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# Artificial intelligence in self-learning: new horizons of education

This article examines the role of artificial intelligence (AI) in self-learning. Self-learning is becoming an important skill in the era of digitalization. The use of AI in self-learning opens up new perspectives for improving the effectiveness and accessibility of education. AI is able to adapt to users, help solve tasks more efficiently, find answers to questions, provide personalized learning. The authors defined the relevance, goals and objectives of the study, analyzed the works of foreign and domestic scientists on the research. Considering that each student is unique in their abilities and needs, traditional teaching methods may not be sufficient to accommodate all these differences. However, AI technologies can provide self-learning by effectively adapting educational materials to the individual requirements of each student in each case. The article presents main promising directions of using AI in self-learning: personalized learning paths, game-based learning platforms, virtual assistants, automatic assessment system. During the study, survey was conducted among students to assess their application of AI technologies, which showed students' interest in AI and its potential use in self-learning. To achieve the obtained results, different theoretical, empirical, statistical methods were applied such as literature analysis, survey, the Mann-Whitney U-test, analysis of variance (Anova-test).

*Keywords:* artificial intelligence, artificial intelligence technologies, self-learning, self-learning skills, lifelong learning, personalization of learning, virtual assistants, automatic assessment system.



## *Introduction*

In the era of digitalization and globalization, the field of education is undergoing changes, acquiring new highly intellectual shades, namely the introduction of various digital fundamental tools such as neural networks, artificial intelligence (AI) and others. The use of AI can help solve important problems and open up new horizons in the education system. One of the important goals of the modern system of higher professional education is to train competitive specialists with a high level of professional competence and well-rounded personal development, who are capable of lifelong learning, continuously expanding the already accumulated fundamental range of their skills and knowledge.

With the rapid development of technology, students are increasingly faced with the need to learn new skills and knowledge on their own. Self-learning, in turn, is becoming an important competence in the era of digitalization and changes in the labor market. AI technologies are able to offer students personalized educational trajectories, as well as assist in the automatic analysis and processing of information. In the Address to the people of Kazakhstan, K.K. Tokayev emphasized the need to use AI in the training of qualified specialists in the higher education system [1]. This, in turn, highlights the importance of using AI in the training of future specialists.

The purpose of this work is to study the role of AI in self-learning of students. The main focus will be on analyzing the opportunities that AI provides for students' self-learning, as well as examining the advantages and challenges associated with the integration of AI into the educational process.

In accordance with our research objective, we have identified the following research objectives:

1. To analyze of the psychological and pedagogical literature of domestic and foreign researchers (authors, scientists) on the research problem.

2. To determine students' opinions on the advantages and challenges of using artificial intelligence.

3. To determine whether there is a difference between men and women in the use of AI in the process of self-learning.

4. To determine whether there is a difference between the ages of students when using AI in the process of self-learning.

The use of AI in education has been actively studied in recent years. There are numerous works by foreign and domestic scientists in this field. Researchers R.Y. Tsarev, S.V. Tynchenko and S.N. Gritsenko in their work outlined the essence of the problem at the present stage and explored the possibilities of using resources in the field of education. [2]. L.K. Fryer believes that the use of AI technologies increases students' interest in completing learning tasks and their motivation to learn [3]. As reported by D.E. Han, an important advantage of using AI in educational activities is the possibility of repeated repetition of information, their availability, regardless of the time and location of the person [4]. That is, the process of learning and assimilation of new knowledge can be continuous, not limited to academic hours.

Domestic researchers have also highlighted in their research the advantages and effectiveness of using AI in learning process. Thus, in her research work, A.E. Zhumabayeva concludes: "the most useful aspect of AI is the independent acquisition and presentation of knowledge; self-selection of the mode of educational activity in the context of the functioning of the information and communication subject environment; self-selection, organizational forms and learning methods" [5]. As reported by Zh.B. Akhmetova, Zh.Zh. Bakirova, AI-based virtual assistants support students in real time and allow them to learn independently and efficiently [6].

