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IMPROVING EDUCATIONAL TASKS AIMED AT DEVELOPING SCIENTIFIC LITERACY THROUGH ARTIFICIAL INTELLIGENCE

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Annotation. This article analyzes the didactic possibilities of improving educational tasks aimed at developing scientific literacy through artificial intelligence. The study highlights the role of artificial intelligence technologies in the educational process, their importance in creating adaptive tasks, and their effectiveness in developing scientific competencies. In addition, the structural components, pedagogical conditions, and practical mechanisms of an AI-based didactic model are described. According to the research findings, the use of AI technologies contributes to the development of students' scientific thinking, problem-solving abilities, independent and creative thinking competencies.

Keywords: scientific literacy, artificial intelligence, didactic model, adaptive tasks, digital pedagogy, scientific thinking, competency-based approach, innovative technologies, research competence, interactive learning, virtual laboratory, smart education system.

In today's conditions of globalization and digital transformation, the development of scientific literacy within the education system has become one of the most pressing issues. Modern society requires individuals not only to possess theoretical knowledge, but also to demonstrate scientific thinking, problem-solving abilities, logical reasoning, and competencies in working with innovative technologies. From this perspective, the use of artificial intelligence technologies in developing students' scientific literacy creates significant pedagogical opportunities.

Artificial intelligence-based technologies serve to individualize the educational process, create adaptive tasks, rapidly identify students' knowledge levels, and design educational trajectories tailored to their needs. Particularly in teaching natural sciences, virtual laboratories, intelligent testing systems, interactive simulations, and automated assessment platforms are emerging as effective tools for improving educational outcomes.

This article discusses the didactic model and pedagogical possibilities of improving educational tasks aimed at developing scientific literacy through artificial intelligence technologies.

In the context of globalization, paying special attention to quality indicators in teaching every subject has become one of the main responsibilities of every teacher. Especially under the conditions of educational transformation, enhancing the quality of teaching natural sciences, improving teachers' professional skills, continuously developing their pedagogical competencies, and increasing their engagement in research activities have been identified as priority areas in education. Today, ensuring quality education and upbringing, particularly fostering competencies and developing scientific literacy in students through the teaching of natural sciences, is considered one of the most important tasks.

As the global educational environment continues to evolve, modern society increasingly regards scientific literacy as one of the key competencies of every individual. Natural sciences — biology, chemistry, physics, and geography — are not only sources of precise knowledge but also means of developing a conscious attitude toward the environment. Today, students' scientific literacy is assessed not merely through test results, but through their ability to make scientifically grounded decisions in everyday life. The importance of teaching natural sciences in the modern educational system is steadily increasing because the rapid development of science and technology demands new types of competencies from individuals, such as critical thinking,

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problem-solving, and evidence-based decision-making. Therefore, teaching natural sciences not only as theoretical knowledge but also as a practical necessity has become an urgent issue.

The concept of scientific literacy has become one of the central ideas in modern education. It refers to students' ability to acquire scientific knowledge, apply it in everyday life, understand ecological and health-related issues, and analyze them critically. For example, understanding and responding consciously to pressing issues such as global climate change, biodiversity loss, genetically modified products, and energy resources requires scientific literacy. In this regard, it is essential to teach scientific knowledge to students through an integrative approach, particularly in physics education.

Research on independent and creative approaches in education, logical thinking, educational technologies, computer literacy, professional competence, and the development of experimental skills has been conducted by scholars such as B. Mirzaakhmedov, M. Djoraev, A. Abduqodirov, U. Begimqulov, K. Nasriddinov, N. Azizkhodjaeva, Sh. Otajonov, M. Qurbonov, A. Xusanov, and M. Matnazarova.

Ideas related to educational technologies aimed at developing students' competencies and monitoring their formation are reflected in the works of J. Tolipova, U. Inoyatov, B. Xodjaev, M. Vahobov, O. Qo'ysinov, Y. Asadov, N. Turdiyev, and D. Mamatqulov.

According to scientific literacy competencies, students should:

-understand and explain the characteristics, essence, and nature of various natural objects, phenomena, and processes based on theoretical knowledge;

-explain natural phenomena and processes observed in everyday life using scientific terms, concepts, and general laws, as well as apply acquired knowledge, skills, and competencies in practice;

-conduct observations, research, experiments, and perform calculations;

-analyze information presented in various sources and use it for educational purposes;

-stay informed about socio-economic and scientific-technological developments in society and understand their significance in personal activities;

-know the theoretical and practical foundations of health and a healthy lifestyle.

