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Readiness of Teachers to Use Intelligent Search Systems in the Digital Educational Environment

This research article discusses the implementation and integration of artificial intelligence-based search engines in higher education institutions, as well as theoretical and practical aspects of the implementation of such systems in Kazakhstan. It describes the current practice, challenges and potential of future achievements in the field of AI, as the modernization of education has become a global trend, especially in the field of digital technologies. Examples of existing AI-based search engines in the field of education and science are also provided. Despite this, there are challenges in ensuring that all universities effectively use available open educational resources (OER) and intelligent search engines in the educational process, which could revolutionize the design of an open digital educational environment for teachers. It should be noted that the research article deeply examines the aspects of using artificial intelligence-based search engines in the field of science, namely the potential of advanced technologies and the latest pedagogical innovations. The study provides an overview and analysis of existing artificial intelligence search engines in the scientific field that provide solutions to pedagogical problems.

Keywords: search engine, digital environment, OER, digital competence, teacher, readiness, artificial intelligence, higher education, educational resources.

Introduction

Modern changes in the educational paradigm associated with technological changes lead to a reassessment of the values and vectors of development of the content of the educational environment. Despite the growing number of educational resources available, the integration of open educational resources in educational practice makes it difficult to find and update information; teachers are constantly facing a shortage of digital tools to access high-quality content, teaching materials, and find the information they need. Currently, open educational Resources (OER) have become indispensable for university teachers seeking to improve their teaching experience through free, high-quality resources, as well as to facilitate research tasks. Many search engines are adapted for reviewing and searching literature for writing scientific papers and dissertations. In particular, Kazakhstan has embarked on a course of development in the field of digital technology, as evidenced by the development of the state program “Digital Kazakhstan”, one of the goals of which is the development of human capital. This program aims to accelerate the Republic of Kazakhstan’s economy and improve its population’s quality of life through advanced digital technologies. It is worth noting that the country’s prospects in digitalization are positive, as evidenced by the 24th place in the world ranking of e-government development, which was compiled by the UN E-Government Survey 2024. Another strategic program is Kazakhstan 2030, which was first announced in the message of the first President of the Republic of Kazakhstan in 1997. Another long-term strategy is Kazakhstan 2050, which aims to create a prosperous society in Kazakhstan with a developed economy and opportunities for universal labor, as well as the country’s entry into the ranks of the developed countries of the world.

The concept of digital competence and active introduction of AI affects the educational environment of the teacher interpreted by many scientists. Holmes (2019) studied the implementation of intelligent search engines in higher education institutions; Authors such as Nouri and others (2020) have studied the effectiveness of using artificial intelligence in teaching while Luckin (2016) believed intelligent search engines make it easier for teachers to work and free them from the psycho-emotional burden of teaching. Kessler (2018) studied the issues of improving teachers’ digital literacy using artificial intelligence [1]; Chen (2020) examined machine learning and semantic search technologies for each user [2].

Many of the technologies used in the modern learning process are aimed at improving the personality, creating the basis for the effectiveness of learning; it is obvious that the integration of open educational resources is an effective way to improve the quality of Education. In Kazakhstan, the integration of digital ed-

educational resources in the educational process, including in higher educational institutions, is carried out within the framework of the state policy program of digitalization of society and education. The integration of open educational resources in higher educational institutions involves a new organization of the educational process in higher educational institutions during the use of information technology tools, creating conditions for increasing the role of teacher and student and their pedagogical activity, improving their professional IC activities through the use of educational and cognitive actions in the educational system in the context of information. This, in turn, will lead to the development of human capital, provided for in the state program “Digital Kazakhstan”. Following the above, it can be assumed that any joint efforts will lead to sustainable development in all areas in the two countries, especially in the modernization of higher education.