Therefore, it can be concluded that AI is an indispensable tool that can help students at any time and in any place in the process of improving their weaknesses on a topic or self-learning of interesting material. The use of AI in students' self-learning opens up new perspectives and opportunities for improving the effectiveness and accessibility of education. AI is able to adapt to users, help them solve tasks faster and more efficiently, find answers to questions, and provide personalized learning and support. After analyzing the scientific works on the research topic, we have considered several promising directions of using AI in students' self-learning (Fig. 1).


Figure 1. Promising directions for the use of AI in self-learning

Personalized learning paths. AI can analyze the individual needs and characteristics of each student, such as the level of knowledge, the speed of learning, preferences in teaching methods, and other characteristics. According to R.A. Amirov and U.M. Bilalova, AI allows each student to form an individual educational trajectory for successful university studies and further professional growth [7]. When using AI, an individual learning plan can be formed in accordance with the needs and learning situation of students, AI provides immersive learning and intelligent tracking of learning to help students form and develop their self-learning skills.

As claimed by M. Della Ventura, AI technologies open up new opportunities for the implementation of personalized learning, adapted to the individual needs of students [8]. Considering that each student has different abilities and capabilities, the use of traditional teaching methods in solving problems that may arise in this regard may not be sufficient in self-learning. However, artificial intelligence technologies can provide self-learning by effectively adapting learning materials to the individual requirements of each student in any situation. AI is also able to analyze the interests of students and offer them programs and courses in accordance with them. An individual approach allows students to be interested in the learning process, as well as to control the independence of completing tasks during distance or independent study [9]. Thus, students can show high motivation, level of participation and independence in the educational process. AI technologies allow students to master materials on their own.

Based on this data, AI systems can offer personalized learning paths, adapting content, assignments, and topics depending on the student's progress. For example, adaptive learning platforms such as "Coursera", "Duolingo", and "Khan Academy" use AI to create personalized learning plans. Today, the "Coursera" educational platform has a very high use among students engaged in self-study. "Coursera" is a

global platform created by Stanford University professors Daphne Koller and Andrew Ng in 2012. The platform's materials closely resemble traditional education, including lectures, tests, homework, and exams. If students encounter difficulties, they can engage in discussions on a dedicated forum, where both students and teachers communicate and exchange insights. These AI-based learning platforms can deeply evaluate students' daily current academic performance, reducing learning time and increasing its effectiveness.

Game-based learning platforms. The use of gaming technologies and platforms in education is a trend that is becoming increasingly visible through the use of gamification. According to A. All, E.P.N. Castellar and L.J. Van, game-based learning refers to the using of games power in educational purposes where it can be used to define the accomplishment by using games as a learning method without any stress or pressure on students to improve student's education level [10]. AI can integrate into educational games, creating dynamic and interactive learning scenarios. Scientists T. Kingchang, P. Chatwattana and P. Wannapiroon investigated that the application of AI technology concepts and digital innovations to create the instruction supporting tools on small mobile devices, which can be accessed anywhere and anytime, can respond to the current education policies that promote lifelong learning and enable learners to seek knowledge by themselves from all forms of learning media [11]. Students can learn through the game, encountering real-world challenges and solving them with the help of knowledge. At the same time, AI stimulates active and interactive learning. Some platforms using AI offer students participation in interactive tasks that contribute to a deep understanding of the material and increase student interest. Thus, education becomes more exciting and attractive, which helps to improve students' results and motivation. For example, educational games and platforms such as "Kahoot" use AI elements to create mind games that stimulate motivation and help students learn through gameplay.

Virtual assistants and tutors. AI can serve as virtual assistants or tutors that help students learn the material on their own, complete various tasks and answer any of their questions. Also, virtual assistants are able to adapt to the student's level of knowledge and provide the necessary information in a convenient form. The V.S. Mkrtchyan, D.F. Amirov, L.A. Belyanina concludes: "A virtual assistant is an intelligent software system designed to extract educational materials from the knowledge base and provide them to the student in a form convenient for him. Unlike standard computer training programs, in which the form of presentation of the material is rigidly fixed and laid down at the design stage, the virtual assistant can generate new types of educational materials based on the available knowledge base" [12].

