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Integration of digital technologies and artificial intelligence into the dual methodology of teaching bachelors of vocational education

Abstract. The special relevance of integrating artificial intelligence into the educational process arises due to the rapid development of digital technologies in the 21st century, which opens up new opportunities for pedagogical practice and at the same time poses new challenges to it, especially in the context of dual education, where combining academic training with practical experience can significantly increase the effectiveness of training specialists. The purpose of the study was to identify the most effective ways to integrate digital technologies and artificial intelligence in order to meet modern challenges in education and prepare students for the requirements of the modern labour market. To achieve the goal, the authors used a literature review, statistical analysis of data, and the development of recommendations for optimising the use of digital technologies in dual education. The paper identifies innovative approaches that can significantly improve the quality of education, ensuring individualisation of the educational process and optimisation of educational methods using modern technologies. The paper offers a comprehensive look at the theoretical and practical aspects of implementing digital innovations in education, providing methodological recommendations for teachers to optimise the learning process. The authors consider the problem of introducing the latest artificial intelligence technology into the educational process with examples of the use of artificial intelligence to improve the efficiency of the educational process and increase the safety of students. The opinion is expressed about the need to reform the modern educational system for more effective implementation of the latest technologies in the learning process. The influence of digital technologies on the effectiveness of dual education is analysed, emphasising the main advantages and challenges of integrating these technologies into the modern educational environment. The practical significance of this study lies in the fact that its results can be used by teachers and developers of educational programmes for bachelors of professional education to integrate artificial intelligence and digital technologies into dual education, providing an effective combination of theoretical training with practical experience

Keywords: educational programme; academic studios; professional practice; modern information systems; algorithms; intelligent data processing; individualisation of training; effectiveness of the educational process

INTRODUCTION

The relevance of investigating artificial intelligence in the educational sphere has increased due to the development of digital technologies in the 21st century, known as the age of artificial intelligence. Since its introduction in the mid-20th century, artificial intelligence has become an important element of modern human history, finding

application in such industries as energy, robotics, medicine, and in particular education. The spread of artificial intelligence through various applications, such as chatbots, has opened up new opportunities for scientific research and teaching practice, and raised questions about the ethical aspects of its use. This dynamic has contributed

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to the integration of artificial intelligence into dual educational methods, making this area particularly relevant and promising for training a new generation of specialists who can effectively use digital innovations.

The accessibility of artificial intelligence through applications such as chatbots opens up new opportunities for research and teaching practice, while raising questions about the ethical aspects of its use (Altman *et al.*, 2023; Elkin, 2023). Such dynamics makes the study and integration of artificial intelligence into the methods of dual training of future bachelors of professional education an actual and promising direction for the development of educational programmes aimed at training new generation specialists who can effectively use the potential of digital innovations. This is especially true in the context of the current state of need to introduce distance education (Order of the Cabinet of Ministers of Ukraine No. 660-p, 2018). The need for distance learning and flexibility is becoming important due to current challenges, such as the pandemic. These challenges highlight the importance of flexible learning systems that can function effectively remotely. Digital technologies play a key role in this context, providing an opportunity to improve the learning process and ensure its continuity.

Interest in dual education in Ukraine began to develop actively closer to the 2010s, when the country experienced the need to modernise its education system to increase competitiveness in the labour market. There was a significant impetus for the development of dual education in 2015, when Ukraine started the processes of reforming vocational education in accordance with the needs of the labour market and the standards of the European Union. An important step was the introduction of new regulations that stimulate the development of dual education, in particular, the Resolution of the Cabinet of Ministers of Ukraine and relevant legislative initiatives that allow educational institutions and enterprises to officially cooperate in the format of dual education. According to the analytical report prepared based on the results of the fourth year of the pilot project in accordance with the Order of the Ministry of Education and Science of Ukraine (MES) No. 1296 (2019), the dual form of education demonstrates significant potential in training qualified specialists (Buchynska *et al.*, 2023). Analysis of the study by O. Buchynska *et al.* (2020) indicates the positive attitude of employers towards this model of education, emphasising its importance for the development of skills required in today's labour market. Thus, it can be argued about the integration of AI and digital technologies in professional education, which can further increase its effectiveness, in particular, in the context of training bachelors of professional education.