Currently, the reform of educational policy has led to the differentiation of the traditional system, its flexibility in the economy, social and social life, as well as integration with the education system. It is obvious that there is the problem of using information and educational resources in the educational process, which is determined by multi-stage, continuous, general (accessible to everyone at will), free and transparent learning [3]. Today, the effective path of the global information educational space is based on the complete informatization of the educational sphere. By this, one of the points of development of the education system in the Republic of Kazakhstan is aimed at informatization of education in the information space. Therefore, this process implements the following actions: improving the management mechanisms of the education system based on the use of automated scientific and pedagogical funds, communication networks; improving methods, sorting strategies, and methods of forms of training per the tasks of personal development in the context of informatization of modern society. Hence, creation of methodological teaching systems focused on the intellectual development of students, the formation of skills of independent learning, the implementation of information-educational, experimental research activities, the diversity of independent work on information processing; attempts to create and apply a methodology for developing a computer test program that determines the assessment and control of the level of knowledge of students [4].

Based on foreign experiences, a number of useful AI-based search engines should be noted, one of the first is Felo AI, which contains more than 200 million scientific articles, supporting international research queries in different languages. The next search engine is Wordvice AI, which is a smart writing assistant, offering an easy way to edit and customize the style of correcting sentence structures and grammar of scientific work on the platform. Typeset is another AI-based assistant that helps automate work with academic documents, helping to save time on preparing theses and research papers. Scite AI is an excellent example of a search engine for analyzing the citation of a scientific article based on evidence, which allows you to consider different points of view, analyze articles and their arguments, facilitating the research process at all stages. The Spotify-based Research Rabbit platform makes it easier for scientists to organize scientific work by enabling them to manage a large flow of information by sharing between studies. AI-based Consensus helps researchers extract information from academic resources. The Lumina search engine is one of the fastest systems for finding research used by scientists from all over the world. Semantic Scholar makes it easier to work with academic resources in different fields (Table 1).

Table 1

Characteristics of existing intelligent systems

Intellectual search engine	Usage Rate (%)	Average usage frequency (once a month)	Main purpose of use
Felo AI	44 %	4.2	Generating answers to scientific questions. Formulation of research topics
Scite AI	32 %	3.6	Analysis of scientific trends and citation of scientific articles
Consensus	17 %	2.8	Search for scientific opinions on controversial issues
Wordvice AI	35 %	3.5	Edit and formulate the scientific texts in an Academic style

Continuation of Table 1

Intellectual search engine	Usage Rate (%)	Average usage frequency (once a month)	Main purpose of use
Lumina	14 %	2.5	Fast generation of scientific texts
Semantic Scholar	58 %	6.1	Analysis of authors and scientific sources
Research Rabbit	26 %	3.2	Bibliography analysis by expanding the literature
Typeset	36 %	4.3	Automating article editing and creating a list of references

Consequently, there is a growing need to introduce the latest intelligent AI-based systems in educational institutions that help educators to facilitate the search for academic jobs [5]. In turn, Kazakhstan's leading universities integrate the latest digital technologies and OER both in the educational process and in the scientific environment. These changes are taking place by global requirements aimed at improving the effectiveness of training specialists in various industries. Digitalization as a pedagogical system consisting of interrelated and interdependent subsystems [6]: regulatory, information, software, personnel, and content support. It should be noted that digitalization of education involves the use of modern information technologies, such as AI, to create a new type of education based on the leading world practices, create favorable conditions for the comprehensive development of each student's abilities, as well as improve the efficiency and quality of the educational process at all levels (Fig. 1).

