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DISTINCTIVE FEATURES OF USING DIGITAL EDUCATIONAL TECHNOLOGIES IN TEACHING PHYSICS AT ACADEMIC LYCEUMS OF THE INTERNAL AFFAIRS SYSTEM

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ABSTRACT

This article analyzes the theoretical and methodological foundations, didactic potential, and specific organizational and pedagogical features of using digital educational technologies in teaching physics at academic lyceums within the system of the Ministry of Internal Affairs. In particular, the study highlights mechanisms for improving physics education through simulation-based modeling, virtual laboratories, digital measurement systems, artificial intelligence–driven adaptive platforms, and STEAM integration. Considering the professional orientation, disciplinary environment, and safety requirements characteristic of academic lyceums of the internal affairs system, an effective model for the implementation of digital technologies in physics instruction is proposed.

KEYWORDS

Digital pedagogy, virtual laboratory, simulation, adaptive learning, STEAM, physics competence, safety-oriented education.

INTRODUCTION

In the modern education system, the process of digital transformation is fundamentally reshaping curriculum content, teaching methodology, and assessment mechanisms. In particular, academic lyceums operating within the system of the Ministry of Internal Affairs of the Republic of Uzbekistan differ significantly from general secondary educational institutions due to their professional orientation, disciplinary environment, and focus on practical training.

In these lyceums, physics serves not only as a source of theoretical knowledge but also as a means of developing technical thinking, analytical reasoning, rapid decision-making skills, and competencies related to understanding safety-oriented technological processes [1]. Therefore, the use of digital educational technologies in this context is not merely a visual support tool, but rather an integrative mechanism that ensures professional preparation.

As specialized educational institutions under the Ministry of Internal Affairs of the Republic of Uzbekistan, academic lyceums occupy a distinct position within the national education system. Their primary mission is not only to provide students with in-depth knowledge but also to form disciplined, responsible, and analytically minded individuals who are prepared for future service in the field of internal affairs [2]. In this respect, these lyceums fundamentally differ from general academic lyceums in terms of objectives, content, organizational structure, and institutional culture.

First and foremost, the specificity of their goals directly influences the content of physics instruction. In ordinary academic lyceums, physics is generally interpreted as a preparatory stage for higher education, with emphasis placed on mastering theoretical knowledge, solving problems, and preparing for standardized examinations. In contrast, in academic lyceums of the internal affairs system, physics is not merely a natural science subject but serves as the scientific foundation of future professional activity [3]. The mechanics section is connected with traffic accident analysis and ballistic calculations; optics is linked to forensic technical devices; electricity and magnetism are integrated with communication systems and technical safety. Thus, physics is formed as a professionally contextualized and practice-oriented discipline.

The second important aspect is the organizational and disciplinary environment. In educational institutions of the internal affairs system, strict adherence to discipline, regulations, and internal rules is prioritized. This environment significantly influences the pedagogical process. Physics lessons are organized according to clearly defined plans, with rational time management, and laboratory work is conducted in full compliance with safety regulations [4]. As a result, students acquire not only knowledge of physical laws but also a culture of responsibility, precision, and systematic work. These qualities are essential competencies for their future professional careers.

The third aspect is the priority given to safety considerations. Certain experiments in physics may involve high voltage, mechanical impact, or complex technical processes. In academic lyceums of the internal affairs system, such experiments are often studied within simulation-based and digital environments. This serves two main purposes: first, students understand complex processes under safe conditions; second, they develop skills in working with modern technologies [5]. Consequently, a safety-oriented integrative model becomes an integral component of physics education.

Moreover, the psychological preparedness of students in these lyceums is also a significant factor. Since admission is based on competitive selection, students typically demonstrate high motivation and goal orientation. This allows physics to be taught more deeply and through a logical-analytical approach. In this context, the teacher is not merely a transmitter of information but a methodologist who cultivates analytical thinking. Each

physics problem becomes a process of analyzing a situation, identifying cause-and-effect relationships, and drawing evidence-based conclusions [6].

Thus, academic lyceums within the internal affairs system differ sharply from general educational institutions due to their targeted orientation, disciplinary environment, and safety principles. This distinction is clearly reflected in the model of physics instruction. Unlike the classical academic model, physics here is taught through a professionally oriented, integrative, and competency-based approach. As a result, physics functions not only as a body of scientific knowledge but also as a strategic discipline that shapes the technical mindset of future internal affairs officers.

Teaching physics in academic lyceums of the internal affairs system is characterized by the following features:

- Professional orientation – the content of physics is integrated with criminology, technical expertise, optical devices, radiolocation, and elements of ballistics.
- Disciplinary environment – the instructional process is organized according to strict regulations.
- Practical priority – theoretical knowledge is reinforced through applied training.
- Safety factor – experiments and laboratory activities are organized in digital formats that comply with safety requirements.

Therefore, there is an objective need for the effective use of digital educational technologies in teaching physics within these institutions. Digital educational technologies are grounded in the theories of constructivism, connectivism, and the competency-based approach.

In physics education, they are based on the following principles:

- Interactivity – active information exchange between the learner and the environment;
- Visualization – representation of complex physical processes through graphical and animated models;
- Modeling – linking theoretical formulas with practical simulations;
- Adaptivity – consideration of the learner's individual trajectory.

For example, the "Crocodile Physics 605" software enables the modeling of electrical circuits (Figure 1) and allows real-time observation of current flow and voltage distribution (Figure 2). This, in turn, links theoretical formulas with empirical observation.

This software creates a safe experimental environment, visually demonstrates complex processes, and enables the rapid analysis of events and phenomena.

Teaching physics in academic lyceums of the internal affairs system is characterized by the following features:

- Professional orientation – the content of physics is delivered in integration with criminology, technical expertise, optical devices, radiolocation, and elements of ballistics.
- Disciplinary environment – the instructional process is organized according to clearly defined regulations.
- Practical priority – theoretical knowledge is reinforced through practical training sessions.
- Safety factor – experiments and laboratory activities are organized in digital formats that comply with safety requirements.

If these aspects are taken into account in physics instruction, they play a significant role in developing students' subject-specific competencies. In conclusion, the effective use of digital technologies and integrative approaches in physics lessons is essential for fostering subject-related competencies. Such an approach enhances the opportunities for preparing comprehensively developed and professionally competent specialists.

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