The creation of an advanced educational environment is influenced by globalisation and integration processes with the European Union, with the aim of adhering to international professional standards. This creates an urgent need not only to improve existing pedagogical methods, but also to introduce innovative approaches to the

educational process (Kosubai & Shemet, 2020; Kravchenko *et al.*, 2022; Yaroshenko, 2023). Researchers are actively analysing how artificial intelligence can improve dual teaching methods for undergraduate vocational education students. The importance of such research increases in the context of rapid changes in the field of education, which adapts to the needs of modern students and the requirements of their educational environment. According to S.H. Halili (2019), the development of technology contributes to these changes, especially in the field of education, where innovation activity is particularly intense. The current need for distance education, actualised by the pandemic and other global challenges, points to the importance of flexible learning systems that can function effectively in an online format. Digital technologies play a key role in this process, helping to optimise learning and ensure its continuity. Interest in dual education in Ukraine intensified in the early 2010s, when the need to modernise the educational system to increase its competitiveness became obvious. The reforms of 2015, in particular, the introduction of new regulations, contributed to the development of dual education, allowing educational institutions and enterprises to officially cooperate. An analysis of employers' attitudes towards dual education shows a positive attitude towards this model, as it contributes to the development of practical skills required in the labour market.

The importance of artificial intelligence in dual learning lies in its ability to adapt educational materials to the individual needs of students, increasing their motivation and academic results. The integration of academic learning with practical experience is made possible by innovative approaches that consider the requirements of the modern educational and professional environment. The educational process in the context of globalisation and integration with the European Union requires not only updating traditional methods, but also applying advanced approaches, including the use of digital technologies and artificial intelligence. This allows meeting international standards and train specialists who can meet the needs of the modern labour market. Thus, artificial intelligence and digital technologies play a key role in modern education, in particular in dual training programmes, which contributes to the training of highly qualified specialists who are ready for the challenges of the new century.

The purpose of the study was to investigate the potential of artificial intelligence in educational processes, in particular, in the context of dual training of future bachelors of professional education from the experience of Berdyansk State Pedagogical University (BSPU).

Research objectives in dual education included:

- evaluate the potential of digital tools and technologies to support a dual learning model that combines theoretical learning with practical experience;
- analyse the impact of digital technologies on the effectiveness of dual education, in particular, on academic achievements and motivation of students to learn in real working conditions;

→ explore the possibilities of digital technologies to create an integrated educational environment that helps to attract students to actively participate and independently solve professional problems.

The originality of this study consists in the analysis of the impact of artificial intelligence and digital technologies on dual bachelor's education, based on the experience of Berdyansk State Pedagogical University. It includes assessing the potential of digital tools to support theoretical and practical learning, analysing their impact on academic performance and student motivation, and exploring the possibilities of creating an integrated educational environment for active student participation. A special feature is the investigation of the role of AI in creating personalised curricula and ensuring security in the digital space, offering new approaches to dual learning in the context of digitalisation of education.

MATERIALS AND METHODS

To achieve the research goal, namely, the analysis of the potential of artificial intelligence in educational processes with a focus on dual training of future bachelors of professional education, an integrated approach was chosen, which includes both quantitative and qualitative research methods. The research was conducted at the BSPU and continues until 2026. This paper is part of the complex topic "Development of methods of dual training of future bachelors of vocational education in the field of digital technologies" of the Department of Computer Technologies in Management and Education and Informatics and describes its first stage (2021-2023). The first stage of the study was a review of the scientific literature aimed at determining the main areas of using digital technologies and artificial intelligence in dual education. The literature review was chosen as the first stage of the study, as it allows systematising existing knowledge about the use of artificial intelligence and digital technologies in dual education. This method helped to identify key trends and potential areas for further analysis.

