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COMPARATIVE ANALYSIS OF THE ROLE OF ARTIFICIAL INTELLIGENCE IN THE TRAINING OF SPECIALISTS IN THE IT FIELD

Abstract. This article examined the role of artificial intelligence (AI) technology in the field of education and the attitude of students to it. In the course of the study, a survey was conducted among 71 students studying in the IT field, which analyzed their understanding of AI, the level of perception of importance and the impact on future professions. As a result, it was shown that the majority of students (49.3%) understand artificial intelligence at an average level, and 38% are good at it. At the same time, 45% of participants noted that AI is very important for IT specialists. The results of the study show that most students consider it necessary to include AI in the curriculum and believe that mastering this technology will increase their professional competitiveness. However, some students also noted that the incorrect use of AI poses a risk of personal data destruction and reduced thinking ability. In general, the results of the study prove that artificial intelligence plays an important role in the education system and students have a high interest in mastering it. This study can serve as the basis for identifying ways to effectively introduce AI into the educational process in the future.

Research relevance: the role of AI in the IT field is growing, as future professionals need skills such as machine learning, data analysis. The survey collects the opinions of 71 students and shows the pros and cons of AI. The article consists of the following sections: introduction, concept of artificial intelligence, history of development, impact on IT specialists, role in the education system, artificial intelligence in Kazakhstan, advantages in the education system, future development, methodology, results, discussion, conclusion.

Keywords: Artificial Intelligence, Educational Technologies, Students' Perception, Digital Transformation, Education System, Innovative Learning, AI in Education, Training of IT Specialists

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ІТ САЛАСЫНДАҒЫ МАМАНДАРДЫ ДАЙЫНДАУДА ЖАСАНДЫ ИНТЕЛЛЕКТІҢ РӨЛІН САЛЫСТЫРМАЛЫ ТАЛДАУ

Аңдатпа. Бұл мақалада жасанды интеллект (ЖИ) технологиясының білім беру саласындағы рөлі мен оған студенттердің көзқарасы зерттелді. Зерттеу барысында ІТ саласында білім алып жатқан 71 студент арасында сауалнама жүргізіліп, олардың ЖИ туралы түсінігі, маңыздылығын қабылдау деңгейі және болашақ мамандықтарына әсері талданды. Нәтижесінде студенттердің басым бөлігі (49,3%) жасанды интеллектті орташа деңгейде түсінетінін, ал 38%-ы жақсы білетінін көрсетті. Сонымен қатар, 45% қатысушы ЖИ-дың ІТ мамандары үшін өте маңызды екенін атап өтті. Зерттеу

нәтижелері көрсеткендей, студенттердің көпшілігі ЖИ-ды оқу бағдарламасына енгізу қажет деп есептейді және бұл технологияны меңгеру олардың кәсіби бәсекеге қабілеттілігін арттырады деп санайды. Алайда кейбір студенттер ЖИ-ды дұрыс қолданбау жеке деректердің бұзылуы мен ойлау қабілетінің төмендеу қаупін тудыратынын да атап өтті. Жалпы алғанда, зерттеу нәтижелері жасанды интеллекттің білім беру жүйесінде маңызды рөл атқаратынын және студенттердің оны меңгеруге жоғары қызығушылық танытатынын дәлелдейді. Бұл зерттеу болашақта ЖИ-ды оқу процесіне тиімді енгізу жолдарын анықтауға негіз бола алады.

Зерттеу актуалдығы: IT саласында ЖИ-дың рөлі артып келеді, өйткені болашақ мамандарға машиналық оқыту, деректер талдау сияқты дағдылар қажет. Сауалнама 71 студенттің пікірін жинап, ЖИ-дың оң және теріс жақтарын көрсетеді. Мақала мына бөлімдерден тұрады: Кіріспе, жасанды интеллект ұғымы, даму тарихы, IT мамандарына әсері, білім беру жүйесіндегі рөлі, Қазақстанда жасанды интеллект, білім беру жүйесіндегі артықшылықтары, Болашақтағы даму, әдістеме, нәтижелер, талқылау, қорытынды.

