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Technologies and Stages of Creating Educational Resources Based on Artificial Intelligence

Muhiddinov Muhriddin Nuriddin oglu
Independent Researcher at the National Pedagogical University of Uzbekistan named after Nizami
muhiddinovm444@gmail.com

Abstract

This article thoroughly explores technologies and stages involved in developing artificial intelligence (AI)-based educational resources in specialized schools. The study examines methods of employing AI and ICT to enhance the effectiveness of the pedagogical process. It provides an in-depth analysis of the capabilities of adaptive and individualized learning facilitated by artificial intelligence technologies, alongside pedagogical monitoring and interdisciplinary integration. Specific indicators and criteria have been developed to evaluate students' knowledge and determine their motivation.

Keywords: Artificial intelligence, ICT, educational resources, adaptive learning, pedagogical monitoring, interdisciplinary integration, pedagogical effectiveness, information security, individualized education.

Introduction

Increasing the efficiency and quality of pedagogical processes in the modern education system is one of the urgent tasks. The role of information and communication technologies (ICT) and artificial intelligence (AI) technologies is becoming increasingly important in this process. The rapid development of AI technologies is opening up new opportunities for the creation and use of educational resources.

Educational resources based on artificial intelligence are created taking into account the individual characteristics and learning needs of students. This approach helps students to effectively and deeply master knowledge, ensures a personalized learning process. It also allows teachers to accurately and systematically monitor the process of students' learning, evaluate the results and make the necessary recommendations.

Within the framework of this study, the technologies for developing AI-based educational resources and their stages are scientifically and methodologically substantiated. In particular, the following stages are analyzed in detail within the framework of the study:

1. Determining the learning needs of students in creating educational resources, formulating pedagogical and didactic goals;
2. Creating a software and technological infrastructure of resources, i.e., developing platforms, programs, algorithms and models;
3. Developing mechanisms for forming individual learning paths using machine learning and neural networks;
4. Organizing pilot testing processes and pedagogical experiments of resources, testing their effectiveness in practice and improving them based on feedback;
5. Developing methodological recommendations for the introduction and use of educational resources in the educational process, and improving the training of teachers.

Each of these stages is scientifically and methodologically justified separately, and the results of relevant international and national studies are analyzed. This substantiates the pedagogical effectiveness and practical significance of the developed educational resources based on SI.

In general, the introduction of SI technologies into the education system will serve to more effectively organize educational processes in accordance with the modern educational paradigm, to develop students' knowledge and competencies in a high-quality manner. As a result, it will be possible to reach a qualitatively new level in the education system.

Literature review

In the experience of integrating mathematics, computer science, and psychology using an interdisciplinary integration approach, it was found that the quality of projects submitted by students improved by 35% [1].

Creating a personalized learning trajectory that matches each student's individual learning needs, abilities, and interests plays an important role in increasing educational effectiveness. Adaptive learning technologies automatically select learning materials that are suitable for each student, and the pedagogical process becomes more personalized [2].

By integrating knowledge from pedagogy, computer science, mathematics, and psychology, it is possible to form complex competencies. This integrative approach allows students to form more comprehensive knowledge and skills [3].

It stimulates the process of effective mastery of knowledge by students and provides teachers with detailed information about students [4].

Formation of complex competencies by integrating knowledge from different disciplines [5].

The following main stages are envisaged in the development of the pedagogical model. Assessment methods and indicators are based on advanced scientific research in the field of pedagogical diagnostics and allow for an accurate and effective assessment of the development of each student [6].

Results

During the study, the following main stages and technologies for creating educational resources based on artificial intelligence were identified:

Conceptual stage: Identification of pedagogical and methodological aspects, creation of an adaptive and innovative educational model.

Technological platform and methodological support stage: Solving pedagogical tasks using Frontend and Backend technologies (HTML, CSS, JavaScript, React, Python, Django).

Testing process and pedagogical effectiveness assessment stage: Development of specific indicators and criteria for monitoring and evaluating the educational process.

Indicators of students' motivation for the educational process:

Students' interest and activity in the educational process are determined through special questionnaires. Motivational questionnaires are developed based on the Likert scale (on a 5-point scale) and students' responses are statistically analyzed. The results of the questionnaires are analyzed using statistical programs such as SPSS or Excel, and the results are displayed in the form of graphs and diagrams.

Indicators of the development of independent learning skills: The number, quality and consistency of students' independent tasks are recorded by the teacher in observation journals. The results of independent tasks are determined through assessment rubrics (using a scoring system). Students' self-assessment (reflection) skills are determined through special reflexive questionnaires and evaluated using scores.

Procedure for implementing the assessment process: To determine the initial state, introductory diagnostic tests and initial motivational questionnaires are conducted. In the middle of the educational process, intermediate diagnostic tests and observations are conducted, and intermediate results are recorded. For the final assessment, exit tests, final motivational questionnaires, and the results of tasks completed independently by students are analyzed. The results are summarized in the form of tables, graphs, and diagrams, and the reliability of the results is checked using statistical methods (t-test, analysis of variance (ANOVA)). Based on the results obtained, the strengths and weaknesses of pedagogical resources are identified, and specific recommendations are developed for further optimization of the pedagogical process. This methodological approach creates the opportunity to prove the effectiveness of pedagogical resources using scientifically based and accurate indicators. Advantages of the above revised version: The mechanisms for assessing practical effectiveness are very clearly and in detail. The types of assessment indicators and the process of their formation are specifically described. The procedure for collecting, processing, and analyzing results is explained in a scientifically based manner. Educational resources developed through the effective application of these pedagogical and methodological aspects serve to improve the quality of student education. This creates opportunities to significantly improve the overall efficiency and quality of the pedagogical process.

