[18] Synenko S. I. Rozvytok pisliadyplomnoi pedahohichnoi osvity v krainakh zakhidnoi Yevropy (Anhliia, Frantsiia, Nimechchyna) [Development of postgraduate pedagogical education in Western European countries (England, France, Germany)]: dys. … kand. ped. nauk. Kyiv, 2002. 180 s. (in Ukrainian)
[19] Slozanska H., Pezhynska O., Horishna N. Bezperervnyi profesiinyi rozvytok pedahohiv zakladiv spetsialnoi ta inkliuzyvnoi osvity v umovakh formalnoi, neformalnoi ta informalnoi osvity [Continuous professional development of teachers of special and inclusive education institutions in formal, non-formal and informal education]. Vvichlyvist. Humanitas, 2023. (3), 157–166. https://doi.org/10.32782/humanitas/2023.3.21 (in Ukrainian)
[20] Sulym-Karlir I. F. Orhanizatsiia samostiinoho pozaaudytornoi roboty studentiv pedahohichnykh koledzhiv SShA [Organization of independent extracurricular work of students of pedagogical colleges in the USA]: avtoref. dys… kand. ped. nauk: Vinnyts. derzh. ped. un-t im. M. Kotsiubynskoho. Vinnytsia, 2008. 20 s. (in Ukrainian)
[21] Frytsiuk V. A., Vovk L. P. Akmeolohichnyi pidkhid do vyvchennia problemy profesiinoho samorozvytku maibutnoho vchytelia [Acmeological approach to studying the problem of professional self-development of a future teacher]. Naukovi zapysky. Seriia: Pedahohika i psykholohiia. VDPU im. Mykhaila Kotsiubynskoho. Vinnytsia, 2016. Vyp. 42. S.66-71. (in Ukrainian)
[22] Frytsiuk V. A. Problema kreatyvnosti u pedahohichnykh doslidzhenniakh [The problem of creativity in pedagogical research]. Pedahohichna dumka. Lviv, 2009. № 1. S. 32-38. (in Ukrainian)
[23] Asunta T. Developmentsin Teacher Educationin Finland. Inservice Educationand Training. 137-146.
[24] Dobbins R., Pettman B.O. Self-development: The nine basic skills for business success. The Journal of Management Development. 1997. V.16 (8). P. 521-667. (in English)
[25] International Handbook on the Continuing Professional Development of Teachers / ed. By C. Day, J. Sachs. Reprinted 2008, 2009. London : Open University Press. 320 p. (in English)
[26] Häring L. Die Akademie für Lehrerfort bildungin Dillingen. Dieberufs bildende Schule. 48 (2000)12. S. 716-723. (in English)
[27] Gurevich R., Fritsyuk V., Opushko N., Gadaichuk N., Gabriychuk L. Preparation of future specialists for professional self-development in the information and educational environment of the university. Theoretical and scientific foundations of pedagogy and education: collective monograph / Kazachiner O., Boychuk Y., etc. International Science Group. Boston : Primedia eLaunch, 2022. p. 425-442. Available at : DOI 10.46299/ISG.2022.MONO.PED. (in English)
[28] Gurevych R., Frytsiuk V., Dmytrenko N. Computer diagnostics of readiness of prospective teachers to professional self-development. Information technologies and learning tools, 2019. Vol 69. №1. (in English)

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INTEGRATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN EDUCATION: CHALLENGES AND PROSPECTS

Summary. The article highlights the issue of integrating artificial intelligence technologies into the educational process, in particular in the context of higher education. The challenges and prospects of implementing artificial intelligence, as well as its advantages and disadvantages, are assessed. It is noted that the use of artificial intelligence in education is not only an innovative step, but also a strategic decision for preparing young people for the professions of the future. The article discusses the key aspects

of using artificial intelligence to personalize learning, adapt to different learning styles, ensure accessibility of education for all students, and optimize learning processes through big data analysis. It is emphasized that various forms of artificial intelligence are designed to facilitate the work of scientists and contribute to the optimization of preparation for classes in teaching activities. The importance of using virtual and augmented reality as modern approaches to stimulate students' interest in learning, as well as to optimize the process of integrating theoretical knowledge and practical skills, is determined. It is noted that artificial intelligence, thanks to personalized algorithms, adapts educational materials to the individual needs of students, assessing their strengths and weaknesses. The features of the use of artificial intelligence for automating the assessment and analysis of academic results of higher education students are analyzed. A classification of artificial intelligence types by content form is proposed for a better understanding of the possibilities of artificial intelligence technologies in education. Particular attention is paid to the analysis of competence in the sphere of artificial intelligence and the determination of the levels of this competence among educators. The importance of ensuring the ethical use of artificial intelligence is emphasized, in particular to minimize bias and protect student privacy. The strategies and approaches for training educators to use of artificial intelligence are presented. The importance of continuous professional development of educators for the effective integration of artificial intelligence into the educational process is stated.

Key words: artificial intelligence, personalized learning, AI competence, types of AI tools, higher education, learning strategies.

1. INTRODUCTION

Formulation of the problem. Digital education, which is increasingly popular in the digital era, is gaining wide recognition and support among the younger generation. At the same time, the educational process is changing rapidly and continuously. The development of digitalization is deeply transforming the educational models. The implementation of smart technologies, such as artificial intelligence, digital twins, and virtual and augmented reality enhances the educational process, boosts efficiency, and shortens learning time by enabling a new level of automation [1, p. 447].

In the modern world, where technological progress is rapidly breaking into various spheres of people's lives, the role of artificial intelligence in education is becoming increasingly important. This innovative learning method presents numerous opportunities, while also bringing forth challenges and concerns for the society.