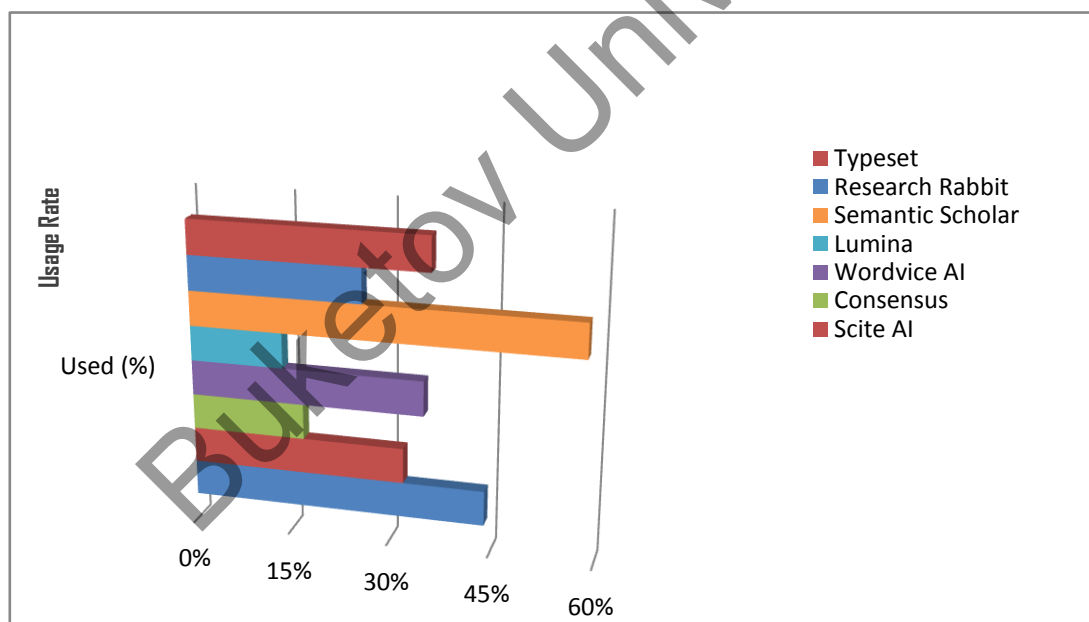


Figure 1. Existing popular search engines

However, existing search engines do not provide the necessary level of contextualization of the results for university teachers, make it difficult to access educational materials and pose a problem for teachers in terms of finding relevant and accessible content that meets specific pedagogical needs. This issue is particularly relevant in the context of English language teaching, where language proficiency levels vary, curriculum standards and the need for different materials may vary significantly [7].

In general, the capabilities of artificial intelligence can be used from reviewing the literature on the research topic to analyzing and preparing statistical research data. However, it is worth remembering that there are a number of limitations in the form of ethical standards in the integration of AI in scientific work. But it is important to remember that AI cannot replace the author and be responsible for scientific accuracy, as an

incorrectly configured search engine can generate false information and falsify data. Artificial intelligence serves as an assistant, but not as the author of a scientific paper [8]. Nevertheless, the modern fast pace of life requires the active introduction of AI-based digital platform. Using the example of Kazakhstani universities, there are many examples of integrating AI-based tools into the scientific environment. In terms of the list of references of scientific papers in the field of application of tools in the design of Kazakhstani universities serves as an example of development in the field of science. Nazarbayev University is actively implementing Zotero for the preparation of master's and doctoral theses.

On the one hand, Kazakh National University is actively implementing the Mendeley program for students to work together in a scientific context. Another illustrative case is the Gumilyov Eurasian National University, which uses the EndNote program to automate the design of literature lists in scientific papers. On another hand, Astana IT University launches LaTeX plug-ins for engineering and technical specialties, and also widely uses platforms such as Mendeley and Zotero. Karaganda University named after academician E.A. Buketov, as a research university, actively uses search tools in the preparation of dissertations and scientific articles indexed in Scopus and Web of Science databases. It can be noted that Zotero is often used by doctoral students and teachers, especially in the humanities and social sciences, and Mendeley helps to prepare publications in international journals (Elsevier, Springer), especially in natural sciences and in IT areas. It is also worth noting that the BibTeX program is used by mathematics teachers. These tools are capable of automatically extracting data from online databases such as JSTOR, Google Scholar, and others. They are able to make lists of literature in the new age, adding a collection every day. The data and the tool can find and analyze the citations of articles, as well as collect references, update the list of references, and extract the necessary data from online databases [9]. Taking Mendeley as an example, it can be seen that it is able to find articles on certain topics, add them to his library as favorites, generate the necessary literature, edit and work with rare sources (Fig. 2).

