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Organizational and Technical Conditions for Establishing Students' Independent Learning with The Help of Artificial Intelligence

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Abstract: This article systematically analyzes the need to organize independent learning of students based on artificial intelligence (AI) technologies, organizational and technical conditions, existing platforms, problems and solutions. First of all, the need to introduce AI tools is justified based on the limitations of traditional education, the need to increase student activity and the need for personalized education. Harmonizing curricula with AI technologies, increasing teachers' digital literacy, developing methodological manuals and forming monitoring systems are identified as the main organizational conditions. Also, provision of technically modern ICT, access to AI platforms, electronic libraries and the presence of stable Internet are considered as important infrastructures for effective independent learning. The article briefly analyzes learning platforms based on local and foreign practical experience and shows their functional capabilities. At the same time, problems such as technological inequality, low level of training, financial and legal restrictions and specific solutions to eliminate them are proposed. Finally, methodological, technical, and strategic recommendations are presented to increase the effectiveness of independent learning using AI. This article serves as a scientific, theoretical, and practical basis for the formation of a digital learning environment based on artificial intelligence in the education system of Uzbekistan.

Keywords: Artificial intelligence, independent learning, digital pedagogy, learning platforms, technological inequality, organizational conditions, educational technologies, e-learning, digital literacy, AI in education, monitoring system.

Introduction:

The development of artificial intelligence (AI) technologies is leading to fundamental changes in the field of education. AI technologies provide opportunities for individualizing the learning process, creating a learning environment adapted to the needs of students, and optimizing the learning process. In particular, as a result of the widespread use of information technologies, students have the opportunity to independently develop their knowledge and skills through electronic learning platforms and virtual assistants. The Law of the Republic of Uzbekistan “On Education” states that “the organization of the educational process using modern information and communication technologies is an important condition for improving the quality of education”[1]. As a result, the efficiency of the educational process increases, and students begin to master knowledge more deeply and independently.

The concept of independent learning has become an important component of the modern education system today. Independent learning is the individual development of a student's knowledge, skills and competencies, in which he or she acquires knowledge on the basis of an active, initiative and creative approach.

The relevance of this article is explained by the need to identify the organizational and technical aspects of using artificial intelligence technologies in organizing independent learning of students. The purpose is to study the organizational and technical conditions for

the effective organization of independent learning of students using AI, analyze existing opportunities and develop practical recommendations. The modern education system is undergoing fundamental changes under the influence of rapidly developing technologies, especially solutions based on artificial intelligence (AI). Such changes are mainly due to the need to find solutions to existing limitations in the traditional education system. In traditional education, the teacher is in the center, and students often participate as passive listeners. This reduces the effectiveness of learning and hinders the development of independent thinking and innovation skills [2]. In addition, the implementation of lessons based on a strict schedule, a generalized approach without taking into account the level of knowledge of each student, also hinders the individualization of the learning process [3]. Artificial intelligence technologies are emerging as an effective tool to prevent these shortcomings. First, SI tools allow students to form an educational path that is appropriate for each student's level of knowledge, learning speed, and interests by providing an individual approach [4]. This, in turn, leads to increased student engagement in the learning process. For example, adaptive learning platforms or intelligent tutoring systems facilitate the learning process by delivering the necessary knowledge to the student in a prescribed manner and step by step [5]. Secondly, systems built on the basis of SI stimulate students' interest in learning through interactive tools, virtual environments and communication technologies, increasing their activity. This develops not only the student's knowledge, but also his critical thinking, creative approach and independent problem-solving skills [6]. A personalized approach to education is becoming increasingly relevant. Organizing education that meets the specific didactic needs of each student can only be implemented through artificial intelligence technologies. With the help of SI, educational materials are automatically updated and presented based on the previous level of knowledge of each user, which dramatically increases the effectiveness of learning [7]. Increased personalization in education, in turn, increases motivation for learning among students, which makes the transition to independent learning a natural and effective process [8].