Virtual assistants such as "Chat GPT", "Deepseek" or "Google Assistant" can help students search for information, analyze educational materials, and answer questions about academic subjects. Within the framework of ChatGPT, it is possible to create so-called "agents" — specialized chatbots configured to provide assistance and training on specific subjects, courses or topics. These agents can be adapted to specific educational tasks, providing a deeper and more focused study of the material. Educational chatbots are very common, serve educational purposes, and can revolutionize the very essence of the educational process. The famous Bill Gates [13], reflecting on the educational potential of chatbots, stated that the most significant breakthrough that this technological paradigm will give humanity a significant improvement in the quality and accessibility of education. In addition, the use of chatbots in learning gives the student a sense of freedom and relieves anxiety. For instance, scientists Y. Li, C.Y. Chen, D. Yu et al. [14] note the positive impact of chatbots on reducing language anxiety and discomfort among students.

AI tutors are available 24/7 and do not require physical presence, and it makes learning more flexible and convenient. Students can study at any time convenient for them and in any place with Internet access.

Automated assessment and feedback. Automated assessment and feedback significantly facilitate the process of self-learning, making it the most effective, accessible and adaptive.AI assessment systems allow students to be assessed, analyze academic performance, make suggestions for improving it, and develop effective learning plans. D. Boud and E. Molloy [15] discuss how automated AI-based feedback systems can enhance students' autonomy by providing timely and detailed feedback that helps them adjust and improve their knowledge and skills on their own. In their research, C.K.Y. Chan and W. Hu [16] reveals a positive student perception of AI support and feedback while developing their assessment. A distinctive feature of the knowledge control system is a dialogue in the form of "question-answer" in natural language. The system generates questions about a given topic, and the student answers in natural language. The system allows to improve the quality of knowledge control by automating the process and eliminating the subjective approach.

*Methods and materials*

The research employed theoretical, empirical and statistical methods. The theoretical methods included the analysis and synthesis of scientific and pedagogical literature in the field of artificial intelligence. The empirical method involved conducting a survey to identify students' opinions on AI and its application in the self-learning. The target population of the study includes 94 students studying at the Karaganda Buketov University in Karaganda, Kazakhstan and Gazi University in Ankara, Turkey. The study was conducted remotely using the Google Forms service. The students were offered a questionnaire of 10 closed-ended questions and 30 statements, which they had to answer as clearly and fully as possible. The questionnaire used elements of the Likert scale, namely: 1 — absolutely disagree, 2 — disagree, 3 — partially agree, 4 — agree and 5 — completely agree. The content of the questionnaires is presented in Table 1.

Table 1

| № | Questions |
|---|---|
| 1 | Gender. |
| 2 | Age. |
| 3 | Specialization. |
| 4 | Can you plan the learning process yourself? |
| 5 | Have you used AI (artificial intelligence) in self-learning? |
| 6 | Did you receive an education in AI? |
| 7 | What is your level of knowledge on AI? |
| 8 | How often do you use AI in self-learning? |
| 9 | How many hours a day do you use AI? |
| 10 | In what training activities do you use AI? |
| | **Statements** |
| 1 | AI is a system that helps in education. |
| 2 | AI is a computer program. |
| 3 | AI is a computer-controlled system designed to perform specific tasks. |
| 4 | AI is a highly advanced technology. |
| 5 | AI is a technology that makes life easier. |
| 6 | AI is a tool that facilitates self-learning. |
| 7 | AI increases productivity in learning. |
| 8 | AI saves time on self-learning. |
| 9 | AI makes the learning process more effective. |
| 10 | AI is necessary to evaluate the educational process. |
| 11 | AI promotes self-learning. |
| 12 | AI provides more effective materials in education. |
| 13 | AI offers different teaching methods according to the needs of students. |
| 14 | AI increases stability in learning. |
| 15 | With the help of AI scheduled events make learning engaging. |