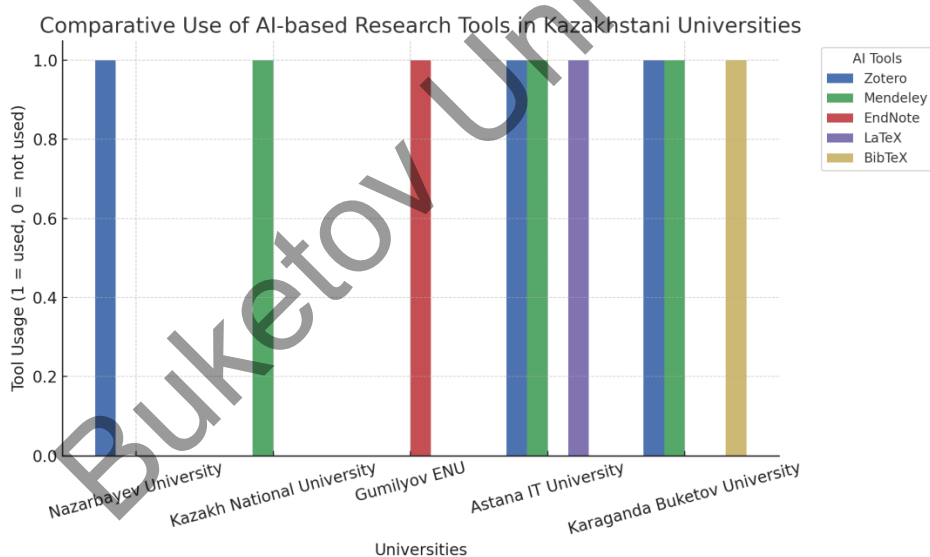


Figure 2. Comparison of Universities on the Integration of AI-based Research Tools

These findings suggest that using AI for research purposes not only automates the work and facilitates the teacher's work, but also speeds up the process and improves the quality of the literature review.

Methods and materials

To analyze the effectiveness of the introduction of artificial intelligence in shaping the digital environment of the teacher, a survey was conducted, during which a comprehensive statistical analysis was carried out, which included both quantitative and qualitative data. The effectiveness of AI implementation in the educational process, in particular for foreign language teachers, was assessed using a mixed approach to data analysis. The data was collected in a survey format among teachers. An assessment of the faculty's readiness for the daily integration of AI tools into the educational process was also carried out. 108 respondents were accepted, their quantitative data was analyzed using the t-test, and qualitative data was obtained during the

interview, which helped to conduct a statistical analysis to study general trends in higher education. The expected learning outcomes were assessed using the Chi-square method, and teacher readiness was assessed, as mentioned earlier, using t-tests. These statistical analyses provide an opportunity for qualitative analysis of the data obtained during the study.

Results and Discussion

During a survey of university teachers about search engines, it turned out that the assessment of the readiness of using AI-based search engines by teachers, it can be concluded that the t-criterion revealed a significant difference ($t(112) = 2.98, p < 0.01$), and the results of the experimental group using AI-based search engines was 4.3, while for control group using traditional search tools was 3.7 (Fig. 3).

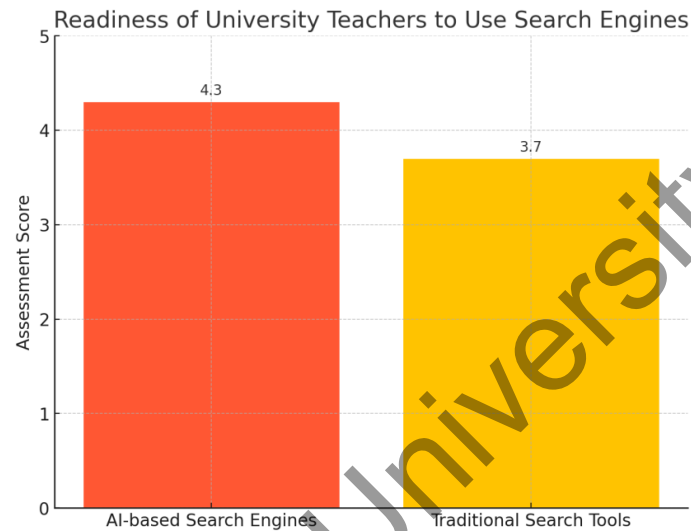


Figure 3. Group Comparison of Readiness Scores

The surveys were also analyzed on a Likert scale, and a total of 108 teachers participated in them. The survey assessed the involvement and willingness of the teaching staff, as well as the expected learning outcomes. Several criteria were used in the quantitative analysis, such as the level of engagement, which was assessed on a scale from 1 (not involved) to 5 (strongly involved) (Fig. 4).