The role of all sciences, including physics, in the development of society is invaluable. Physics is an exact science; however, it is also rich in abstract concepts and therefore considered a complex discipline. Naturally, the solutions to scientific problems are transferred directly into the educational process to pass this knowledge on to future generations. In physics education, the following objectives are pursued:

-developing students' scientific worldview and philosophical reasoning abilities;

-explaining the fundamental laws of nature on a scientific basis and forming students' understanding of physical processes underlying the operation of technological devices and tools used in everyday life;

-ensuring continuity in physics education to deepen students' knowledge and create a solid foundation for future scientific research activities.

The foreign experience of assessing students' knowledge can be examined through the example of Finland. Finland recently attracted worldwide attention due to its students' high achievements in the Programme for International Student Assessment (PISA). PISA is conducted every three years and assesses approximately 15-year-old students in about 57 countries (Kupianinen, Hautamaki, & Karjalainen, 2009). Finland's school practices may seem unfamiliar to teachers in the United States because the Finnish government provides a one-year pre-primary education program for six-year-old children, and 96% of students take advantage of this opportunity.

The views of scholars such as B. Mirzaakhmedov, N. Mamadiyorov, and A. Abduvahobov, who conducted scientific research on intellectual education and its implementation in physics lessons, are of great value. However, the issue of developing scientific literacy among secondary school students in physics classes has not yet been fully studied and has not been adequately

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resolved in accordance with today's requirements. This issue has not been investigated as a special research object, as evidenced by analyses of pedagogical experiences and our observations. Various aspects of the research topic have been purposefully studied by Uzbek scholars.

In particular, within the framework of implementing the tasks outlined in the Resolution of the President of the Republic of Uzbekistan No. PQ-5032 dated March 19, 2021, "On measures to improve the quality of education in the field of physics and develop scientific research," a number of scientific studies have been conducted by researchers over the past five years.

The essence of scientific literacy. Scientific literacy refers to an individual's ability to understand natural and social phenomena from a scientific perspective, draw conclusions based on scientific evidence, conduct observations and experiments, and solve problems scientifically. This type of literacy not only develops students' critical and analytical thinking but also prepares them to make informed decisions based on scientific approaches in real-life situations.

Today, scientific literacy is recognized as one of the key competencies in international assessment programs, particularly in PISA studies. Therefore, in teaching natural sciences, it is essential not only to provide knowledge but also to develop a system of tasks aimed at forming scientific competencies.

The importance of AI-based educational tasks. The integration of artificial intelligence technologies into education is fundamentally transforming the methodology of creating and applying educational tasks. Unlike traditional assignments, AI-based tasks are adaptive, interactive, and individualized in nature.

Such tasks provide the following advantages:

-automatic selection of tasks according to students' knowledge levels;

-individualization of the learning process;

-opportunities for rapid analysis and assessment;

-development of students' independent learning activities;

-formation of scientific research competencies;

-enhancement of creative and critical thinking skills.

For example, through virtual laboratories, students are able to conduct various scientific experiments in a safe environment. Chatbots and intelligent assistants, in turn, serve as individual consultants in explaining complex topics.

Didactic model improved on the basis of artificial intelligence. The didactic model aimed at developing scientific literacy consists of several interconnected components.

The first component is the target component, which focuses on developing scientific competencies, forming scientific thinking, and improving skills in using digital technologies.

The second component is the content component. Within this component, a system of problem-based, research-oriented, creative, and adaptive tasks is developed. The tasks are based on real-life situations and stimulate students' scientific thinking activities.

The third component is the technological component. At this stage, AI-based platforms, virtual laboratories, interactive simulations, and intelligent testing systems are applied. These technologies not only improve the effectiveness of the educational process but also increase students' interest and motivation.

The fourth component is the activity component. In this process, the teacher acts as a facilitator and guide, while students acquire knowledge through independent inquiry, analysis, experimentation, and project-based activities.

The fifth component is the assessment component, in which automated monitoring and diagnostic systems based on artificial intelligence are utilized.

Pedagogical opportunities of the didactic model. The implementation of this model in practice ensures the following pedagogical outcomes:

-increased interest in natural sciences;

-expansion of students' scientific worldview;

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-development of independent and creative thinking;
-formation of digital competencies;
-creation of individualized learning trajectories;
-improvement of the effectiveness of the educational process.

In addition, AI-based tasks make it possible to monitor students' achievement levels in real time. As a result, teachers can implement an individualized approach based on the specific needs of each student.

In conclusion, the use of artificial intelligence technologies in developing scientific literacy is considered one of the priority directions of modern education. AI-based adaptive and interactive tasks contribute to the development of students' scientific thinking, the formation of problem-solving competencies, and the improvement of educational effectiveness. The improved didactic model serves as an innovative pedagogical mechanism in teaching natural sciences. The educational process organized on the basis of this model develops not only students' knowledge levels but also their research, creative, and digital competencies. Therefore, the wide integration of artificial intelligence technologies into natural science education is regarded as one of the urgent pedagogical tasks of today.

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