Analysis of research papers, for example by O. Buchynska *et al.* (2020), helped to obtain up-to-date data on research in the industry, while the materials of reports of expert organisations by O. Buchynska *et al.* (2023) were used to provide a more formal and balanced review of the topic. Conference proceedings of I.V. Kozubai & U.R. Shemet (2020) contributed to understanding recent discussions and debates in the academic community. Information sites, such as the website of BSPU "University word" (Meeting with stakeholders, 2023) were included to get acquainted with current news and events taking place at the university and relevant to the research topic. Analysis of monographs by V.G. Khomenko (2015) helped to summarise existing knowledge and identify potential opportunities and challenges. The empirical study was chosen as the second stage because it allows collecting primary data directly from stakeholders – students and teachers involved in dual education. The developed computerised curriculum improvement system was aimed at integrating dual

professional competencies, which optimises the structure and content modules of the curriculum, ensuring connectivity between the technical and pedagogical components necessary for the preparation of bachelors in the field of computer technology. Data analysis included statistical methods and correlation analysis to ensure the objectivity and accuracy of conclusions, facilitating the assessment of the current state of technology use and identification of effective strategies for their implementation in dual education.

The development of recommendations was based on analysis data and was aimed at creating practical guidelines for teachers and developers of educational programmes so that they can effectively integrate digital technologies and artificial intelligence into dual education. This included proposals for optimising theoretical and practical training, and measures to increase students' activity and independence in solving professional problems. This integrated approach provided a deep understanding of the capabilities of artificial intelligence and helped to identify effective methods of its application to improve the quality of dual education.

RESULTS AND DISCUSSION

In the modern world, where the speed of technology development and their impact on all spheres of society are growing every day, education faces the need to adapt to new conditions and challenges (Alekseeva, 2012; Havrylenko *et al.*, 2020). This is especially true for the preparation of bachelors of professional education, where the issue of integrating digital technologies and artificial intelligence into the educational process is becoming relevant. The dual teaching methodology, which combines theoretical knowledge with practical experience in real-world working conditions, opens up new horizons for the educational process, allowing students to better assimilate professional skills and adapt to the requirements of the labour market. The use of digital technologies and artificial intelligence in dual learning can significantly improve the effectiveness of the educational process, providing individualisation of learning, access to a wide range of information and resources, and the opportunity to study in conditions as close as possible to future professional activities. However, along with the advantages, the integration of the latest technologies also introduces certain challenges, in particular, related to the need to update curricula, train teaching staff, and ensure ethical standards for the use of artificial intelligence.

The impact of artificial intelligence on the dual teaching methodology of bachelors of professional education is a key area of scientific research within the modern educational paradigm, according to S.A.D. Popenici & S. Kerr (2017), AI has a significant impact on the development of Society 4.0, modernisation of educational systems, introduction of innovative pedagogical approaches and integration of the latest scientific achievements and technologies, as confirmed by V. Antonov (2023), L.M. Gren (2019), I. García-Martínez *et al.* (2020) and M. Shyshkina & Y. Nosenko (2023). These research efforts focus on assessing the potential of AI to improve the effectiveness of the

learning process, especially in the context of dual education, which involves integrating academic learning with practical experience. It also explores how the integration of artificial intelligence can improve the personalisation of learning by adapting learning materials and methods to the individual needs and characteristics of each student, thereby increasing their motivation and academic performance. Studying such aspects helps to identify the best strategies to effectively engage students and ensure a deeper understanding of the learning material, which is especially important in today's rapidly changing educational environment. For example, I.M. Gabenko (2019) highlights the use of dual education in the preparation of students of the speciality "Food Technologies" at the Sumy National Agrarian University, where the results of surveys indicate low motivation of students for this form of education. The main barriers, according to the study, are the fear of failure in production tasks and lack of work experience, which increases doubts about the effectiveness of dual training for this speciality. The researcher suggests increasing motivation through "organising seminars among students to get acquainted with the dual system".