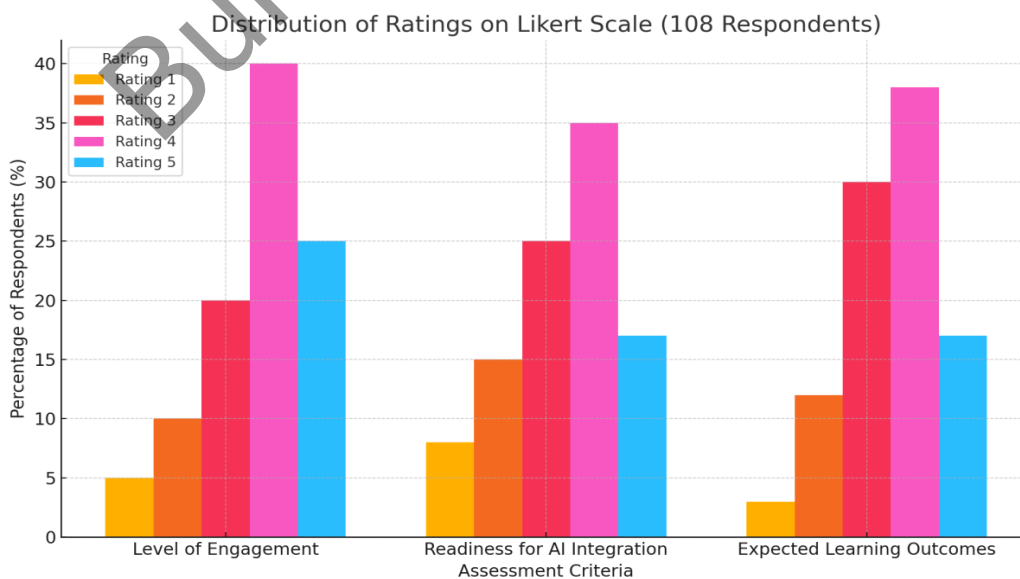


Figure 4. Rating on Likert Scale

In terms of the perceived learning outcomes, and then getting an answer to the question of whether AI-based search engines are effective and how they affected their learning, 88 % of respondents answered that they had improved positively, whereas 9 % responded neutral, and only 3 % reported a negative impact. This shows a favorable perception of AI-based search engines, and indicators (Fig. 5).

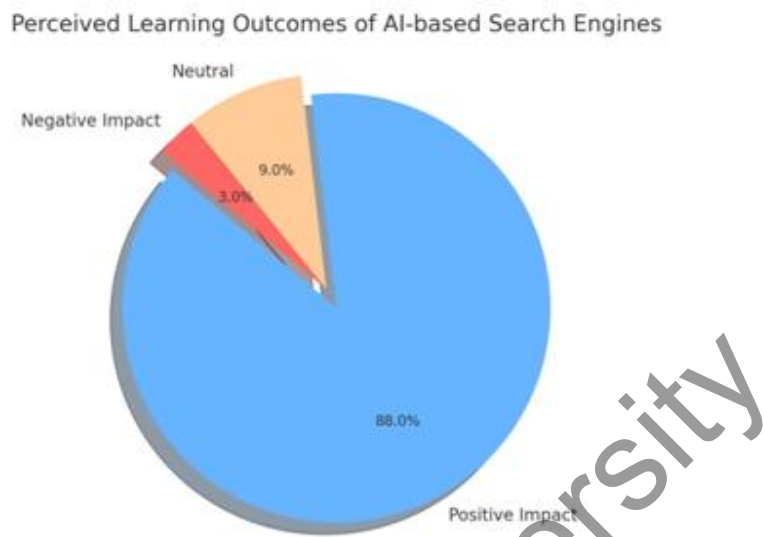


Figure 5. Perceived Learning Outcomes of AI-based Search Engines

The indicator of readiness for AI-based search engines was answered positively by 88 % of respondents. According to the results of the Chi-square analysis, it can be seen that there is a significant relationship between the university affiliation and the perceived readiness to use search engines systems in the digital educational environment, which is equal to $(\chi^2(1, N = 200) = 10.24, p < 0.01)$ (Fig. 6).