To successfully organize independent learning using artificial intelligence (AI), it is necessary to create a number of important organizational conditions in educational institutions. First of all, by combining curricula with modern AI tools, it is possible to digitize and automate the content of education. This requires not only the introduction of information technologies, but also a revision of the methodological approach to teaching. Integrated curricula not only equip students with knowledge, but also prepare them to act independently in a digital environment [9]. The level of digital literacy of teachers is one of the decisive factors in the implementation of AI-based education. Many teachers have only basic skills in using information technologies and face difficulties in working with advanced AI platforms. Therefore, it is necessary to introduce systematic training courses for teachers aimed at professional development, including practical training and virtual laboratories [10]. This, in turn, reduces the gap between the teacher and technology. Another important aspect is the systematic development and wide dissemination of methodological guides and instructions on the use of AI tools. Practical guides adapted to each subject clearly explain to teachers and students how to use artificial intelligence systems, their didactic advantages and application scenarios. This eliminates disparities in the use of technologies and forms a unified approach to the learning process [11]. In addition, it is necessary to establish monitoring and analytical tracking systems for effective management of education based on AI. Analytical platforms operating in real time allow you to monitor student activity, the level of completion of tasks, knowledge acquisition indicators and individual growth [12]. Such systems, in particular, increase the transparency of the educational process and help management bodies make informed decisions. Long-term monitoring will determine the real effectiveness of AI-based learning tools and improve educational strategies in the future [13]. Thus, for the development of independent learning with the help of artificial intelligence, it is of strategic importance to harmonize educational plans with AI, develop digital skills of teachers, develop methodological resources, and implement educational monitoring systems, all of which must be organized in a comprehensive manner.

The technical conditions necessary for the effective implementation of independent learning based on artificial intelligence require the development of educational infrastructure in accordance with modern requirements. First of all, educational institutions must be sufficiently equipped with modern information and communication technologies (ICT). Classrooms equipped with personal computers, tablets, smart boards, and other digital devices support the independent work of students and expand the possibilities of interactive learning [14]. The presence of such a technological

infrastructure is especially important in the practical implementation of digital pedagogy elements.

Free and convenient access of students to modern artificial intelligence platforms - ChatGPT, Khanmigo, Squirrel AI, Duolingo Max, etc. - expands their technical capabilities for independent learning. Through these platforms, a student can deepen his knowledge, get answers to questions in real time, do exercises, and perform tasks ranging from language learning to complex analysis [15]. In many cases, such systems provide an individual approach based on artificial intelligence, adapting educational materials to the needs of the student [16].

Another important technical condition is the presence of an electronic library, LMS (Learning Management System), and networked (cloud) educational systems. Electronic libraries do not tie students to printed literature, but provide real-time access to global knowledge resources. The LMS serves not only as a system for distributing and collecting tasks, but also as a tool for monitoring, evaluating, and analyzing student learning activities [17]. Platforms such as Moodle, Canvas, and Google Classroom provide seamless management and transparency of the learning process. Cloud services provide access to all learning materials from any device. In addition, internet speed and stability are of particular importance as the technical basis for independent learning. If the internet speed is low or there are frequent interruptions, timely access to learning materials, online training, etc.