Artificial intelligence (AI) is no longer just a trending topic; it has become an integral part of daily lives. Artificial intelligence is radically transforming people's lives, from personal applications to highly organized systems, covering various fields of activity, including education. The integration of AI into education is not only a revolutionary step for modern learning, but also a strategic decision for preparing young people for the professions of the future.

However, the integration of AI technologies into the educational process requires a deep understanding and study of these technologies. We emphasize the importance of continuous professional development of teachers, which includes the study of new technologies in order to meet the needs of modern students. The rate of progress in the digital space determines the number of new technologies that appear and are actively introduced into the field of education [2, p. 319]. Along with actively incorporating artificial intelligence technologies into education, it is essential to provide proper training for educators and establish effective interaction between the participants in the educational process and the technologies. Modern education demands a thorough understanding of how to implement artificial intelligence technologies, ensuring these technologies do not negatively affect the quality of the learning process.

Analysis of recent research. The study of the technical, pedagogical and philosophical aspects of the use of artificial intelligence technologies in the educational environment covers a significant body of literature. The scientists and experts from various disciplines are actively discussing the potential of machine learning and neural network algorithms, the use of robot assistants and virtual teachers, the automation of many aspects of the educational process and the significance of these innovations for the future educational environment. In particular, this topic is covered in the works

of such well-known scientists as: S. Alekseeva, V. Bykov, O. Hrybyuk, R. Gurevich, Yu. Dudun, M. Mar'yenko, V. Kovalenko, A. Kolomiyets, S. Lytvynova, Yu. Nosenko, V. Osadchy, O. Pinchuk, O. Spirin, O. Topuzov, M. Shyshkina, A. Yatsishyn and others.

I. Bubnov described the potential benefits and risks associated with the use of artificial intelligence in Ukraine's contemporary educational sector and identified the task of explaining the potential of artificial intelligence technologies for subjects and objects of the educational process [3].

Scientists S. Dovgy, S. Babiychuk, L. Davybida, M. Biletska studied the impact of using artificial intelligence technologies in education during during a full-scale military invasion of Ukraine, which caused serious disruptions to traditional educational processes [4].

O. Topuzov and S. Alekseeva analyzed the potential for integrating artificial intelligence into the learning process of secondary education institutions in wartime [5].

However, the issue of using artificial intelligence technologies in education has not been fully explored in scientific literature, as these technologies are continually evolving.

The purpose of the article is to cover the issue of integrating artificial intelligence technologies into the educational sphere, to analyze the challenges and prospects, the key aspects, the advantages and disadvantages of AI technologies in higher education.

2. RESULTS OF THE RESEARCH

Ensuring the quality of educational services has always been a primary goal for any educational institution. Lectures, readings from literary sources, assignments for independent study, and preparation for practical and laboratory sessions make up the theoretical aspect of education. Therefore, theoretical learning relies primarily on the student's motivation and desire. Strengthening theoretical knowledge through laboratory practice forms the basis for acquiring learning skills and assessing students' progress. Engaging students in experimental tasks encourages them to master new material. This creates an inseparable link between theory and practice, leading to the critical task of identifying modern methods to motivate students to learn, with virtual and augmented reality offering valuable support in achieving this goal. [6, p. 37].

The implementation of modern information technologies, including artificial intelligence, in the field of education is becoming a relevant direction. The use of various artificial intelligence tools is significant not only in education, science, and the commercial sphere, but also in everyday life and professional activities. After all, various forms of artificial intelligence are designed to facilitate the work of scientists and contribute to the optimization of preparation for classes in teaching activities [7, p. 61].

The term "artificial intelligence" was first used in 1956 at a conference at Dartmouth University. There are three main types of artificial intelligence: narrowly focused artificial intelligence (chess games, antivirus, data storage), general artificial intelligence (a computer, machines capable of performing intelligent actions), artificial superintelligence (a computer smarter than a person). The most popular artificial intelligences are: Siri, DeepMind from Google, Cortana Assistant from Microsoft, "Smart" robot chef Flippy [8, p. 492].

The term "**artificial intelligence**" describes the ability of automated systems to perform various functions of human intelligence, such as selection and decision-making based on data analysis. In other words, it is the ability of machines to simulate the mind and imitate human cognitive abilities, to learn and adapt to new conditions [6, p. 51]. The modern development of technologies confirms that artificial intelligence is becoming an integral aspect of human life in various areas – from everyday life to work and education. This is reflected in the use of artificial intelligence as an assistant and advisor, which provides new opportunities to facilitate daily tasks [9, p. 49].

Artificial intelligence has emerged as a powerful tool for addressing challenges in education and speeding up advancements. By collecting and analyzing data, AI provides educators with insights into student engagement, learning development, and overall well-being. Additionally, it offers integrated digital tools and applications that facilitate interaction with educators and enable personalized monitoring of student progress.

Artificial intelligence has the capacity to revolutionize education by enhancing teaching and learning through personalized learning algorithms. By recognizing each student's strengths and weaknesses, AI can adapt the educational content to meet individual needs. Virtual reality experiences can also be created within the classroom to connect with students from remote countries or demonsrate historical sites that are at risk of excessive environmental damage. This offers students an interactive learning environment that boosts retention and comprehension [10, p. 95].

Augmented reality technology, enhanced by artificial intelligence, offers a more immersive learning experience for students, enabling them to engage with virtual objects in ways that were previously impossible. By overlaying real-time information onto the environment using devices or smartphones, smart boards, or classroom screens, new interactive experiences can be developed, changing the way information is effectively shared.