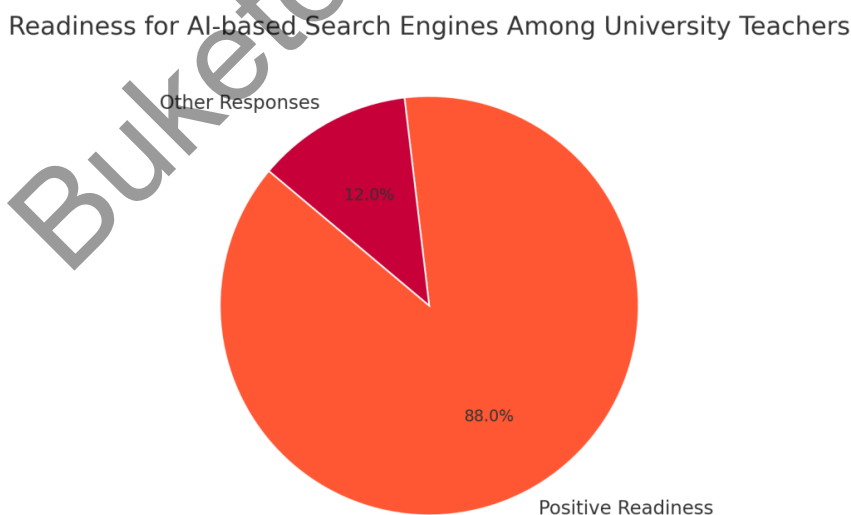


Figure 6. Readiness to Use Digital Tools by Teaching staff

According to the analysis of the teaching staff’s readiness to use intelligent search engines, many respondents demonstrated confidence in their responses. The t-criterion showed a significant difference $(t(98) = 4.12, p < 0.001)$, for example, the average indicator was 4.1.

The qualitative data gathered through interviews depicted a favorable university environment is an important aspect and the teachers of both universities noted the need to support the integration of intelligent search engines, as well as increase the number of joint projects that help strengthen the confidence of teachers in the AI-based search engines in everyday academic practice [10]. The next important aspect influencing readiness was the availability and accessibility of digital resources; for example, teachers stated that there were difficulties associated with limited access to high-quality content and digital materials, compounded by occasional instability in Internet connection, which undoubtedly creates obstacles in the process of using digital platforms. Finally, the adaptation of innovative pedagogical practices in universities, where methods of interactive modeling are often used, and the indicators are simply impressive. Innovative practices are being applied in contexts where AI-based search tools are integrated into both language learning and instruction, particularly in foreign language education. Statistical analysis revealed a significant difference in the effectiveness of integration intelligent search engines in the digital environment of a teacher, variations exists in the level of teachers engagement and the willingness to use intelligent search engines for preparing lectures and seminars. The finding from qualitative data is summarized as statistical analysis.

Overall, it can be noted that the results of the research show that the universities demonstrate the need to create a favorable institutional environment for all participants in the educational process. Undoubtedly, in the presence of a digital environment, such as intelligent search engines obviously gives an impetus to the professional development of faculty and researchers, as well as the development of digital competencies. The results of qualitative data analysis demonstrate the importance of expanding access to high-quality resources such as intelligent AI-based search engines. In addition, regular professional development for teaching staff and researchers — including refresher courses and seminars on AI integration and digital tools — is currently underway, positively contributing to teachers' digital literacy.

Conclusions

In conclusion, based on the results of the research, it can be said that the integration of AI-based search platforms to search for academic papers and create a list of references expand the digital capabilities of the teacher. The integration of digital tools into language training will significantly improve opportunities in the higher education system. By examining research data such as expected learning outcomes obtained through Chi-square analysis and teacher readiness through t-tests, there is no doubt that the prospects for using OER and digital technologies are showing positive trends.

