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DEVELOPMENT OF STUDENTS' METAPROFESSIONAL COMPETENCIES THROUGH THE INTEGRATION OF DIGITAL TECHNOLOGIES INTO THE TEACHING OF DC LAWS

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Abstract:
This article analyzes the development of students' metaprofessional competencies while teaching the laws of direct current using digital technologies. The role of virtual laboratories, computer modeling, and interactive platforms in the modern educational environment and their impact on the learning process are emphasized. The article also explores the potential for deepening students' knowledge, developing competencies in independent thinking, problem solving, and working with information using digital tools. The study's results demonstrate that integrating digital technologies into physics education develops students' knowledge not only in the field of science but also in their universal competencies.

Keywords: Digital technologies, laws of direct current, metaprofessional competence, virtual laboratory, modeling, physics education, interactive learning, digital learning environment, electrical circuits, innovative pedagogy.

O‘zgarmas tok qonunlarini o‘qitishda raqamli texnologiyalar integratsiyasi orqali talabalarning metaprofessional kompetensiyalarini rivojlantirish

Annotatsiya: Mazkur maqolada raqamli texnologiyalar asosida o‘zgarmas tok qonunlarini o‘qitish jarayonida talabalarning metaprofessional kompetensiyalarini rivojlantirish masalalari tahlil qilingan. Zamonaviy ta’lim muhitida virtual laboratoriyalar, kompyuter simulyatsiyalari va interfaol platformalarning o‘rni hamda ularning o‘quv jarayoniga ta’siri yoritilgan. Shuningdek, raqamli vositalar yordamida talabalar bilimini chuqurlashtirish, mustaqil fikrlash, muammoli vaziyatlarni hal etish va axborot bilan ishlash kompetensiyalarini shakllantirish imkoniyatlari asoslab berilgan. Tadqiqot natijalari raqamli texnologiyalarni fizika ta’limiga integratsiya qilish talabalarning nafaqat fan bo‘yicha bilimlarini, balki ularning universal kompetensiyalarini ham rivojlantirishini ko‘rsatadi.

Kalit so‘zlar: Raqamli texnologiyalar, o‘zgarmas tok qonunlari, metaprofessional kompetensiya, virtual laboratoriya, simulyatsiya, fizika ta’limi, interfaol o‘qitish, raqamli ta’lim muhiti, elektr zanjirlari, innovatsion pedagogika.

Развитие метапрофессиональных компетенций студентов посредством интеграции цифровых технологий в преподавание законов постоянного тока.

Аннотация:
В данной статье анализируются вопросы развития метапрофессиональных компетенций студентов в процессе обучения законам постоянного тока с использованием цифровых технологий. Подчеркивается роль виртуальных лабораторий, компьютерного моделирования и интерактивных платформ в современной образовательной среде и их влияние на учебный процесс. Также обосновываются возможности углубления знаний студентов, формирования компетенций в самостоятельном мышлении, решении проблемных ситуаций и работе с информацией с помощью цифровых инструментов. Результаты исследования показывают, что интеграция цифровых технологий в физическое образование развивает у студентов не только знания в области науки, но и их универсальные компетенции.

Ключевые слова: Цифровые технологии, законы постоянного тока, метапрофессиональная компетенция, виртуальная лаборатория, моделирование, физическое образование, интерактивное обучение, цифровая учебная среда, электрические цепи, инновационная педагогика.

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Introduction.

In the current context of globalization and digital transformation, improving the quality and efficiency of the education system is emerging as one of the pressing issues. In modern society, a specialist is required not only to have deep theoretical knowledge, but also to master metaprofessional competencies such as independent decision-making in various professional and social situations, effective problem solving, critical and systematic thinking. In this regard, organizing the teaching process of physics, in particular the laws of constant current, in higher educational institutions on the basis of innovative approaches is of great scientific and practical importance.

Main part. The laws of constant current are one of the important sections of physics, which, along with theoretical knowledge, plays an important role in the formation of practical skills. Traditional teaching methods often do not sufficiently increase the activity of students and cannot ensure deep and stable assimilation of knowledge. Therefore, there is a need to introduce digital technologies into the educational process.

Digital technologies – virtual laboratories, computer simulations, interactive platforms and multimedia tools – allow for the effective organization of the learning process. Using these tools, learning through modeling complex concepts such as electrical circuits, current, voltage and resistance helps students develop deep and systematic knowledge. As a result, theoretical knowledge is combined with practical experience.

The learning environment, organized on the basis of digital technologies, stimulates students' independent learning activities, develops creative and critical thinking, and creates an opportunity for integrated acquisition of knowledge. In particular, through simulations, students have the opportunity to observe real processes in a virtual environment, change parameters, and analyze results. This serves to develop metaprofessional competencies - working with information, analyzing problem situations, decision-making, and communicative skills.

Modern digital technologies have the advantages of ensuring interactivity in the educational process, automating knowledge control, analyzing large amounts of data, and expanding the possibilities of distance learning. Online platforms, mobile applications, electronic textbooks, and virtual laboratories allow students to learn independently, consolidate their knowledge, and assess their level of mastery.

Metaprofessional competencies are an integral part of a modern specialist, they ensure the successful functioning of a person in various fields of activity. These competencies include critical thinking, problem solving, communication, information literacy, and self-development skills. The integration of digital technologies into the educational process creates an effective pedagogical environment for the formation of these competencies.

In physics education, especially in the study of the laws of constant current, the use of software tools such as PhET, Crocodile Physics, Multisim is very effective. With the help of these programs, students have the opportunity to virtually assemble electrical circuits, conduct experiments, analyze the results, and connect theoretical knowledge with practice. Virtual laboratories provide an environment that is safe, cost-effective, and allows for repeated experiments.

In addition, interactive tests and automated assessment systems provide a quick and objective assessment of student knowledge. Virtual environments based on teamwork develop students' communicative competencies.

As a result of the use of digital technologies, the following metaprofessional competencies are formed:

- critical and logical thinking;
- solving problem situations;
- information literacy;
- communication and teamwork skills;
- self-development and reflection.

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Also, computer modeling of physical processes is considered one of the promising areas of teaching. Computer models activate the learning process, allow for a visual explanation of complex processes, and help to effectively organize the teacher's pedagogical activities.

Teaching the laws of constant current based on digital technologies not only deepens students' knowledge of the subject, but also develops their metaprofessional competencies. This serves one of the main goals of the modern education system - to train competitive, independent-thinking and innovative specialists.

Conclusion. In the context of digital transformation, modernization of the education system, introduction of innovative technologies into the educational process, and development of metaprofessional competencies of students are among the priority tasks. Teaching the laws of constant current based on digital technologies is an effective tool in achieving these goals.

The widespread introduction of digital technologies not only improves the educational process, but also has a positive impact on the informatization of society, the knowledge economy, and the processes of innovative development. As a result, a modern education system serves to form digitally literate individuals, creative thinkers, and those capable of solving global problems.

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