Let's consider some key aspects of using artificial intelligence in higher education:

– individual training, which provides individual programs for each higher education applicant in order to increase the effectiveness of learning;

– adaptation to different learning styles, providing support at the appropriate level for each applicant;

– ensuring accessibility of education, especially for those higher education applicants who have limited opportunities or are located remotely;

– conducting analysis and forecasting based on processing large amounts of data, which allows universities to anticipate trends and improve curricula;

– providing support for scientific and pedagogical staff through automation of administrative tasks and provision of analytical data;

– digital skills training that helps higher education students master modern technologies;

– promoting innovations in the educational process and other areas through active research and development of new artificial intelligence technologies [9; 11].

Thus, artificial intelligence in higher education institutions opens up new opportunities for individualizing the educational process, providing personalized support to higher education students (Fig. 1). It helps educators adapt educational materials and teaching methods to the needs of each higher education student. In addition, AI provides automated assessment of tasks and analyzes data to improve the quality of education [12, p. 223].

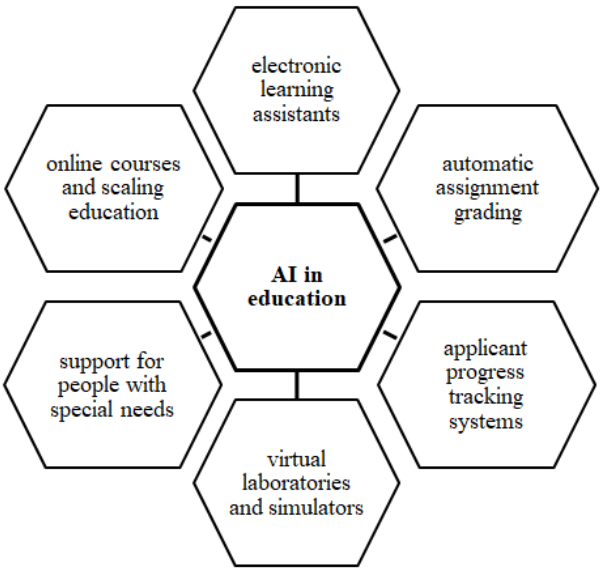

Fig. 1. Possibilities of using artificial intelligence in higher education

These examples demonstrate the diversity of AI uses in education and its potential to improve the learning process and expand opportunities for higher education students.

While the advantages of AI in education are enormous, scholars should identify the risks associated with fully implementing these technologies effectively. The use of confidential data raises privacy and fairness issues, requiring transparent policies for the collection, storage, and sharing of such data with interested parties. It also prompts a critical assessment of whether technological innovations are advancing pedagogical goals rather than reinforcing existing biased practices or teaching methods that can limit creativity, critical thinking, and diversity, when incremental change is implemented through machine-generated ideas or conclusions.

A major benefit of AI in education is personalized learning. AI- based systems can create individual lesson plans and assessments tailored to each student's specific learning abilities and needs. This guarantees an optimized learning experience, resulting in increased engagement and improved performance.

Students, when applying learning strategies to solve a specific task or problem, must have metacognitive knowledge about their learning approaches. They must clearly understand the essence of the task and develop the ability to choose strategies that best meet the requirements of the task and their individual learning capabilities [13]. Through the implementation of artificial intelligence, students gain access to personalized recommendations that help better adapt learning strategies to their learning style and needs.

In addition, the set of available learning strategies for students is expanding, and individual learning styles are becoming more flexible due to the introduction of new methods of perception and processing of educational material provided by AI capabilities [14].

AI can also improve access to education for students with special needs. Through intelligent learning systems, AI- based devices can identify areas where a student requires additional support and offer personalized instruction. This ensures that students who may need more time or assistance in certain subjects can stay on track with their classmates.

Another advantage of AI in education is its ability to provide real-time assessments of problem-solving skills. The educators can use AI technologies to monitor how well students understand concepts, tracking the progress during a lesson or course. This enables teachers to identify areas that require further focus and offer targeted solutions.

Advancements in artificial intelligence, particularly in machine vision algorithms like SLAM (simultaneous localization and mapping), have made immersive virtual reality (VR) experiences possible. These algorithms enable computers to generate maps from camera input, facilitating VR gaming. [15, p. 297].

Overall, the advantages of AI are profoundly changing teaching and learning methods, offering a wide range of opportunities for students worldwide, regardless of their personal circumstances.

The use of AI in education contributes not only to improving the learning process, improving student learning and development, but also allows higher education institutions to adapt to modern challenges, and also helps prepare higher education applicants for future needs in the labor market [16, p. 101]. However, the use of AI in higher education has its advantages and disadvantages (Fig. 2).

Artificial intelligence is reshaping education by offering personalized learning approaches to students. This personalized learning boosts student engagement and motivation, which are crucial for academic success. AI can collect, combine, and analyze data to create detailed learning profiles for students. By examining data on each student's preferences, strengths, and weaknesses, AI can recommend personalized learning strategies and offer additional support as needed.

Beyond providing personalized support for students, AI analytics can also help educators and administrators make better-informed decisions. By collecting extensive student data, from assessment templates to test scores, and presenting it in accessible dashboards or reports from AI platforms, educators can gain valuable insights into areas that need improvement. This includes monitoring student progress over time, adjusting curricula based on real-time classroom needs, and identifying which topics are the most challenging for students.