Kazakhstani universities demonstrate strong potential in the field of artificial intelligence, supported by advanced research laboratories that actively contribute to scientific innovation and practice, which ultimately allows teachers to adapt to work in a digital environment. Universities comprise many buildings, as well as separate technology parks, laboratories, and other campuses for scientific research. The analysis identified an urgent need to develop a new intelligent search engine, referred to as *Intelligent OpenEd*. Powered by artificial intelligence, this system offers a scalable solution for enhancing the accessibility and relevance of educational resources. Its implementation is expected to not only improve the quality of available materials but also positively influence the overall level of education in Kazakhstan. Furthermore, the model supports the evolution of innovative teaching practices and contributes to strengthening the competitiveness of scientific institutions.

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С.Т. Абдрахманова

Педагогтардың сандық білім беру ортасында зияткерлік іздеу жүйелерін пайдалануға дайындығы

Мақалада жоғары оқу орындарында жасанды интеллект негізінде іздеу жүйелерін енгізу және интеграциялау мәселелері, Қазақстанда осындай жүйелерді енгізудің теориялық және практикалық аспектілері қарастырылған. Білім беруді модернизациялау, әсіресе цифрлық технологияларды қолдану саласындағы жаһандық үрдіске айналғандықтан, қазіргі тәжірибе, проблемалар және болашақ ЖИ жетістіктерінің әлеуеті сипатталған. Сондай-ақ, білім беру және ғылым саласындағы ЖИ негізіндегі іздеу жүйелерінің мысалдары келтірілген. Осыған қарамастан, барлық университеттердің оқу процесінде қол жетімді ашық білім беру ресурстарын (АББР) және интеллектуалды іздеу жүйелерін тиімді пайдалануын қамтамасыз етуде қиындықтар бар, бұл мұғалімнің ашық сандық білім беру ортасын жобалауда төңкеріс жасай алады. Айта кету керек, зерттеу мақаласы ғылым саласындағы жасанды интеллектке негізделген іздеу жүйелерін пайдалану аспектілерін, атап айтқанда озық технологиялар мен соңғы педагогикалық инновациялардың әлеуетін терең қарастырады. Зерттеу педагогикалық мәселелерді шешуді қамтамасыз ететін ғылыми саладағы қолданыстағы жасанды интеллект іздеу жүйелеріне шолу мен талдауды ұсынады.

Кілт сөздер: іздеу жүйесі, сандық орта, АББР, сандық құзыреттілік, оқытушы, дайындық, жасанды интеллект, жоғары білім, білім беру ресурстары.

С.Т. Абдрахманова

Готовность педагогов к работе с интеллектуальными поисковыми системами в цифровой образовательной среде

В статье рассматриваются вопросы внедрения и интеграции поисковых систем на основе искусственного интеллекта в высших учебных заведениях, теоретические и практические аспекты внедрения таких систем в Казахстане. Описывается текущая практика, проблемы и потенциал будущих достижений в области ИИ, поскольку модернизация образования стала глобальной тенденцией, особенно в области применения цифровых технологий. Также приводятся примеры существующих поисковых

систем на основе ИИ в области образования и науки. Несмотря на это, существуют проблемы в обеспечении того, чтобы все университеты эффективно использовали доступные открытые образовательные ресурсы (ООР) и интеллектуальные поисковые системы в учебном процессе, что могло бы революционизировать проектирование открытой цифровой образовательной среды педагога. Следует отметить, что в статье подробно рассматриваются аспекты использования поисковых систем на основе искусственного интеллекта в науке, а именно потенциал передовых технологий и новейших педагогических инноваций. В исследовании представлен обзор и анализ существующих поисковых систем ИИ в научной сфере, которые способствуют решению педагогических задач.

Ключевые слова: поисковая система, цифровая среда, ООР, цифровая компетентность, преподаватель, готовность, искусственный интеллект, высшее образование, образовательные ресурсы.

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