N. Momot (2022) presents the organisation and results of using the dual form of education based on the research implemented by the KROK University of Economics and Law within the framework of the international project "Integration of dual higher education in Moldova and Ukraine / COOPERA Erasmus+". This study examines in detail the distribution of theoretical and practical training hours between academic institutions and production partners, highlighting how dual education contributes to the professional self-determination of future journalists in choosing a specialisation – be it news, sports or politics – and preparing them for a specific workplace, such as news agencies, radio or television studios. Especially significant is the author's emphasis on how dual education can adapt to the conditions of martial law, providing future journalists with the necessary practical training in difficult conditions.

S.M. Zinchenko & A.L. Zinchenko (2021) analysed the practice of social partnership in French educational institutions, in particular, through the prism of the activities of the GRETA Association (Groupements d'établissements). This organisation plays a key role in the professional training and professional development of graduates, collaborating with leading enterprises to develop relevant educational programmes that include the introduction of the latest technologies and certification of professional aptitude. The specificity of GRETA is their ability to adapt educational programmes to the requirements of the modern labour market, which makes their experience especially valuable for Ukrainian research and teaching staff who seek to integrate such approaches into dual teaching methods. A significant part of studies focuses on the analysis and popularisation of Germany's experience in using the dual education system. Y.O. Dovhenko *et al.* (2021), S.V. Cherkashyn (2021) and I.S. Kramarenko (2023) emphasise that the German dual vocational education system, recognised

for its long history of success at the international level, serves as the foundation for the country's economic efficiency. This system not only increases the professional opportunities of young people, but also contributes to overall economic development.

These publications do not cover the key methods of implementing dual education in Ukraine, despite its successful foreign experience. Lack of awareness and lack of necessary methodological materials for participants of dual education turned out to be the main obstacles. This has led to a gap between the large number of graduates with higher education and their low level of employment in their speciality in Ukraine. The development of interaction between higher education institutions and employers is becoming key to meeting the needs of the labour market for qualified specialists, emphasising the need for scientific research of dual education. The creation of a progressive educational space that meets professional standards at the global level requires not only the revision of traditional teaching methods, but also the introduction of the latest forms of education, which is made possible by the integration of digital technologies and artificial intelligence into the educational process (Song & Wang, 2020; Yang *et al.*, 2021; Zhai *et al.*, 2021). This approach encourages a deep reformation of educational programmes to train specialists who can meet modern labour market requirements and globalisation challenges (Order of the Cabinet of Ministers..., 2023).

Further, aspects that emphasise the importance of optimising the educational process are considered. One of them is an individualised approach to learning, using digital technologies, which allows creating unique curricula and tasks based on the characteristics and needs of each student. Digital tools provide an opportunity to learn at their own pace, which helps students to understand the material more deeply or speed up learning depending on their abilities and understanding. Interactivity and gamification increase the effectiveness of students' involvement in the educational process. The use of interactive platforms, video and multimedia tools makes the learning process more interesting and helps to attract students' attention. Gamification motivates and encourages students to participate more actively. Active participation of students in learning is stimulated through collaboration and interaction due to digital technologies that contribute to the development of online communities for discussion, exchange of ideas and teamwork. Online tools with asynchronous access and the ability to receive real-time feedback provide students with learning flexibility and contribute to better assimilation of the material. In the context of dual education, automated systems for evaluating and tracking students' progress greatly facilitate the process of monitoring their achievements, making assessment faster, more accurate and objective. Digital technologies in dual education improve assessment methods and allow teachers and students to track academic progress in real time, identifying areas for further development and improvement. Within dual education, the integration of digital technologies provides

unique opportunities to improve the quality of education and ensure greater efficiency of the educational process. Individualisation of learning through digital tools allows developing curricula that meet the personal interests and level of knowledge of students, providing the opportunity to independently choose the pace and areas of study.