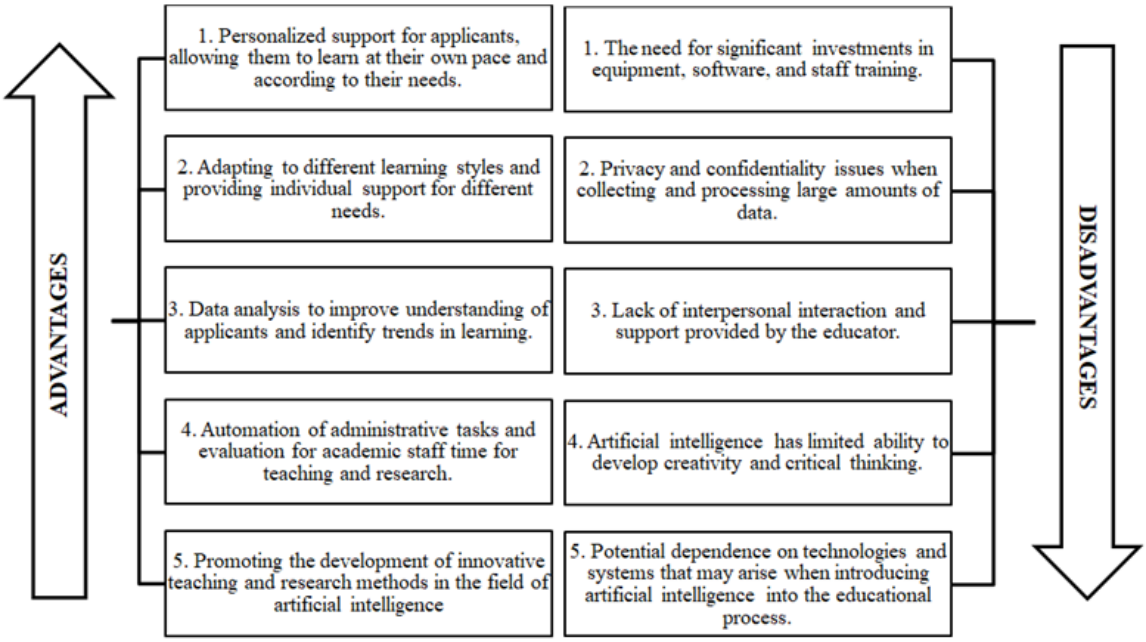

Fig. 2. Advantages and disadvantages of using artificial intelligence in higher education

AI-based personalized learning systems have the capacity to assess large amounts of student data. It is crucial to ensure equal access to information resources to prevent increasing disparities between students from different income levels or backgrounds, ensuring that these technologies remain supportive tools rather than isolating devices used outside educational environments.

AI-based personalized learning provides numerous advantages, including enhanced student engagement and motivation, while also enabling educators and administrators to make better-informed decisions. The framework established by these technologies will surely be valuable in creating a more inclusive education system that equally serves all student groups.

AI-based assessment is fundamentally transforming the education system. It has the potential to enhance the accuracy, efficiency, and fairness of assessments. With AI, student learning can be assessed more accurately, offering deeper insights and supporting personalized learning paths.

Artificial intelligence can automate such tasks as test grading, enabling educators to dedicate more time to teaching instead of grading exams. AI-based essay grading not only saves time but also delivers immediate feedback to students. Moreover, AI-based assessment can enhance physical and cybersecurity through biometric solutions [16, p. 107].

A key advantage of using AI for assessment is its ability to rank candidates purely based on their merit, reducing human biases related to factors like race or gender. This contributes a fairer system where students are assessed based on their abilities rather than discriminatory considerations.

Europe has proposed a legislative framework for artificial intelligence that takes into account the risks associated with biased decisions or erroneous automated judgments during assessment. Therefore, it is important for institutions planning to implement this technology to ensure that strict ethical standards are followed when using these powerful systems [17, p. 185].

AI-based assessment will play a crucial role in modernizing the education system by making assessments faster, more objective, and more effective in identifying the areas where students require assistance. This will better equip them for success in their future careers.

When considering the competence of educators in the use of AI technologies in education, it can be determined that artificial intelligence **competence** (AI competence) is characterized by the knowledge, skills, and attitudes necessary to understand and effectively use AI in various contexts: understanding the roles of AI in education, using it in educational practices in an ethical and effective way, and the ability to define AI and its applications [18].

The development of AI competence is an essential aspect of the digital competence framework for educators, students and citizens being developed by ICT-CFT UNESCO and OECD.

It should be noted that the digital competence framework for citizens of Ukraine contains a description and examples of the use of AI in the following areas [18]:

- computer literacy;
- information and digital literacy;
- communication and interaction;
- digital content creation;
- security;
- problem solving and lifelong learning.

AI competence is not defined in the teacher's professional standard, but potentially relates to the implementation of all teacher's work functions and is a component of educators' digital competence regarding the ability [18]:

- to navigate in the information space, to search and critically assess information, and to apply it in professional tasks;
- to use existing educational resources effectively and create (if necessary) new electronic (digital) educational materials;
- to use digital technologies in the educational process.

Thus, AI competence is an integral part of digital competence, its areas of application cover almost all areas and components.

In this case, it is advisable to consider the levels of AI competence [18].

– A.1 – beginner and/or A.2 – user. AI literacy (literacy in the field of using artificial intelligence) is one of the basic levels of educator competence in the field of using AI, which is a set of knowledge, abilities, skills and attitudes that allow a person to critically reflect, apply and evaluate artificial intelligence systems, methods and technologies in the context of their effective and ethical use in various areas of activity, contributing to the security and sustainable development of the society. AI knowledge and skills can be combined into several areas: understanding, using and evaluating AI.