Түйін сөздер: Artificial Intelligence, Educational Technologies, Students' Perception, Digital Transformation, Education System, Innovative Learning, AI in Education, Training of IT Specialists

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СРАВНИТЕЛЬНЫЙ АНАЛИЗ РОЛИ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ПОДГОТОВКЕ СПЕЦИАЛИСТОВ В ОБЛАСТИ IT

Аннотация. В этой статье исследуется роль технологии искусственного интеллекта (ИИ) в образовании и подход студентов к ней. В ходе исследования был проведен опрос 71 студента, обучающегося в сфере IT, и проанализировано их понимание ИИ, уровень восприятия значимости и влияние на будущие специальности. В результате подавляющее большинство студентов (49,3%) показали, что они понимают искусственный интеллект на среднем уровне, а 38%-хорошо. Кроме того, 45% участников отметили, что ИИ очень важен для IT-специалистов. Результаты исследования показывают, что большинство студентов считают, что ИИ необходимо включить в учебную программу, и считают, что освоение этой технологии повысит их профессиональную конкурентоспособность. Однако некоторые студенты также отметили, что неправильное использование ИИ может привести к нарушению личных данных и снижению способности рассуждать. В целом результаты исследования доказывают, что искусственный интеллект играет важную роль в системе образования и что студенты очень заинтересованы в его освоении. Это исследование может стать основой для определения способов эффективного внедрения ИИ в учебный процесс в будущем.

Актуальность исследований: роль ИИ в IT растет, поскольку будущим специалистам необходимы такие навыки, как машинное обучение и анализ данных.

Опрос собрал мнение 71 студента и показывает плюсы и минусы ИИ. Статья состоит из следующих разделов: введение, понятие искусственного интеллекта, история развития, влияние на IT специалистов, роль в системе образования, искусственный интеллект в Казахстане, преимущества в системе образования, будущее развитие, методика, результаты, обсуждение, заключение.

Ключевые слова: *Artificial Intelligence, Educational Technologies, Students' Perception, Digital Transformation, Education System, Innovative Learning, AI in Education, Training of IT Specialists*

INTRODUCTION

The main feature of the 21st century is the rapid development of information technologies. Today, countries of the world are valued not only for their natural resources or production capacity, but also for their digital potential and innovative capabilities. In the new stage of society's development, artificial intelligence (AI) is considered one of the main achievements of human civilization. Today, it is widely used not only in the scientific community, but also in everyday life, business, government, and the education system.

Although the concept of artificial intelligence initially appeared as a science fiction idea, over time it has become a real technology. The ability of machines to perform the abilities inherent in human intelligence is the realization of a scientific fantasy that has been dreamed of for centuries. Today, systems based on artificial intelligence can process information, make decisions, learn, and model human thought processes. All of these processes affect all professions in society.

Artificial intelligence is especially important for students studying in the field of information technology (IT). After all, IT is the fastest growing industry, where new programming languages, platforms, and tools are emerging every day. In such a situation, traditional education may not be enough. A student can become a sought-after specialist in the future by not only mastering algorithms, but also fully mastering the capabilities of artificial intelligence (Alalwan & Al-Rahmi, 2023).

The importance of artificial intelligence in IT education can be considered from several aspects. First, it increases the efficiency of the learning process. AI-based intelligent assistants quickly answer students' questions and explain complex concepts. For example, language models such as ChatGPT can greatly help students in writing code, finding errors, or searching for scientific information.

Secondly, artificial intelligence allows students to adapt to their individual learning style. Since each student has different abilities and pace, AI can create an individual curriculum for him and offer the necessary materials. This approach is often lacking in the traditional education system.

Thirdly, artificial intelligence contributes to the development of students' creative abilities. In projects such as programming, data analysis, and mobile application development, AI helps to suggest new ideas. For example, a student can create an intelligent chatbot with the help of artificial intelligence or design a video surveillance system using computer vision. Such projects allow students to combine theoretical knowledge with practice.

Fourth, artificial intelligence is fundamentally changing the labor market in the IT sector. Currently, the demand for such specialties as Data Scientist, Machine Learning Engineer, AI Developer is growing. This indicates that students who master this area will not be unemployed in the future. On the contrary, they will become competitive specialists. Therefore, mastering artificial intelligence is a guarantee of a student's professional success (Alqahtani, 2022).

At the same time, it is necessary to consider the importance of artificial intelligence not only in terms of advantages, but also in terms of challenges. One of the main dangers for students is excessive reliance on AI tools. In this case, their ability to think independently, analyze, and draw logical conclusions may decrease. Also, improper use of artificial intelligence leads to plagiarism and violation of academic integrity. This issue requires special attention in the education system. The table below systematizes the literature by main topics.