E-learning platforms support active interaction through virtual discussions and forums, stimulating the exchange of knowledge and opinions between students. Online collaboration allows implementing group projects and tasks, overcoming the barriers of physical distance, and promotes the development of team interaction and collaboration skills. Using cloud services and interactive tools for group work and project activities not only simplifies student collaboration, but also opens up space for creativity and improved communication skills, which are key in dual education. The introduction of gaming technologies, in particular gamification, virtual (VR) and augmented reality (AR), in the educational process contributes to the growth of motivation and interest among students, creating immersive environments that facilitate deep learning of the material. Automated assessment and progress tracking systems simplify the assessment process and provide fast, objective feedback, enabling students and teachers to effectively monitor progress and identify needs for additional improvement. Online learning, with its accessible lectures and video tutorials, provides students with the opportunity to learn without space and time constraints, while video conferencing supports real-time interaction, facilitating more active discussion and problem solving.

In the context of the challenges that Ukrainian education faces as a result of martial law and the relocation of universities, the development and improvement of dual education is of particular importance. Cooperation between displaced higher education institutions and educational institutions is becoming a key element in training qualified professionals who can adapt to rapidly changing conditions and contribute to the country's recovery. Thus, the experience of Berdyansk State Pedagogical University is presented. On March 23, 2023, an important online meeting was held, which brought together leading representatives of Berdyansk State Pedagogical University, including Rector Professor Ihor Bohdanov, First Vice-Rector and Professor Olha Hurenko, Dean of the Faculty of Physical and Mathematical, Computer and Technological Education Professor Victoria Zhyhir, and other prominent educators. This meeting was held with the participation of the management and teaching staff of the municipal institution "Pokrovsky Pedagogical College", headed by the Director, Candidate of Pedagogical Sciences Olena Oliynyk, and was implemented through the Zoom web platform.

The main purpose of this event was a constructive discussion on professional orientation and improvement of educational and professional programmes at the bachelor's and master's levels in the speciality 014 Secondary Education (Labour training and technology). In particular, the meeting discussed modifications of educational

programmes with an emphasis on patriotic education and integration of elements of national culture into applied technological disciplines, considering modern challenges and martial law in the country. Such interaction is key to training future specialists who will be able to play an active role in the post-war reconstruction of Ukraine and become competitive teachers, highly valued in the educational sector (Meeting with stakeholders, 2023). Consequently, these technological innovations in education, including game technologies and distance learning, lead to the need to include artificial intelligence in dual education tools. Artificial intelligence, as a key component of digital technologies, opens up new horizons in teaching methods and approaches to education. It not only complements existing tools, but also offers unique opportunities for personalising the learning process, automating assessment, and creating adaptive learning environments that can independently respond to the needs of each student. Thus, the integration of AI into dual education not only enhances the effects of using digital technologies, but also opens up new ways to optimise the educational process, making it more flexible, efficient, and individualised.

The concept of artificial intelligence is defined as a branch of computer science that focuses on the development of machines and systems capable of performing tasks normally requiring human intelligence, such as learning, problem solving, and decision-making. AI is based on the idea of creating machines that can think and reason like humans, and can learn from their own experience to improve their productivity over time (Artificial intelligence tools..., 2024). It may seem that discussions about the use of AI in learning are only about using certain tools to do written homework or generate texts, but this topic is deeper than it seems at first glance. A. Synytska (2023) argues that this involves adherence to university and general education values along with the creation of a sufficiently flexible learning environment that will facilitate development, and therefore, should correspond to the inevitable changes in the activities of the participants in the educational process.

With the introduction of ChatGPT in the educational space, the European University Association (EUA) expressed its thoughts on the widespread concern among the community about the impact of this application on the educational process in higher education institutions: "Noting the current disadvantages and potential advantages of these technologies ... the higher education sector must adapt its approaches in such a way that artificial intelligence is used effectively and appropriately. Therefore, the Association invites universities to consider key factors related to the immediate impact of artificial intelligence tools on learning and teaching, continuous innovation in teaching and learning, and the broader role of universities in the impact of such technologies on our societies". It was also noted that the association is ready to study the experience of using AI in training and exchange advice, given that this issue continues to develop (Artificial Intelligence, 2024). One of the main thoughts about the introduction of AI in

learning is the need to adapt education by developing a new concept of human thinking, and changing the very essence of human-machine interaction to prevent a gap between the concepts of human knowledge and human understanding. Ultimately, the latest technology not only disseminates human thought, but is also able to achieve its understanding and education, albeit indirectly (Lebid, 2023).