Continuation of Table 1

| | Statements |
|---|---|
| 16 | Planned activities with the help of AI make learning easier. |
| 17 | AI leads to an emotionless educational environment. |
| 18 | AI reduces communication in the classroom. |
| 19 | AI causes students to become selfish. |
| 20 | AI negatively affects the socialization of students. |
| 21 | AI reduces the role of the teacher in the classroom. |
| 22 | AI cannot ensure the confidentiality of information. |
| 23 | AI causes Internet addiction. |
| 24 | AI makes the student lazy. |
| 25 | AI reduces learners' thinking ability. |
| 26 | AI creates ethical problems. |
| 27 | AI has no legal basis. |
| 28 | AI weakens students' research skills. |
| 29 | AI reduces students' cognitive skills. |
| 30 | AI causes dependence on technology. |



*Results and discussion*

The data gathered were analyzed depending on the purpose of the study and the research questions. Descriptive analysis methods were used in data analysis. The frequency of occurrence and the arithmetic mean were used to analyze students' opinions about artificial intelligence; due to the absence of a normal distribution of the original variance in the studied data (12 male, 82 female), the U-test was used instead of the T-test to determine differences in perception based on students' gender; the Anova test was used to determine whether there were differences between students' ages related to the use of AI in self-learning.

According to the second task of the study, it turned out which advantages of using AI students consider the most important (Fig. 2). The students were offered several statements to determine the advantages of using AI. Each of them was given the following answers: 1 — absolutely disagree, 2 — disagree, 3 — partially agree, 4 — agree and 5 — completely agree.

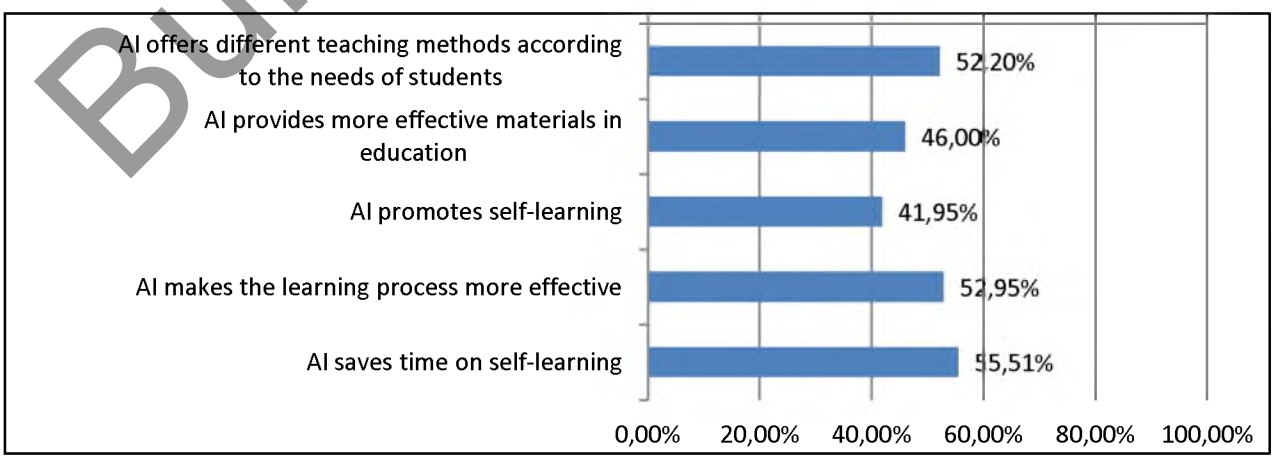


Figure 2. Advantages of using AI

Analyzing the results, the majority of participants demonstrated several advantages of using AI, meaning they responded "agree" to the given statements. More precisely, the majority of respondents (55.51 %) agree with the statement that "AI saves time in self-learning." Moreover, 52.95 % of interviewees believe that "AI makes the learning process more effective"; 41,95 % of students agree that "AI promotes self-learning"; 46 % of respondents hold the opinion that "AI provides more effective materials in education" and 52,20 % of respondents think that "AI offers different teaching methods according to the needs of students." Therefore, it can be stated that students are interested in AI technologies and believe that the use of AI technologies helps them in self-learning.