Table 1. Literature review table

№	Author(s) and year	Main topic	Results/Conclusions	Context
1	Alalwan & Al-Rahmi (2023)	Student Adoption and Academic	AI improves learning outcomes, positive	Higher education

		Performance	acceptance	
2	Bui & Pham (2021)	Student Attitudes	Positive attitude prevails	General education
3	Chen & Xie (2020)	The Role of AI (Systematic Review)	Automation and efficiency	Education
4	Zhang & Wang (2020)	Machine Learning and Analytics	Data-driven solutions	Educational technology
5	Kim & Kim (2021)	Adoption of AI Platforms	High acceptance	Higher education
6	Arinto (2022)	Integration: Opportunities and Challenges	Equality and ethical issues	Higher education
7	Shukla & Verma (2023)	Personalized Learning	Increased interest and achievement	Student behavior
8	Alshahrani & Alqahtani (2024)	Adoption: Benefits and Ethics	Benefits prevail, but concerns remain	Education
9	Nurlybekova & Zhumasheva (2022)	AI Trends in Kazakhstan	Development prospects	Higher education in Kazakhstan
10	UNESCO (2023)	Policy Guidelines	Ethical use	International
11	OECD (2021)	Future of Skills	Development of digital skills	International
12	World Economic Forum (2023)	Workforce and AI	New skills economy	International
13	Ministry of Digital Development (2024)	Roadmap in Kazakhstan	Development plan 2024–2030	Kazakhstan
14	Kenzhebekova & Omarova (2023)	Student Readiness	Positive level of readiness	Kazakhstan
15	Li & Zhang (2025)	ChatGPT Impact	Learning behavior changes, risks remain	University students
16	Alqahtani (2022)	Teacher and Student Adoption	Positive attitude towards classroom use	Education
17	Informburo.kz (2024)	AI News in Kazakhstan	Innovations in the education system	Kazakhstan media

The role of artificial intelligence in the context of Kazakhstan is a separate story. The country is implementing the Digital Kazakhstan program, supporting various IT projects. Innovation centers such as Astana Hub are developing startups based on artificial intelligence. In addition, special courses are being opened at Kazakhstani universities, where students are taught the basics of AI. However, there are still obstacles, such as a lack of qualified specialists and a weak laboratory base. Solving these problems is the task of the future.

THE CONCEPT OF ARTIFICIAL INTELLIGENCE AND ITS DEVELOPMENT

Artificial intelligence is the ability of computer systems to imitate the abilities inherent in human intelligence. In other words, it means that machines can perform such functions as thinking, learning, decision-making, and speech (Alshahrani & Alqahtani, 2024).

Types of artificial intelligence

- ✓ Narrow AI (Narrow AI) - focused on performing a specific task. For example, facial recognition systems, online translators.
- ✓ General AI (General AI) - systems that think like humans and have comprehensive abilities. Currently, this is at a theoretical level.
- ✓ Super AI - a hypothetical artificial intelligence that exceeds human capabilities.

History

The first ideas of artificial intelligence appeared in the middle of the 20th century. The term "artificial intelligence" was first used at the Dartmouth Conference in the USA in 1956. In subsequent years, neural networks, expert systems, and machine learning methods were developed. Since the 2000s, the development of Big Data, Cloud Computing, and Deep Learning technologies has led to a new level of artificial intelligence. Today, language models such as ChatGPT, advances in robotics, and computer vision prove the capabilities of artificial intelligence (Arinto, 2022, Informburo.kz, 2024).

The impact of artificial intelligence on IT professionals

The development of artificial intelligence is placing new demands on IT professionals. As before, it is not enough to master programming languages, now students need AI algorithms, data processing, and machine learning methods. There is every reason to say that the future of IT professionals is bleak until they master these methods.

New professions

- ✓ Data Scientist
- ✓ Machine Learning Engineer
- ✓ AI Developer
- ✓ Business Intelligence Analyst

All of these professions are closely related to data analysis and the use of AI tools.

Improving work efficiency

- ✓ AI-based tools to simplify coding (for example, GitHub Copilot).
- ✓ Automatic detection and correction of errors.
- ✓ Automatic recommendations when creating design, mobile applications, and websites (Bui & Pham, 2021).

Research and application in projects

Students can create modern products using artificial intelligence in their coursework and diploma projects. For example, an intelligent chatbot, a smart application, a video surveillance system.