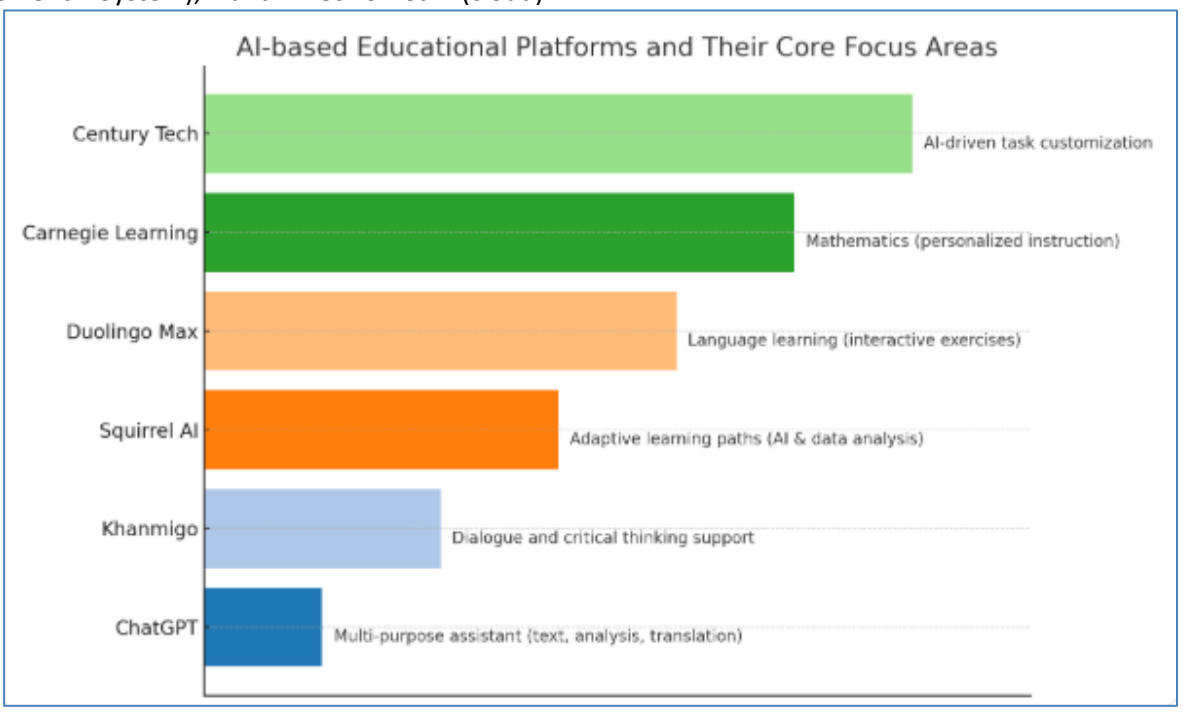

Figure 1. SI-based learning platforms and their main areas.

Among the AI-based learning platforms that are currently widespread worldwide, ChatGPT, Khanmigo, Squirrel AI, Duolingo Max, Carnegie Learning, Century Tech, and Knewton Alta deserve special attention. For example, ChatGPT acts as a multifunctional tutor by answering students' questions in real time, explaining topics, analyzing texts, and assisting with translation and writing [20]. Khanmigo is Khan Academy's AI assistant; it asks students questions and guides them in their thinking, which encourages independent thinking [21]. Squirrel AI, developed in China, analyzes the knowledge level of each student based on big data and forms an individual learning plan [22]. Duolingo Max is a platform for language learning that allows you to create interactive exercises and conversations using AI [23].

Looking at local experience, the desire to introduce SI technologies is also growing in the education system of Uzbekistan. In particular, through digital projects such as UzEduAI, Darslik.uz, EduMarket.uz, educational resources are being provided in an automated and customized form. At the new stage, some universities are creating wide opportunities for practical work such as writing scientific papers, creating tests, and translating using ChatGPT or similar technologies [24].

Foreign experience shows the widespread introduction of SI technologies at all levels of education, from preschool to higher education. For example, in the USA, Carnegie Learning provides

personalized suggestions for learning mathematics, and in the UK, the Century Tech platform automatically provides students with the necessary tasks, determining their knowledge level [25]. All this indicates the increasing use of SI tools as an innovative tool in independent learning.

Although the introduction of AI-based self-directed learning offers many promising opportunities, there are also a number of important challenges that arise in this process. A comprehensive analysis of these challenges and the development of practical solutions are important steps towards the sustainable digitalization of the education system. Table 1 briefly presents the challenges and solutions encountered in the introduction of AI-based self-directed learning.