Also, during the study, students' opinions on the risks and issues of using AI were identified (Fig. 3). 34.35 % of respondents agree that "AI reduces the role of teachers in the classroom"; 35,65 % interviewees think that "AI makes the student lazy"; 33,05 % of respondents think that "AI reduces learners' thinking ability." Indeed, there is a risk that regular use of AI may lead to a loss of the ability to critically assess a problem and find non-standard solutions to solve it. This trend may lead to the formation of what psychologists and neuroscientists call a "lazy brain" in students.

According to 34.95 % of students, one of the risks of using AI is "dependence on technology". And 38.85 % of interviewees agreed with the statement that "AI leads to Internet addiction." Actually, constantly seeking help from artificial intelligence in any matter can make student dependent on technology and the Internet.

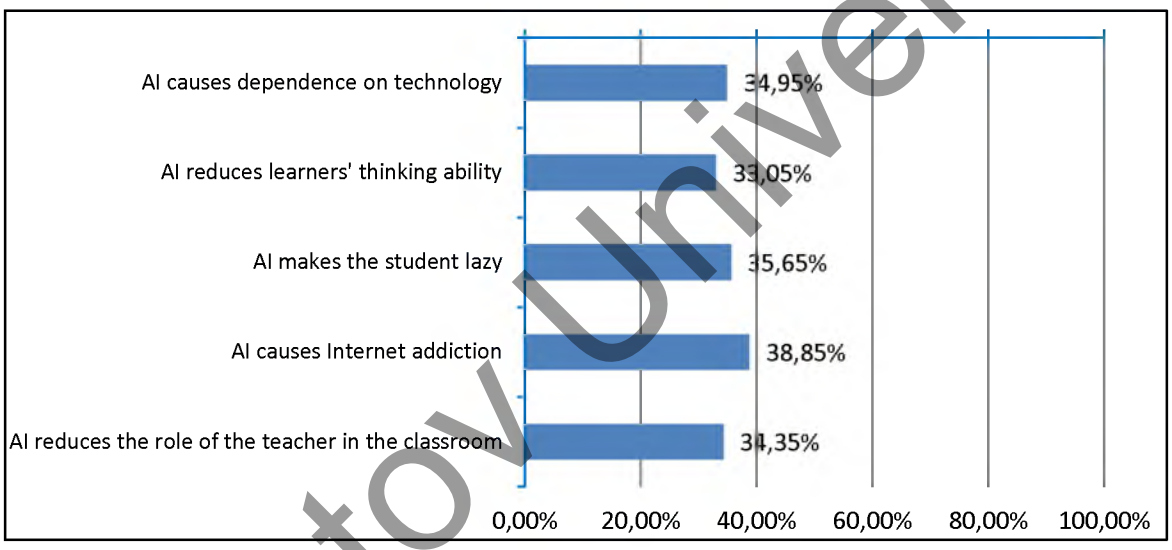


Figure 3. Risks and challenges of using AI

Consequently, the introduction of AI in the field of education can cause not only positive aspects, but also potential risks, such as a decrease in cognitive functions and mental activity, dependence on technology and the Internet. It is also important to ensure a balance between using AI to achieve goals and adhering to ethical standards and principles to protect the interests of people and society. According to V.T. Konusova, it is necessary to develop a system of ethical principles, as they serve as the basis for determining approaches to regulating the considered field. This approach will allow to ensure ethics and social responsibility in the development and application of AI [17].

In Table 2 the participants' opinions about AI in education in terms of the sexual variable are evaluated.

Table 2

**Students' opinions about AI in terms of gender variables**

| Question | Sex | N | Middle rank | U | P |
|---|---|---|---|---|---|
| Total | Man<br>Woman<br>Total | 12<br>82<br>94 | 53,29<br>46,65 | 422,500 | ,431 |

A significant difference isn't found (U=422,500, P>0,05) according to the total mark when the findings in the Table 2 are analyzed students' opinions about AI in terms of their gender. However, a significant difference has been found in the 2nd (Q2=,046, P<.0.05), 4th (Q4=,004, P<.0.05), and the 26th (Q26=,029, P<.0.05) questions.

In particular, to the second question, "AI is a computer program" the majority of male students replied that they "disagree", while the majority of female respondents replied "strongly disagree. "AI is a high-level technology" to the fourth question, the majority of male students are of the opinion that they "disagree," while the majority of female students replied that they "absolutely disagree". According to question 26, "AI creates ethical problems", the majority of male respondents believe that they "disagree", while the majority of female students think that they "completely disagree".