The development of digital technologies draws special attention to the changes taking place in the education system. Many countries around the world are undergoing a process of education modernization, and its main driving force is artificial intelligence (AI). AI provides a great opportunity to automate the educational process, improve the quality of teaching, and create an individual learning trajectory tailored to the abilities and capabilities of each student.

The role of artificial intelligence in the education system

Artificial intelligence is a set of software systems capable of modeling human thinking, making logical conclusions, learning, and analyzing large amounts of information. The main areas of AI include machine learning, natural language processing, computer vision, robotics, and expert systems.

In the field of education, AI has the following capabilities:

- ✓ Adaptive learning - providing an individual curriculum for each student based on their level of education.
- ✓ Intelligent assistants - virtual assistants that quickly respond to student questions.
- ✓ Automatic assessment - checking assignments, issuing exam results.
- ✓ Learning process analysis - monitoring student progress and identifying weaknesses.
- ✓ Support for teachers - preparing educational materials, creating lesson plans, and offering new methodologies.

The education system in Kazakhstan and the need to introduce AI

The education system of Kazakhstan has undergone fundamental changes in the last decade. As part of the "Digital Kazakhstan" program, schools were provided with the Internet, electronic diaries, online testing systems, and distance learning platforms were introduced. During the COVID-19 pandemic, the importance of online learning increased, forcing educational institutions to look for new solutions. We can list the main needs for introducing AI into the education system as follows (Kim & Kim, 2021).

- ✓ Demand for individualized learning - there is a large number of students in Kazakhstan, but their abilities and interests are different. AI can create an individual program for each student.
- ✓ Teacher shortage - there is a shortage of qualified teachers, especially in rural areas. AI can facilitate the work of teachers and become an auxiliary tool.
- ✓ Fair assessment of progress - there can be subjectivity in the traditional assessment system. AI can accurately and fairly assess student knowledge.
- ✓ The need for big data analysis - AI can process the data collected in the field of education and make effective decisions.

Advantages of artificial intelligence in the education system

Artificial intelligence technologies are giving a new impetus to the education sector. Developed countries of the world are widely using this opportunity and improving the quality of education. For Kazakhstan, the introduction of AI into the education system opens up great advantages.

Individualized learning

AI analyzes the student's learning pace, progress, and interests and offers a curriculum accordingly. For example, it gives easy tasks to students who are weak in mathematics and gradually complicates them. And for gifted students, it offers additional complex level problems.

Support for teachers

Teachers spend a lot of time and effort on preparing for lessons and checking. AI automates this process, allowing teachers to focus more on creative work.

Continuous learning

AI-based online platforms allow students to learn anytime, anywhere. This is especially effective for remote rural schools (Ministry of Digital Development, Innovations and Aerospace Industry of the Republic of Kazakhstan, 2024).

Artificial Intelligence in Kazakhstan

Currently, several projects are being implemented in our country to introduce AI into the education system:

- ✓ *BilimLand* is a Kazakhstani online education platform where video materials, tasks, and tests are presented using AI.
- ✓ *Daryn.online* is a system of remote Olympiads and online classes. Here, student results are automatically assessed.
- ✓ *e-Learning project* is a project to digitize school programs and provide online resources.
- ✓ *AI laboratories* are being created in some universities (for example, Nazarbayev University, Al-Farabi Kazakh National University) to test new educational technologies (OECD, 2021).

Among the difficulties and limitations in introducing artificial intelligence, we can highlight the following:

- ✓ Infrastructure limitations are weak Internet access in rural schools, and there is a shortage of computers.
- ✓ Teacher training level is low - not all teachers are fully familiar with AI tools.
- ✓ Financing issues are required to develop AI technologies.
- ✓ Ethical issues are AI can make mistakes in decision-making. In addition, the issue of protecting students' personal data is relevant (Chen & Xie, 2020).

Future development directions

The role of AI in the education system will increase in the coming years. Development in Kazakhstan is expected in the following areas:

- Intelligent textbooks and digital teachers - AI-based interactive learning systems will appear in each subject.
- National education platform - creation of a single AI platform that will unite all schools and universities.
- Early education in STEM and AI subjects - the basics of artificial intelligence will be introduced into the school curriculum.
- Academic integrity control - detection of plagiarism through AI, fair conduct of exams.

- Improvement of distance learning - virtual classrooms, AI teachers, and addition of VR/AR technologies.

