

Modern information technologies, including virtual laboratories, digital simulations, multimedia presentations, interactive learning platforms, and distance learning systems, enhance the visual quality of physics lessons and enable the explanation of complex processes through simplified models. Such technologies foster students' independent thinking, interest in experimental activities, and development of research skills. At the same time, teaching in a digital environment expands opportunities for differentiated and learner-centered education by considering individual learning pace. The use of modern information technologies in teaching physics in academic lyceums is an important factor in deepening students' knowledge, skills, and competencies, preparing them for higher education, and developing their digital competencies. From this perspective, scientifically analyzing methods of using information technologies in physics education, identifying their didactic potential and impact on educational effectiveness is one of the urgent scientific and pedagogical tasks.

METHODS

This research aims to determine the impact of using modern information technologies on the educational process in teaching physics in academic lyceums and employs a comprehensive scientific-pedagogical approach using various research methods. The research methodology was selected to deeply analyze the educational process, identify the current situation, and ensure the reliability of the results obtained.

The analytical-synthetic method was used as one of the primary research methods. Through this method, scientific and pedagogical literature, regulatory documents, state educational standards, and curricula related to the use of information technologies in teaching physics were analyzed. Theoretical data obtained were generalized to identify the didactic potential of digital technologies in physics education.

The pedagogical observation method was applied to directly study the educational process in physics classes of academic lyceums. Lessons conducted using information technologies were compared with those taught using traditional methods, and students' activity during lessons, level of knowledge acquisition, independent learning skills, and attitudes toward experimental activities were analyzed. The results of observations were systematized and used in drawing research conclusions.

In addition, the comparative analysis method was used to compare the outcomes of lessons incorporating modern information technologies with those of traditional teaching methods. This method made it possible to assess the effectiveness of digital tools in teaching physics and evaluate their impact on students' cognitive activity.

Statistical analysis methods were applied to process empirical data and draw reliable conclusions. Changes in students' knowledge levels were analyzed based on percentage indicators, average values, and growth dynamics. Statistical results contributed to ensuring the scientific validity of the research.

The research object was physics lessons conducted in academic lyceums, while the research subject was the process of using modern information technologies in these lessons and their impact on educational effectiveness. The research was conducted in several stages, during which data were systematically collected and analyzed.

Experimental Design

The experimental stage of the research was organized to practically determine the impact of using modern information technologies on educational effectiveness in teaching physics in academic lyceums. Experimental work was carried out during the 2024–2025 academic year in several academic lyceums.

Two groups were formed for the experiment: an experimental group and a control group. The groups were selected under equal conditions in terms of number of students, initial knowledge level, and curriculum. In the control group, physics lessons were mainly conducted using traditional teaching methods, while in the experimental group, lessons based on modern information technologies were implemented.

In the experimental group, the following information technologies were systematically used in teaching physics:

- digital simulations and virtual laboratories;

- multimedia presentations and animations;

- interactive learning platforms;

- electronic testing and assessment tools.

The experimental process was carried out in three stages:

Initial diagnostic stage – aimed at identifying students' existing knowledge level in physics, logical thinking, and experimental skills. Tests, oral surveys, and observation methods were used.

Main experimental stage – during this stage, lessons in the experimental group were conducted using modern information technologies. Students' cognitive activity was increased through virtual experiments, modeling, and interactive activities. Traditional methods continued in the control group.

Final assessment stage – at the end of the experiment, changes in students' knowledge levels were identified and compared with initial diagnostic results. Students' achievement levels were assessed through final tests and practical tasks.

The data obtained during the experimental work were systematized and statistically processed, scientifically proving the effectiveness of using modern information technologies in physics education. The experimental results showed that students in classes using digital tools achieved deeper and more stable knowledge acquisition.

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