A significant difference was found (F=5,014, P<0,05) according to the date presented in Table 3, analyzed considering students' opinions about AI in terms of their ages.

Table 3

**Students' opinions about AI in terms of age variables**

| Age | N | Mean | SD | F | P |
|---|---|---|---|---|---|
| 16–18 | 22 | 3,2288 | ,31561 | 5,014 | ,003 |
| 19–21 | 10 | 3,4167 | ,24356 | | |
| 22–24 | 17 | 3,6118 | ,30160 | | |
| 25–27 | 45 | 3,4659 | ,33594 | | |
| Total | 94 | 3,4316 | ,33695 | | |

To determine which ages there are differences, the Tukey HSD (Honestly Significant Difference) test was conducted, according to which there is a significant difference between the ages of 16–18 and 22–24, and between the ages of 16–18 and 25–27 (Table 4). This may mean that students aged 16–18 have a different experience of interacting with AI technologies, which affects their perception of this problem.

Table 4

**Tukey HSD test results**

| | (I) Age | (J) Age | Average difference (I-J) | MSW | P |
|---|---|---|---|---|---|
| Tukey HSD | 16–18 | 19–21 | -,18788 | ,12092 | ,410 |
| | | 22–24 | -,38298* | ,10238 | ,002* |
| | | 25–27 | -,23714* | ,08248 | ,026* |
| Tukey HSD | 19-21 | 16–18 | ,18788 | ,12092 | ,410 |
| | | 22–24 | -,19510 | ,12635 | ,416 |
| | | 25–27 | -,04926 | ,11084 | ,971 |
| | 22-24 | 16–18 | ,38298* | ,10238 | ,002* |
| | | 19–21 | ,19510 | ,12635 | ,416 |
| | | 25–27 | ,14584 | ,09026 | ,375 |
| | 25-27 | 16–18 | ,23714* | ,08248 | ,026* |
| | | 19–21 | ,04926 | ,11084 | ,971 |
| | | 22–24 | -,14584 | ,09026 | ,375 |

*Conclusion*

An analysis of modern research shows that the introduction of AI into educational processes helps to increase students' motivation, improve the quality of education and develop skills for independent learning of materials. The study revealed significant differences in the perception of AI among students of different ages, which shows the need to develop differentiated methods for integrating AI into the educational process.

Based on the obtained results, several recommendations were formulated for further research on the use of AI in students' self-learning:

- Assessment of the long-term impact of AI on students' cognitive development. It is necessary to conduct longitudinal studies to understand how the use of AI in the process of self-learning affects the development of critical thinking skills, creativity, memory and imagination of students.

- Improving the digital literacy of students. For the effective use of AI in self-learning, training in digital literacy, including the effective use of AI tools, is necessary. For example, in order to properly use the capabilities of AI technologies, it is possible to prepare methodological manuals, organize seminars and preventive measures to avoid technology and Internet addiction.

- Explore the ethical aspects of using AI in learning. AI technologies bring significant benefits and assistance in independent student learning, but without an ethical framework, they can endanger the spread of prejudice and discrimination in the real world, the escalation of disagreements, and the fundamental rights and freedoms of the student. An ethical approach to the implementation of AI is crucial to ensure the positive impact of technology on the educational process and reduce potential risks. Therefore, it is necessary to study the issues of data confidentiality, transparency of algorithms and the dependence of students on AI technologies. In this regard, it is important to conduct interdisciplinary research to develop universal ethical principles governing the development and use of AI in learning. In addition, it is important to organize empirical research aimed at understanding which AI technologies inspire user confidence or caution.

In general, it can be concluded that AI opens up new opportunities for education, adapting to the specific needs and abilities of each student, which can significantly increase student autonomy and the effectiveness of self-learning.