APPLICATION OF ARTIFICIAL INTELLIGENCE IN KAZAKHSTAN

Kazakhstan is taking the first steps towards the development of artificial intelligence.

- ❖ New technologies are being introduced into the education system as part of the “Digital Kazakhstan” program.
- ❖ Astana Hub supports IT startups, and special attention is paid to projects in the field of artificial intelligence.
- ❖ AI subjects are taught at universities such as Nazarbayev University, Al-Farabi Kazakh National University, and Satpayev University.
- ❖ Robotics and programming courses are increasing for students.

In recent years, large-scale measures have been taken in our country to digitize the education sector, introduce electronic platforms, and develop students’ skills in working with modern technologies. In particular, the issue of introducing AI technologies into schools, colleges, and universities is being considered at the state level (Nurlybekova & Zhumasheva, 2022).

A survey was taken from students studying in the IT field on the need for artificial intelligence in education, its importance, and its benefits. The purpose of the study is to determine the theoretical and practical role of AI in IT education, as well as to make recommendations.

The theoretical basis is the theory of constructivism (Piaget, Vygotsky) and adaptive learning models. According to constructivism, students independently construct knowledge, and AI helps in this process as a tool. Adaptive learning systems adapt the material to the level of students, which increases the quality of education. In the Kazakhstani context, the role of AI in education is being studied, where it is considered an important element of digital transformation.

METHODOLOGY

The study was conducted using a survey method. The survey was prepared on the Google Forms platform and consisted of 15 questions: level of knowledge about AI, importance, future impact, inclusion in the curriculum, advantages in employment, interest, useful areas, threats, support for creative thinking, use in programming lessons, knowledge assessment, impact on academic performance, teacher replacement, competitiveness, and general need.

Participants were 71 IT students (from Kazakhstani universities), answers were collected in Excel format. Frequencies, percentages, cross-analysis, and statistical methods (Python: pandas, matplotlib) were used to analyze the data.

Ethical aspects were taken into account: anonymity was maintained, and consent was obtained from the participants.

Analysis stages: 1) Data cleaning; 2) Calculation of the distribution of responses; 3) Identification of relationships (e.g., level of knowledge and importance); 4) Visualization (Figures). Research limitations: small sample size, subjective opinions.

RESULTS

The survey results showed that AI is highly valued among IT students. The level of knowledge about AI: 49% have an average understanding, 38% know a lot, 10% have heard a little, and 3% know nothing (*Figure 1*). This shows the interest of students in AI.

Most students indicated that they have an average understanding of artificial intelligence. The chart below shows the percentage of responses.