The following levels of AI competence correspond to the levels of digital competence of a pedagogical worker, namely:

- B.1 – integrator,
- B.2 – creator-experimenter,
- C.1 – leader-innovator.

Let us consider **the strategies** for training educators in the use of AI. Such training should include both theoretical foundations and practical skills necessary for the effective integration of these technologies into the educational process. Here are some strategies and approaches for training educators in the use of AI [18]:

1) Development of specialized courses and trainings:

– Theoretical introduction to AI: introduction to the basics of artificial intelligence, history of development, basic principles and technologies (neural networks, machine learning, etc.).

– Practical sessions: using AI tools in the educational process, such as adaptive learning systems, tools for automating assessment and individualizing the learning process.

– Ethical aspects and security issues: discussion of ethical issues and challenges related to the use of AI, including data protection and privacy.

2) Webinars and online resources:

– Online Courses: to offer educators access to online AI courses from leading universities and educational platforms.

– Webinars with experts: to organize webinars with leading AI experts where educators can ask questions and discuss practical aspects of using AI.

3) Supporting the community of practice:

– Forums and discussion groups: creating online communities where educators can share experiences, successes and challenges in using AI.

– Workshops and working groups: organizing workshops where educators can practically apply AI tools and discuss new approaches to teaching.

4) Integrating AI into professional development:

– Integration into existing programs: incorporating AI modules into educator in-service and professional development programs.

– Best practice workshops: conducting workshops where educators who have successfully integrated AI into their practice can share the experiences, methods, and results with the colleagues.

5) Pilot projects and experiments:

– Implementation of pilot projects: inviting educators to participate in the pilot projects using AI in the educational process, which will allow them to assess the possibilities and limitations of these technologies in practice.

– Analysis and discussion of results: collection and analysis of the data on the effectiveness of the use of AI in education, discussion of the results obtained at professional forums and conferences.

It is also worth noting another possibility for using AI in educational process, namely the filling of educational online portals. AI can be used to create new forms of providing knowledge in various types of presentation: educational materials, test tasks and interactive environments. It can be used for: text generation, translation, creating visualized explanations of complex concepts, etc. This will ensure the creation of educational online portals that are more effective in terms of creating and assimilating material for users than classical environments [4, p. 203].

To determine the necessary AI tools, a classification can be proposed based on the primary multimedia content, which includes text-based, visual, audio, and video-oriented tools. (Fig. 3).

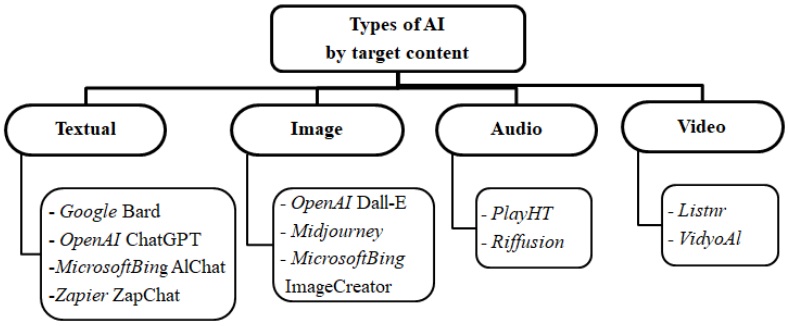

Fig. 3. Types of AI tools by target content

The first interactive category that can be used on the learning platforms is text-based AI tools. Such tools have the potential to revolutionize the study of multimedia disciplines, as they provide a substantial number of advantages to the platform.

These advantages include: improved learning of the educational material, increased interest and motivation of students. Most of the recommended text AIs (Bard, ChatGTP, BingChat) have common features: a large database, basic understanding of human language, ability to learn, the ability to adapt to individual needs (level of training and direction of students' interests), flexibility of use.

Image AIs are types of artificial intelligence that can generate images or other visual elements. Most of them (Dall-E, ImageCreator, Midjourney) are characterized by the following features: easy to use, editing and style change tools, multilingualism, perspective, etc.

Video AIs have the potential to take multimedia learning to a new level in the future, providing students with new opportunities for creative expression, improving the effectiveness of teaching and research. It can be used to create new forms of creative expression, such as video art, video games, and virtual reality. This can help students develop their creative skills and explore new forms of expression. Video generative AIs can also be used to provide students with unique opportunities for research.

Although integrating AI into education is timely and relevant, several challenges and concerns have emerged that go beyond discussions and regulatory frameworks. One of the primary risks is privacy violations, as students and educators may be wary of AI systems. Therefore, it is essential to implement measures to safeguard data security while using the technologies [20, p. 43].

Another significant issue is the accessibility of AI-based tools and platforms. To ensure inclusivity, equal opportunities must be provided, regardless of socio-economic status or location. However, there are concerns that AI may reinforce existing biases and discrimination in education, particularly with personalized learning materials that could unintentionally or intentionally reflect the values of certain cultures or ethnic groups.

Artificial intelligence has the potential to address various challenges in education, such as fostering innovative teaching methods [19, p. 72]. However, this presents certain uncertainties, as effective assessment cannot yet be solely determined by traditional metrics like grades or assessment based only on classroom performance. It is crucial to consider all the factors required for the successful integration of automated assessment systems into the national education system today.

3. CONCLUSIONS AND PROSPECTS OF FURTHER RESEARCH

Artificial intelligence is poised to revolutionize education, addressing key challenges and unlocking new opportunities for both students and educators. With the predicted significant growth of the AI education market by 2027, its potential impact across various global sectors is undeniable. AI offers substantial benefits, such as reducing the workload on educators, optimizing administrative tasks, and enabling personalized learning experiences. By automating routine processes, AI allows educators more time for direct student interaction and the exploration of creative teaching methods.