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## Өзін-өзі оқытудағы жасанды интеллект: білім берудің жаңа көкжиектері

Мақалада өзін-өзі оқытудағы жасанды интеллектің (ЖИ) рөлі қарастырылған. Өзін-өзі оқыту цифрландыру және еңбек нарығындағы өзгерістер дәуірінде маңызды дағды. Студенттердің өзін-өзі оқытуында ЖИ қолдану білім берудің тиімділігі мен қол жетімділігін арттырудың жаңа перспективалары мен мүмкіндіктерін ашады. ЖИ пайдаланушыларға бейімделуге, қойылған міндеттерді тез және тиімді шешуге, сұрақтарға жауап табуға, жекелендірілген оқытуды және қолдауды қамтамасыз етуге қабілетті. Авторлар зерттеудің өзектілігін, мақсаты мен міндеттерін анықтап, зерттеу тақырыбы бойынша шетелдік және отандық ғалымдардың еңбектеріне талдау жүргізген. Әрбір білім алушының қабілеттері мен қажеттіліктері ерекше екенін ескере отырсақ, дәстүрлі оқыту әдістері осы айырмашылықтардың барлығын жеткіліксіз қанағаттандыра алмауы мүмкін. Алайда, ЖИ технологиялары оқу материалдарын кез келген жағдайда әр білім алушының жеке талаптарына тиімді бейімдей отырып өзін-өзі оқытуды қамтамасыз ете алады. Мақалада студенттердің өзін-өзі оқытуында ЖИ қолданудың негізгі перспективалық бағыттары келтірілген: жекелендірілген білім беру маршруттары, оқытудағы ойын платформалары, виртуалды көмекшілер мен репетиторлар, автоматты бағалау жүйесі. Зерттеу барысында студенттерге ЖИ технологияларын қолдану бойынша сауалнама жүргізілді, бұл студенттердің ЖИ деген қызығушылығын және оны өзін-өзі оқытуда қолдану мүмкіндігін көрсетті. Алынған нәтижелерге қол жеткізу үшін теориялық, эмпирикалық және статистикалық әдістер, атап айтқанда, әдеби дереккөздерді талдау, сауалнама, Манн-Уитнидің U-критерийі, дисперсиялық талдау (Anova-тест) қолданылды.

*Кілт сөздер:* жасанды интеллект, жасанды интеллект технологиялары, өзін-өзі оқыту, өзін-өзі оқыту дағдылары, үздіксіз оқыту, оқытуды жекелендіру, виртуалды көмекшілер, автоматты бағалау жүйесі.

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## Искусственный интеллект в самообучении: новые горизонты образования

В данной статье рассматривается роль искусственного интеллекта (ИИ) в самообучении. Самообучение становится важным навыком в эпоху цифровизации и изменений на рынке труда. Использование ИИ в самообучении студентов открывает новые перспективы и возможности для повышения эффективности и доступности образования. ИИ способен подстраиваться под пользователей, помогать быстрее и эффективнее решать поставленные задачи, находить ответы на вопросы, обеспечивать персонализированное обучение и поддержку. Авторами определены актуальность, цель и задачи исследования, проведен анализ трудов зарубежных и отечественных ученых по теме исследования. Учитывая, что каждый учащийся уникален в своих способностях и потребностях, традиционные методы обучения могут быть недостаточно способны удовлетворить все эти различия. Однако технологии ИИ могут обеспечить самообучение, эффективно адаптируя учебные материалы к индивидуальным требованиям каждого учащегося в любом случае. В статье представлены основные перспективные направления использования ИИ в самообучении студентов: персонализированные образовательные маршруты, обучающие игровые платформы, виртуальные ассистенты и репетиторы, автоматическая система оценки. В ходе исследования было проведено анкетирование студентов на предмет знания и примене-

ния технологий ИИ, которое показало заинтересованность студентов к ИИ и возможность его использования в самообучении. Для достижения полученных результатов были применены теоретические, эмпирические и статистические методы, в частности, метод анализа литературных источников, анкетирование, U-критерий Манна-Уитни, дисперсионный анализ (Anova-тест).

*Ключевые слова:* искусственный интеллект, технологии искусственного интеллекта, самообучение, навыки самообучения, непрерывное обучение, персонализация обучения, виртуальные ассистенты, автоматическая система оценки.

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