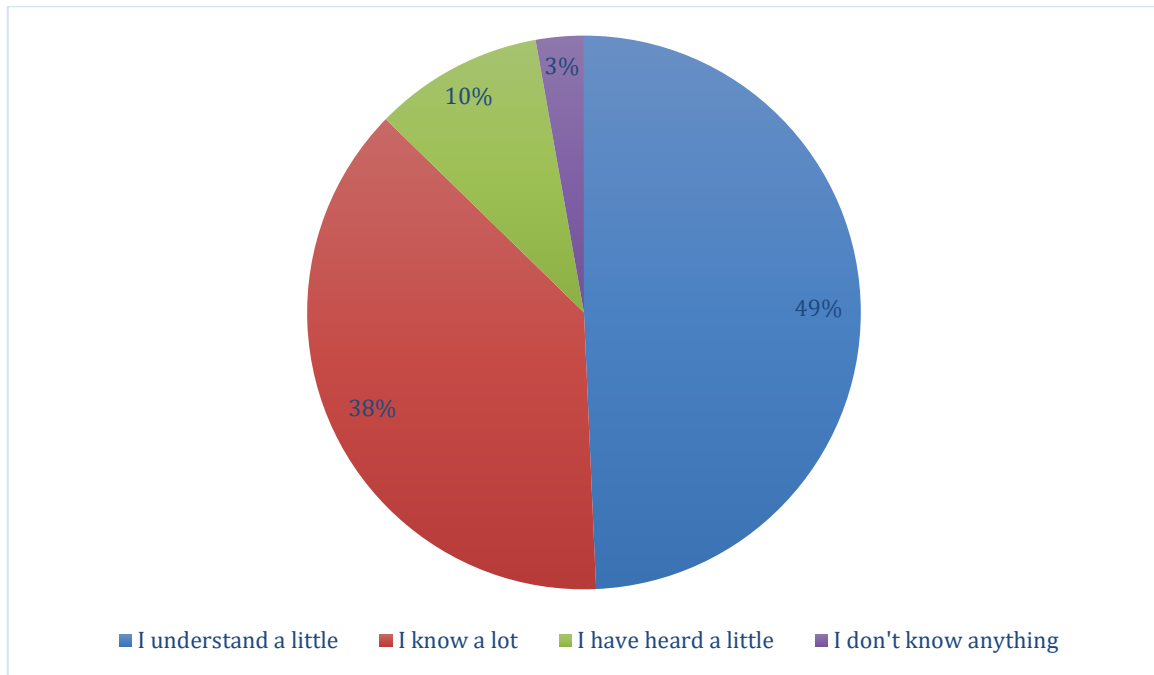


Figure 1. Distribution of knowledge level about AI (N=71)

The importance of AI for the IT industry: 45% are very important, 38% are moderately important, 12% are absolutely necessary, and 5% are not important. These indicators confirm the role of AI in the future (Figure 2).

The study found that the majority of students consider AI to be very important for the future of the IT industry.

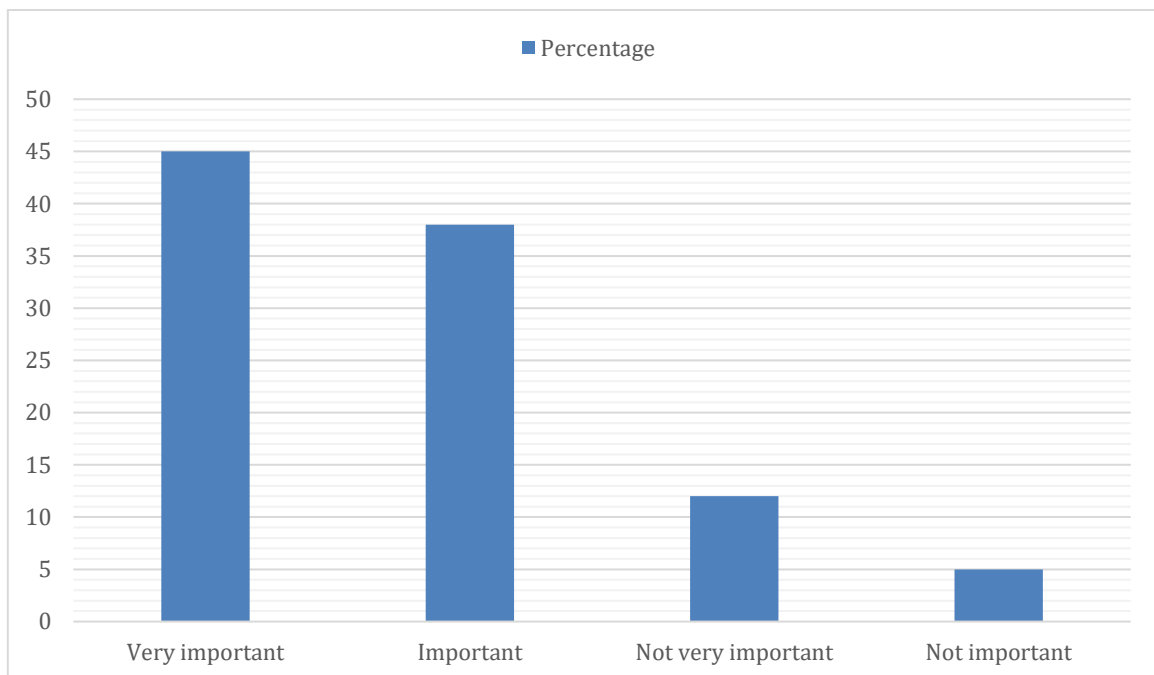


Figure 2. Views on the importance of AI in the IT sector

The importance of AI for the impact on future professions: 52% Strongly influences, 33% Moderately influences, 10% Slightly influences, 5% Does not influence. These indicators indicate that AI has an impact on future professions (Figure 3).

Many students noted that AI has a strong impact on their future professions. This indicates the need for AI-oriented subjects in the education system.