The use of this technology in education also has many advantages. For example, using the analytical capabilities of artificial intelligence, it is possible to create or edit educational programmes according to the individual needs of students. Such an adaptive educational platform was developed by the American organisation Enlearn. Using technology developed by the Centre for Game Science at the University of Washington, the programme breaks down the learning process for each educational applicant into many small components to analyse them and suggest what exactly hinders the student's effectiveness. Director of the Centre for Game Science and founder of Enlearn Z. Popovits argues: "Artificial intelligence can promote a personalised approach, it is able to provide the curriculum that the student needs at the moment." AI can also be used to improve the security of educational applicants by providing a more flexible system for filtering sites based on their content. This technology is successfully used by the American company GoGuardian. The principle of operation of the programme is to notify the administrator (teacher) about the student's search for unacceptable or suspicious things on the Internet (How artificial intelligence..., 2024).

Artificial intelligence technology, however, has its drawbacks. AI works most effectively in the presence of a huge amount of information and, in particular, examples. It is also important that the information provided must be accurate and verified to prevent errors or erroneous results. Another problem, but rather the task of educational institutions that use such technology, is to ensure the protection of personal data of educational applicants (Antonov, 2023).

The use of artificial intelligence in dual education includes certain disadvantages. First, AI requires large amounts of data for effective learning, which can be a limiting factor in dual education programmes where practical data may not be as widely available. Second, the accuracy of the information provided is critical, as errors in the data can lead to inaccuracies in the results of training, which is especially important in professional training. In addition, there is a significant risk from the standpoint of privacy: educational institutions that use AI must ensure reliable protection of students' personal data to avoid their misuse or leakage.

Additional disadvantages of using artificial intelligence in dual education in conditions of forced displacement (due to the fact that Russian troops captured the city of Berdyansk on 28.02.2022) of Berdyansk State Pedagogical University in Zaporizhzhia include:

1. Limited access to equipment and resources – in the context of displacement, it is difficult to provide the necessary technical equipment to fully utilise the potential of AI, especially in the practical aspects of dual education;

2. Interruption of communication with industrial partners – the relocation of the university has made it difficult to interact with existing industrial partners, which is important for dual education, since most of the practical training is carried out in production or in companies;

3. Difficulties with adapting courses – AI used to personalise the learning process requires considerable effort to adapt courses to new conditions, especially if the needs and availability of resources change;

4. Problems with the integration of new students – in the context of moving and changing locations, it is difficult to orient new students in the changed educational space, especially when the use of AI requires specific knowledge and skills to work effectively with systems.

These factors require additional planning and resources for the effective implementation and use of artificial intelligence in the context of a displaced university, which can complicate the implementation of a dual educational programme. Considering the conducted research, it is possible to confirm the significant potential of integrating artificial intelligence and digital technologies into the dual methodology of teaching bachelors of professional education. The results point to the positive impact of such integration on increasing student motivation, improving academic performance and developing professional skills, which is especially important in the context of globalisation and constant changes in market requirements. However, the study also identified a number of challenges associated with the use of AI in education, in particular, the need to provide high-quality data for training models, protect personal data of participants in the educational process, and adapt educational materials to the needs of students.

CONCLUSIONS

Thus, there is an indisputable significant potential for integrating artificial intelligence and digital technologies into the dual teaching methodology of bachelors of professional education. The use of AI in education opens up cutting-edge opportunities for improving the learning process, including ensuring students' safety in the online space and improving their academic performance through the development of personalised curricula. These technologies promise revolutionary changes in learning tools, creating more flexible, adaptive, and effective educational environments. However, it is important to recognise that the development and implementation of AI in education is accompanied by certain challenges and limitations, especially given the risks associated with education and upbringing. Data security issues, ethical considerations, the need for adequate teacher training, and ensuring equal access to technology for all educational applicants are among the main aspects that require attention. Thus, the future of dual education using AI and digital technologies looks encouraging, offering innovative approaches to learning. However, the success of this area depends on the ability of the educational community to solve problems, ensuring high quality and accessibility of education for

each student, and maintaining ethical standards in the use of the latest technologies.