Despite these advantages, there remain concerns about the effectiveness and limitations of AI-based educational tools. Although AI can offer personalized feedback, it may not completely replicate the depth of human interaction, which is a key element in the learning process. Additionally, the ethical use of student data remains a critical issue, requiring comprehensive regulatory frameworks and policy discussions to ensure responsible implementation.

Nonetheless, the transformative potential of AI in education is vast, and as institutions increasingly adopt these technologies, we can expect continued growth and refinement of AI-driven solutions. Future research is crucial to address the gaps in AI's ability to emulate human pedagogical nuances, the long-term impact of AI on student learning outcomes, and the development of ethical standards for data usage. Studies exploring the integration of AI with human-centered teaching approaches, its role in fostering collaboration among students, and its ability to reduce educational disparities will be key to shaping the future of AI in education.

Further research should focus on creating hybrid systems that combine the strengths of AI and human educators, ensuring that technological advancements not only enhance productivity but also maintain the essential human element in teaching and learning.

REFERENCES (TRANSLATED AND TRANSLITERATED)

[1] Roman Gurevych, Myroslav Koval, Galyna Gordiichuk, Shakhina I., Svitlana Genkal, Viktor Romanenko (2022). Improving the Training of Skilled Workers for Professional Activities in Educational Institutions of Ukraine. Revista Romaneasca Pentru Educatie Multidimensionala, 14(1), 440-464. https://lumenpublishing.com/journals/index.php/rrem/article/view/4412 (in English)

[2] Shakhina I. Yu. Digital transformation of education as a challenge of today. Suchasni osvitni tekhnolohii v tsyfrovii realnosti: monohrafiia; za red. akademika NAPN Ukrainy R. S. Hurevycha. Kyiv: Vydavnytstvo «Iurka Liubchenka», 2024. S. 316-334. (in Ukrainian)

[3] Bubnov I. V. Opportunities and risks of using artificial intelligence in the educational sphere of modern Ukraine. Abstracts of XI International Scientific and Practical Conference. Florence, Italy, November 27–29. 285–290 pp. 2023. URL: https://eu-conf.com/ua/events/the-latest-information-and-communicationtechnologies-in-education/ (in Ukrainian)

[4] Dovgyi S., Babiichuk S., Davybida L., and Biletska M. Teachers' and students' attitudes towards the use of artificial intelligence: all-ukrainian research, ITLT, vol. 104, no. 6, pp. 197-215, Dec. 2024, doi: 10.33407/itlt.v104i6.5890. (in English)

[5] Topuzov O., Alieksieieva S. Possibilities of using artificial intelligence in the educational process of secondary education institutions in wartime. URL: https://uej.undip.org.ua/index.php/journal/article/view/718/814 (in Ukrainian)
[6] Fratavchan V. H., Fratavchan T. M., Lukashiv V. H., Litvinchuk V. H. Artificial intelligence methods and systems: navch. posibnyk. Chernivtsi: ChNU, 2023. 114 s. (in Ukrainian)
[7] Pchelianskyi D. P., Voinova S. A. Artificial intelligence: prospects and development trends. Avtomatyzatsiia tekhnolohichnykh i biznes-protsesiv. 2019. T. 11, № 3. S. 59-64. (in Ukrainian)
[8] Toledo Lara, G. E. (2023). Artificial intelligence (AI) and the 21st Century University: Discussion on a New University Scenary. Revista Romaneasca Pentru Educatie Multidimensionala, 15(4), 489-506. https://doi.org/10.18662/rrem/15.4/806 (in English)
[9] Marienko M. V., Kovalenko V. M. Artificial intelligence and open science in education. Fizyko-matematychna osvita. 2023. T. 38, № 1. S. 48-53. (in Ukrainian)
[10] Shakhina I. Yu., Tkachenko V. R. Main areas of using artificial intelligence in education. Scientific Collection «InterConf»,(222): with the Proceedingsof the 5thInternational Scientific and Practical Conference «Diversity and Inclusion in Scientific Area» (October26-28, 2024; Warsaw, Poland) / comp. by LLC SPC «InterConf».Warsaw: Ceac Polonia, 2024. p. 93-99. (in Ukrainian)
[11] Lubko D. V., Sharov S. V. Directions of using intelligent systems in the educational process. Ukrainski studii v yevropeiskomu konteksti: zb. nauk. pr. 2021. № 3. S. 305-310. (in Ukrainian)
[12] Marienko M. V., Shyshkina M. P., Konoval O. A. Methodological principles of forming cloud-oriented open science systems in higher pedagogical education institutions. ITLT. 2022. 89(3), 209-232. (in Ukrainian)
[13] Dmitrenko N., Petrova A., Podzygun O. The role of learning strategies in the process of ESP acquisition of intending educators. Society. Integration. Education. Proceedings of the International Scientific Conference. Volume V. May 28th-29th 2021. Rezekne Academy of Technologies 2021.p.535-546. https://doi.org/10.17770/sie2021vol5.6357 (in English)
[14] Dmitrenko Natalia, Petrova Anastasiia, Podzygun Olena, Nikolaeva Sofiya. Strategies in autonomous learning of professionally oriented English communication. Journal of Teaching English for Specific and Academic Purposes, Vol.9, №3, 2021.Pp. 527-540. University of Niš, Serbia. https://espeap.junis.ni.ac.rs/index.php/espeap/article/view/1066 (in English)
[15] Shakhina I. Yu. Virtual reality in modern education. Artificial intelligence in science and education (AISE 2024). Artificial intelligence in science and education: zbirnyk materialiv mizhnarodnoi naukovoi konferentsii (Kyiv, 1-2 bereznia 2024 r.) [Elektronnyi resurs] / [uporiad: A. Yatsyshyn, V. Matusevych, V. Kovalenko]. Kyiv: UkrINTEI, 2024. S. 296-300. (in Ukrainian)
[16] Kharchenko, A., Nalyvaiko, O., Kreydun, N., Sheiko, A., Ptushka, A., Khatuntseva, S., & Zotova, L. (2024). Digital Technologies as a Factor of Transformation of Learning in the University Education. Revista Romaneasca Pentru Educatie Multidimensionala, 16(4), 97-126. https://doi.org/10.18662/rrem/16.4/909 (in English)
[17] Pinchuk O. and Malytska I. Responsible and ethical use of artificial intelligence in research and publishing. ITLT, vol. 100, no. 2, pp. 180-198, Apr. 2024, doi: 10.33407/itlt.v100i2.5676. (in Ukrainian)
[18] Project Instructional and methodological recommendations on AI in general secondary educational institutions. Ministerstvo tsyfrovoi transformatsii Ukrainy. 2024. 62 s. URL: https://mon.gov.ua/static-objects/mon/sites/1/news/2024/05/21/Instruktyvno. metodychni.rekomendatsiyi.shchodo.SHI.v.ZZSO-22.05.2024.pdf (in Ukrainian)
[19] Shakhina I., Podzygun O., Petrova A., Hordiichuk H. Digitalization as a prospective direction of the contemporary education system. Modern Information Technologies and Innovation Methodologies of Education in Professional Training Methodology Theory Experience Problems, 2022. Vyp. 63. p. 65-77. https://doi.org/10.31652/2412-1142-2022-63-65-77
[20] Protsenko I. Distance education as a component of modern learning. Modern Information Technologies and Innovation Methodologies of Education in Professional Training Methodology Theory Experience Problems, 2024, 73, 40-45. https://doi.org/10.31652/2412-1142-2024-73-40-45