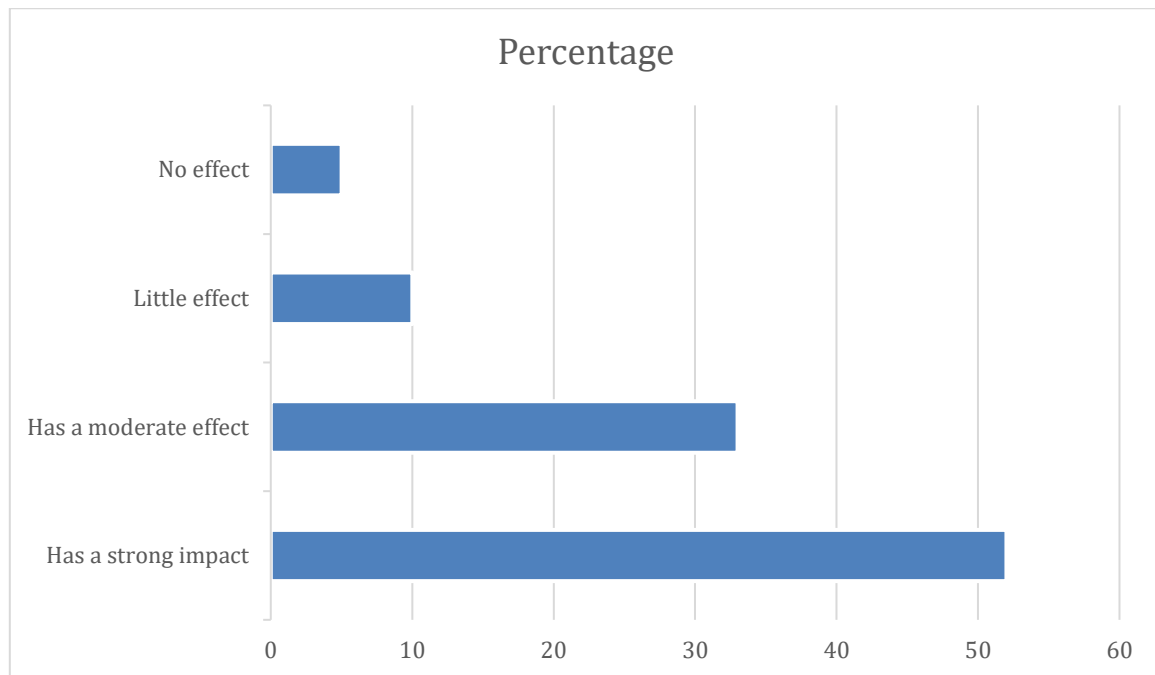


Figure 3. The impact of artificial intelligence on students future professions

DISCUSSION

The results confirm the positive role of AI in IT education. Theoretically, AI adapts to the needs of students, according to the adaptive learning model, which is associated with Vygotsky's concept of the "zone of proximal development". As the Figures show, although the level of education is average, the significance is high, which indicates the need to introduce AI into education.

Threats: decreased thinking ability (44%) raises ethical issues. The theory suggests a "human-AI hybrid" model, where AI is used as an assistant. In Kazakhstan, the role of AI in education is consistent with state programs (Digital Kazakhstan), but security standards are needed.

The survey results are consistent with global trends: according to UNESCO, AI increases the quality of education by 30%, but data protection is important. Research limitations: locality of the sample, need to be expanded in the future.

CONCLUSION

Artificial intelligence (AI) technology is emerging as a transformative force that is fundamentally changing the education sector. This study comprehensively analyzed the role of AI in the educational process and students' attitudes towards this technology based on a survey conducted among 71 students studying IT at the International Kazakh-Turkish University named after Khoja Ahmet Yasawi. The results clearly showed that the majority of students (49.3%) have an average understanding of AI, 38% have a good understanding, and 45% consider it very important for IT professionals. These data confirm the strong impact of AI on future professions (52%) and the need to include it in the curriculum, as it increases students' professional competitiveness.

The study highlighted the advantages of AI - adaptive learning, intelligent assistants, automatic assessment, and the creation of individual trajectories. In the context of Kazakhstan, initiatives such as the Digital Kazakhstan program, Astana Hub, and local platforms (BilimLand, Daryn.online) are laying the foundation for the integration of AI. However, the risks – personal data security, reduced cognitive abilities, and over-reliance – should not be ignored.

These issues require the introduction of ethical standards and a "human-AI hybrid" model. Overall, the study confirms the important role of AI in the education system and the high interest of students. In the future, Kazakhstan can take education to a new level by teaching AI and STEM

subjects from an early age, creating national platforms, and ensuring academic integrity. These results will serve as a basis for policymakers, teachers, and researchers to effectively implement AI.

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