Table 1.

	Challenge	Description	Proposed Solution
1	Technological inequality	Lack of internet and devices, especially in remote areas	Digital grants, free Wi-Fi access, and device distribution
2	Low readiness level	Teachers and students are not prepared to use AI technologies	Training programs on AI tools for teachers and students
3	Financial and infrastructural limitations	High costs of AI platforms and infrastructure	Government subsidies and international donor programs
4	Legal and ethical issues	Concerns regarding personal data, copyright, and fairness	Development of ethical codes and strict legal regulations

The first problem is technological inequality. Not all students or teachers have access to modern devices, stable internet and SI platforms. Educational institutions in remote areas are especially deprived of technological infrastructure. To overcome this problem, public-private partnerships can be established to establish "digital education grants", free Wi-Fi hotspots and mobile device provision programs.

The second problem is the level of training of students and teachers. Many teachers do not know how to use artificial intelligence tools or are afraid to use them. Students, on the other hand, have difficulty critically analyzing digital information, working independently and communicating with SI-based tools. As a solution to this, it is necessary to include continuous professional development programs for teachers and training courses for students on working with AI in educational programs.

The third problem is financial and infrastructural constraints. Components such as SI-based platforms, servers, licenses, and technical maintenance require significant financial resources. Many educational institutions are unable to cover such costs independently [26]. As a solution to this issue, it is advisable for the government to allocate subsidies aimed at developing digital education infrastructure, and to use international grant and donor programs.

The fourth problem is legal and ethical issues. When using SI technologies, issues such as the confidentiality of personal data, the authorship of content created by AI, violation of the principle of fairness in assessment, and algorithmic errors arise. As a solution, it is necessary to develop strict legal standards and codes of ethics when integrating SI tools into education. In particular, the transparency of the information processed by AI and human control in management should remain important principles.

The establishment of independent education using artificial intelligence should be formed in harmony not only with technological progress, but also with social justice, pedagogical preparation, financial stability, and legal frameworks. Solving each problem based on an integrated approach will make the transformation in this area more effective.

CONCLUSIONS

The introduction of artificial intelligence (AI) technologies into education is changing the fundamental nature of the educational process, expanding the possibilities for independent and personalized learning for students. In order to fully

utilize these opportunities in the education system of Uzbekistan, it is necessary to develop important organizational and technical conditions and strengthen methodological and legal foundations.

First of all, the following recommendations are important in improving organizational and technical conditions:

– Enriching educational programs and curricula with flexible modules that support AI technologies;

– Introducing special advanced training programs to prepare teachers to work with AI tools;

– Providing all educational institutions with modern computer equipment, broadband Internet and digital educational infrastructure;

– Creating a permissive and convenient access environment for AI-based educational platforms (ChatGPT, Khanmigo, Squirrel AI, etc.);

– Development of national regulatory documents that provide for ethical and legal principles in the implementation of AI technologies in education.

Ways to increase the effectiveness of independent learning using AI should also be one of the main directions of the education strategy. The following measures are proposed:

– Organization of classes focused on digital literacy, information analysis and critical thinking to develop students' independent work skills;

– Providing student-specific content through automatic personalization of educational materials using AI (adaptive learning);

– Continuous monitoring and optimization of the learning process through the development of automated assessment and feedback systems based on AI;

– Widespread introduction of chatbots, intelligent assistants and gamified learning modules to make the independent learning process interesting and interactive;

– Strengthening tripartite cooperation by informing parents and teachers about students' achievements and difficulties through AI tools.

In general, advancing the educational process through artificial intelligence technologies is not just a technological innovation, but a strategic approach aimed at radically improving the quality of education. Thorough reforms in organizational, technical, methodological and social aspects will allow the effective implementation of the independent learning model using AI in the Uzbek education system.

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