Technological platform and methodological support stage: At this stage, the technological platforms (Frontend and Backend), algorithms, and methods for creating interfaces used in the creation of educational resources are clearly defined. Interactive learning forms, on-line and off-line learning technologies, Telegram bots, and other modern technological tools further improve the quality of the pedagogical process. An effective pedagogical environment is created by taking into account the individual characteristics and needs of each student through pedagogical technologies and methods based on artificial intelligence.

The development of educational resources based on artificial intelligence through the above methodological foundations and stages allows for a significant increase in pedagogical efficiency, increasing each student's interest in the educational process, and qualitatively forming knowledge

and skills. This creates opportunities for effectively solving the most pressing tasks facing the modern education system. The most important tasks facing the education system today include improving the quality of education, effectively organizing the pedagogical process, and implementing digital transformation in the education system. To increase the effectiveness of the educational process, the creation of adaptive and individualized educational resources based on artificial intelligence (AI) is becoming an increasingly urgent task. Adaptive and person-oriented educational processes are based on modern pedagogical approaches, didactic requirements and psychological principles. Educational resources developed on the basis of these principles help to increase the effectiveness and quality of the educational process to a higher level, taking into account the individual characteristics and needs of students. According to experiments, when using these resources, the level of mastery by students has increased by 32% [7]. Such resources increase students' interest in learning, enhance the effectiveness of mastery, and optimize the pedagogical process. Through these technologies, the possibilities of optimizing the pedagogical process, increasing the effectiveness of students' learning, and strengthening their motivation to learn are expanding. Adaptive educational resources based on artificial intelligence allow organizing the educational process taking into account the individual capabilities and needs of students. Each student is provided with educational materials tailored to their level of knowledge, interests, and learning pace. This creates an individual educational development trajectory for each student and, as a result, significantly improves the quality of education. This approach reduces the workload of teachers by making pedagogical activities more effective and interesting, and improves the overall quality of the educational process. The relevance of developing these educational resources is associated with the need to increase the interactivity of the pedagogical process and raise the quality of education to a higher level. The use of artificial intelligence technologies in the pedagogical process allows students to develop independent learning skills and master knowledge in depth and effectively. Therefore, the development of educational resources based on artificial intelligence has been scientifically confirmed by modern research in the field of pedagogical and technological innovations [8].

Artificial intelligence-based educational resources created in accordance with the above-mentioned scientific, methodological and pedagogical foundations have the potential to significantly increase the efficiency of the modern pedagogical process. Such an approach, by fully satisfying the individual development needs of students, brings the quality of education to a higher level and increases the overall efficiency of pedagogical activities.

Choosing a technological platform (Frontend, Backend) The correct choice of technological platforms is a very important stage in the development of artificial intelligence-based educational resources. At this stage, when selecting platforms, pedagogical efficiency, technical capabilities and the creation of a user-friendly interface are considered the main criteria.

When choosing frontend technologies, the main attention is paid to ensuring the effective work of students with the interface. For example, according to recent studies, it was found that working through a simple and intuitive interface increased the speed of students' mastering materials and completing tasks by more than 25% [9]. The selected technologies are determined taking into account the possibilities of increasing the speed of students' learning in the process of performing pedagogical tasks, ensuring effective interaction with educational resources, and enhancing the individual orientation of the educational process. The clarity, simplicity, and intuitiveness of the

interface increase the motivation of students to independently acquire knowledge and significantly increase the effectiveness of the pedagogical process.

The main focus of backend technologies is on increasing the effectiveness of the pedagogical process. Through the selected software solutions, pedagogical tasks such as monitoring student activity, identifying individual educational needs, and automatically selecting educational materials are solved. These technological solutions allow teachers to optimize the process of working with each student and ensure accuracy and speed in the educational process.

Discussion

The integration of artificial intelligence technologies into the pedagogical process is important for improving the quality of education. These technologies serve the effective assimilation of knowledge by students by increasing the interactivity, individual orientation, and adaptability of the educational process. Adaptive learning systems based on SI provide students with educational materials that are tailored to their individual abilities and needs, and as a result, increase the effectiveness of their learning.

However, along with the widespread introduction of these technologies into the educational process, a number of problems are also emerging. In particular, there is a risk of ensuring the security of personal data and excessive reliance on technology in the pedagogical process. Therefore, it is important to ensure a balance of pedagogical and technological requirements when introducing SI technologies. This balance requires maintaining the pedagogical role and creative activity of teachers. In addition, a more effective pedagogical environment can be created by combining innovative technologies with traditional pedagogical methods.

By using interdisciplinary integration, students will have the opportunity to solve complex problems and master practical knowledge. This will increase the quality of projects presented by students and allow them to form their comprehensive knowledge and skills. An interdisciplinary approach serves as an important strategy for increasing the effectiveness of the pedagogical process.

Conclusion

The creation of educational resources based on artificial intelligence and their integration into the pedagogical process requires a comprehensive approach in technological, methodological and pedagogical terms. These technologies significantly improve the quality of the educational process and allow students to effectively and long-term master knowledge. By forming individual and adaptive learning trajectories for students, the educational process becomes more effective and interesting.

However, solving existing problems in the integration of technologies into the pedagogical process, in particular, solving issues such as ensuring data security, taking into account the human factor and preventing excessive reliance on technological tools, is an important task. Also, by expanding interdisciplinary integration and combining pedagogical technologies with innovative methodologies, it is possible to further enrich the educational process and increase its pedagogical effectiveness.

In the future, through research and practical projects conducted in this direction, the efficiency and quality of the education system will be raised to a higher level. This will further enhance the ability to prepare students in accordance with the competitive requirements of modern society.

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