ІНТЕГРАЦІЯ ТЕХНОЛОГІЙ ШТУЧНОГО ІНТЕЛЕКТУ В ОСВІТНЮ ГАЛУЗЬ: ВИКЛИКИ ТА ПЕРСПЕКТИВИ

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Анотація. У статті висвітлено питання інтеграція технологій штучного інтелекту в освітній процес, зокрема в контексті вищої освіти. Оцінено виклики та перспективи впровадження штучного інтелекту, а також його переваги та недоліки. Зазначено, що застосування штучного інтелекту в освіті є не лише інноваційним кроком, але й стратегічним рішенням для підготовки молоді до професій майбутнього. Розглядаються ключові аспекти використання штучного інтелекту для персоналізації навчання, адаптації до різних стилів навчання, забезпечення доступності освіти для всіх студентів, а також оптимізації навчальних процесів за допомогою аналізу великих даних. Визначено, що різні форми штучного інтелекту покликані спростити роботу науковців і допомогти в оптимізації підготовки до занять у навчальному процесі. Визначено важливість використання віртуальної та доповненої реальності як сучасних підходів для стимулювання інтересу студентів до навчання, а також для оптимізації процесу інтеграції теоретичних знань і практичних навичок. Зазначається, що штучний інтелект, завдяки персоналізованим алгоритмам, адаптує навчальні матеріали відповідно до індивідуальних потреб студентів, оцінюючи їх сильні та слабкі сторони. Проаналізовано особливості використання штучного інтелекту для автоматизації оцінювання та аналізу навчальних результатів здобувачів вищої освіти. Запропонована класифікація типів штучного інтелекту за формою контенту для кращого розуміння можливостей технологій штучного інтелекту у навчанні. Окрему увагу приділено аналізу компетентності у галузі штучного інтелекту та визначенню рівнів володіння цією компетентністю серед педагогів. Підкреслюється важливість забезпечення етичного використання штучного інтелекту, зокрема з метою мінімізації упередженості та захисту приватності студентів. Наведено стратегії та підходи для навчання педагогічних працівників використанню штучного інтелекту. Констатовано важливість безперервного професійного розвитку педагогів для ефективної інтеграції штучного інтелекту в освітній процес.

Ключові слова: штучний інтелект, персоналізоване навчання, ШІ-компетентність, типи ШІ-засобів, вища освіта, стратегії навчання.

СПИСОК ВИКОРИСТАНИХ ДЖЕРЕЛ

[1] Roman Gurevych, Myroslav Koval, Galyna Gordiichuk, Shakhina I., Svitlana Genkal, Viktor Romanenko (2022). Improving the Training of Skilled Workers for Professional Activities in Educational Institutions of Ukraine. Revista Romaneasca Pentru Educatie Multidimensionala, 14(1), 440-464. https://lumenpublishing.com/journals/index.php/rrem/article/view/4412 (in English)

[2] Шахіна І. Ю. Цифрова трансформація освіти як виклик сьогодення. Сучасні освітні технології в цифровій реальності: монографія; за ред. академіка НАПН України Р. С. Гуревича. Київ: Видавництво «Юрка Любченка», 2024. (472 с.) С. 316-334. (in Ukrainian)

[3] Бубнов І. В. Можливості та ризики використання штучного інтелекту в освітній сфері сучасної України. Abstracts of XI International Scientific and Practical Conference. Florence, Italy, November 27-29. 285-290 pp. 2023. URL: https://eu-conf.com/ua/events/the-latest-information-and-communicationtechnologies-in-education/ (in Ukrainian)