In addition, based on the analysis of the integration of digital technologies and artificial intelligence into the dual methodology of teaching bachelors of professional education, it is possible to draw key conclusions about the significant potential of these innovations in improving the efficiency of the educational process. Individualised approaches, virtual discussions, gamification, and the use of VR and AR contribute to more active student participation in learning and improve their learning outcomes. However, challenges related to access to technology and the Internet can create obstacles to ensuring equal access to digital educational resources. Ethical issues, in particular, data privacy and security issues, require additional attention and regulation. Flexible and distance learning, supported by digital technologies, is becoming an important component of modern education, offering the latest ways for immersive and interactive mastering of the material. The integration of digital technologies and AI into dual education

opens up broad prospects for rethinking and transforming approaches to learning. Achieving the full potential of digital innovation requires proactively addressing challenges related to access, ethics and security. Effective management of these aspects is key to ensuring equal opportunities for all students and ensuring effective learning. Given the growing importance of the ethical and legal aspects of AI use in education, it is necessary to develop clear guidelines for addressing them to ensure the protection of personal data and avoid abuse. In addition, it is necessary to explore methods for ensuring equal access to educational technologies for students from different socio-economic groups. Further study of these aspects will ensure the effective and inclusive use of AI in dual education.

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CONFLICT OF INTEREST

None.

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Інтеграція цифрових технологій і штучного інтелекту в дуальну методику навчання бакалаврів професійної освіти

Анотація. Особлива актуальність інтеграції штучного інтелекту в освітній процес виникає у зв'язку з стрімким розвитком цифрових технологій у XXI столітті, що відкриває нові можливості для педагогічної практики та водночас ставить перед нею нові виклики, особливо в контексті дуальної освіти, де поєднання академічного навчання з практичним досвідом може значно підвищити ефективність підготовки фахівців. Метою роботи було визначити найефективніші шляхи інтеграції цифрових технологій та штучного інтелекту, щоб відповісти на сучасні виклики в освіті та підготувати студентів до вимог сучасного ринку праці. Для досягнення мети дослідження використовувалися огляд літератури, статистичний аналіз даних, а також розробка рекомендацій для оптимізації використання цифрових технологій у дуальній освіті. В роботі виявлено інноваційні підходи, які можуть значно підвищити якість освіти, забезпечуючи індивідуалізацію навчального процесу та оптимізацію освітніх методик за допомогою сучасних технологій. Стаття пропонує комплексний погляд на теоретичні та практичні аспекти впровадження цифрових інновацій в освіту, надаючи методичні рекомендації для викладачів з метою оптимізації процесу навчання. Авторами розглянуто проблему впровадження новітньої технології штучного інтелекту в освітній процес з прикладами використання штучного інтелекту для підвищення ефективності навчального процесу та підвищення безпеки здобувачів освіти. Висловлено думку про необхідність реформування сучасної освітньої системи задля більш ефективного впровадження новітніх технологій у процес навчання. Проаналізовано вплив цифрових технологій на ефективність дуальної освіти, підкреслюючи основні переваги та виклики інтеграції цих технологій у сучасне освітнє середовище. Практичне значення даного дослідження полягає в тому, що його результати можуть бути використані викладачами та розробниками освітніх програм для бакалаврів професійної освіти щодо інтеграції штучного інтелекту і цифрових технологій в дуальну освіту, забезпечуючи ефективніше поєднання теоретичного навчання з практичним досвідом

Ключові слова: освітня програма; академічні студії; професійна практика; сучасні інформаційні системи; алгоритми; інтелектуальна обробка даних; індивідуалізація навчання; ефективність освітнього процесу