[4] Dovgyi S., Babiichuk S., Davybida L., and Biletska M. Teachers' and students' attitudes towards the use of artificial intelligence: all-ukrainian research, ITLT, vol. 104, no. 6, pp. 197-215, Dec. 2024, doi: 10.33407/itlt.v104i6.5890. (in English)

[5] Топузов О., Алєксєєва С. Можливості використання штучного інтелекту в освітньому процесі закладів середньої освіти в умовах воєнного стану. URL: https://uej.undip.org.ua/index.php/journal/article/view/718/814 (in Ukrainian)

[6] Фратавчан В. Г., Фратавчан Т. М., Лукашів В. Г., Літвінчук В. Г. Методи та системи штучного інтелекту: навч. посібник. Чернівці: ЧНУ, 2023. 114 с. (in Ukrainian)

[7] Пчелянський Д. П., Воінова С. А. Штучний інтелект: перспективи та тенденції розвитку. Автоматизація технологічних і бізнес-процесів. 2019. Т. 11, № 3. С. 59-64. (in Ukrainian)

[8] Toledo Lara, G. E. (2023). Artificial intelligence (AI) and the 21st Century University: Discussion on a New University Scenary. Revista Romaneasca Pentru Educatie Multidimensionala, 15(4), 489-506. https://doi.org/10.18662/rrem/15.4/806 (in English)

[9] Мар'єнко М. В., Коваленко В. М. Штучний інтелект та відкрита наука в освіті. Фізико-математична освіта. 2023. Т. 38, № 1. С. 48-53. (in Ukrainian)

[10] Шахіна І. Ю., Ткаченко В. Р. Основні сфери використання штучного інтелекту в освіті. Scientific Collection «InterConf»,(222): with the Proceedingsof the 5thInternational Scientific and Practical Conference «Diversity and Inclusion in Scientific Area» (October26-28, 2024; Warsaw, Poland) / comp. by LLC SPC «InterConf».Warsaw: Ceac Polonia, 2024. p. 93-99. (in Ukrainian)

[11] Лубко Д. В., Шаров С. В. Напрямки використання інтелектуальних систем в освітньому процесі. Українські студії в європейському контексті: зб. наук. пр. 2021. № 3. С. 305-310. (in Ukrainian)

[12] Мар'єнко М. В., Шишкіна М. П., Коновал О. А. Методологічні засади формування хмаро орієнтованих систем відкритої науки у закладах вищої педагогічної освіти. Інформаційні технології і засоби навчання. 2022. 89(3), 209-232. (in Ukrainian)

[13] Dmitrenko N., Petrova A., Podzygun O. The role of learning strategies in the process of ESP acquisition of intending educators. Society. Integration. Education. Proceedings of the International Scientific Conference. Volume V. May 28th-29th 2021. Rezekne Academy of Technologies 2021.p.535-546. https://doi.org/10.17770/sie2021vol5.6357 (in English)

[14] Dmitrenko Natalia, Petrova Anastasiia, Podzygun Olena, Nikolaeva Sofiya. Strategies in autonomous learning of professionally oriented English communication. Journal of Teaching English for Specific and Academic Purposes, Vol.9, №3, 2021.Pp. 527-540. University of Niš, Serbia. https://espeap.junis.ni.ac.rs/index.php/espeap/article/view/1066 (in English)

[15] Шахіна І. Ю. Віртуальна реальність у сучасній освіті. Штучний інтелект у науці та освіті (AISE 2024). Artificial intelligence in science and education: збірник матеріалів міжнародної наукової конференції (Київ, 1-2 березня 2024 р.) [Електронний ресурс] / [упоряд: А. Яцишин, В. Матусевич, В. Коваленко]. Київ: УкрІНТЕІ, 2024. С. 296-300. (in Ukrainian)

[16] Kharchenko, A., Nalyvaiko, O., Kreydun, N., Sheiko, A. ., Ptushka, A., Khatuntseva, S., & Zotova, L. (2024). Digital Technologies as a Factor of Transformation of Learning in the University Education. Revista Romaneasca Pentru Educatie Multidimensionala, 16(4), 97-126. https://doi.org/10.18662/rrem/16.4/909 (in English)

[17] Пінчук О. and Малицька І. Відповідальне та етичне використання штучного інтелекту в дослідницькій і публікаційній діяльності. *ITLT*, vol. 100, no. 2, pp. 180-198, Apr. 2024, doi: 10.33407/itlt.v100i2.5676. (in Ukrainian)

[18] Проєкт Інструктивно-методичні рекомендації щодо ШІ в ЗЗСО. Міністерство цифрової трансформації України. 2024. URL: https://mon.gov.ua/static-objects/mon/sites/1/news/2024/05/21/Instruktyvno.metodychni.rekomendatsiyi.shchodo.SHI.v.ZZSO-22.05.2024.pdf (in Ukrainian)

[19] [19] Шахіна І. Ю., Подзигун О. А., Петрова А. І., Гордійчук Г. Б. Digitalization as a prospective direction of the contemporary education system. Сучасні інформаційні технології та інноваційні методики навчання у підготовці фахівців: методологія, теорія, досвід, проблеми: збірник наукових праць. Вінниця: ТОВ «Друк плюс», 2022. Вип. 63. С. 65-77. https://doi.org/10.31652/2412-1142-2022-63-65-77 (in English)

[20] [20] Protsenko I. Distance education as a component of modern learning. Modern Information Technologies and Innovation Methodologies of Education in Professional Training Methodology Theory Experience Problems, 2024, 73, 40-45. https://doi.org/10.31652/2412-1142-2024-73-40-45 (in English)