Revista EDaPECI
EDUCAÇÃO A DISTÂNCIA E PRÁTICAS EDUCATIVAS COMUNICACIOANIS E INTERCULTURAIS

ISSN: 2176-171X

Revista EDaPECI
São Cristóvão (SE)
v.24. n. 3, p. 152-165
set./dez. 2024

DOI: http://dx.doi.org/10.29276/redapeci.2024.24.320987.152-165

The role of artificial intelligence in personalisation of the learning process

---

O papel da inteligência artificial na personalização do processo de aprendizagem

---

El papel de la inteligencia artificial en la personalización del proceso de aprendizaje

Valerii Hrytsenko[1]
Anna Tkachenko[2]
Oksana Podolyan[3]
Kostiantyn Dieiev[4]
Liubomyr Ilyn[5]

Abstract: *The study aims to empirically test the role of artificial intelligence in personalising student learning through surveys, quantitative and qualitative data analysis, and modelling. To determine the role of artificial intelligence in personalising the educational process, a survey of students was conducted on the organisation of the educational process using artificial intelligence (format, form of education, educational environment, consulting communication tools, motives). Based on the preferences and requests of students, an experimental programme of personalised learning was generated and tested. The participants of the educational process were asked to evaluate the role of artificial intelligence in personalising learning by the following criteria: motivation to learn, level of educational outcomes, productivity of communication in the teacher-student system, convenience and accessibility of education. Most participants in the educational process noted the positive impact of the experimental personalised learning programme developed using artificial intelligence based on their requests due to its convenience and accessibility, as well as the productivity of communication in the teacher-student system. The study's results can be used in the educational process of higher education institutions of other profiles. The prospect of research is to develop recommendations for using artificial intelligence tools to prepare personalised learning programmes in higher education.*

Keywords: *Artificial intelligence. Educational process. Higher education. Innovative learning. Individualization of education.*

Resumo: O estudo tem por objetivo testar empiricamente o papel da inteligência artificial na personalização da aprendizagem dos estudantes através de inquéritos, da análise de dados quantitativos e qualitativos e da modelização. Para determinar o papel da inteligência artificial na personalização do processo educativo, foi realizado um inquérito aos estudantes sobre a organização do processo educativo com recurso à inteligência artificial (formato, forma de

1 Doctor of Pedagogical Sciences, Professor of the Department of Automation and Computer-Integrated Technologies, Bohdan Khmelnytsky National University of Cherkasy, Cherkasy, Ukraine. Email: sahatskaya.anastasia@gmail.com

2 Candidate of Pedagogical Sciences, Associate Professor, Director of the Educational and Research Institute of Information and Educational Technologies, Physics Department, Bohdan Khmelnytsky National University of Cherkasy, Cherkasy, Ukraine. Email: anv_tkachenko77@ukr.net.

3 Candidate of Physical and Mathematical Sciences, Associate Professor of the Department of Automation and Computer-Integrated Technologies, Bohdan Khmelnytsky National University of Cherkasy, Cherkasy, Ukraine. Email: ompodolyan1983@gmail.com.

4 Candidate of Technical Sciences, Senior Lecturer of the Department of Automation and Computer-Integrated Technologies, Bohdan Khmelnytsky National University of Cherkasy, Cherkasy, Ukraine. Email: konstiantyn.dieiev@gmail.com.

5 PhD, Vice-Rector, Associate Professor of the Department of Architecture and Construction, King Danylo University, Ivano-Frankivsk, Ukraine. Email: liubomyr.ilyn@yahoo.com.ua.

ensino, ambiente educativo, ferramentas de comunicação de consulta, motivações). Com base nas preferências e nos pedidos dos estudantes, foi criado e testado um programa experimental de aprendizagem personalizada. Foi pedido aos participantes no processo educativo que avaliassem o papel da inteligência artificial na personalização da aprendizagem segundo os seguintes critérios: motivação para aprender, nível de resultados educativos, produtividade da comunicação no sistema professor-aluno, conveniência e acessibilidade da educação. A maioria dos participantes no processo educativo registou o impacto positivo do programa experimental de aprendizagem personalizada desenvolvido com recurso à inteligência artificial com base nos seus pedidos, devido à sua comodidade e acessibilidade, bem como à produtividade da comunicação no sistema professor-aluno. Os resultados do estudo podem ser utilizados no processo educativo de instituições de ensino superior de outros perfis. A perspetiva da investigação é desenvolver recomendações para a utilização de ferramentas de inteligência artificial para preparar programas de aprendizagem personalizados no ensino superior.

Palavras-chave: Aprendizagem inovadora. Ensino superior. Inteligência artificial. Individualização da educação. Processo educativo.

Resumen: *El estudio pretende comprobar empíricamente el papel de la inteligencia artificial en la personalización del aprendizaje de los estudiantes mediante encuestas, análisis de datos cuantitativos y cualitativos y modelización. Para determinar el papel de la inteligencia artificial en la personalización del proceso educativo, se realizó una encuesta entre los estudiantes sobre la organización del proceso educativo mediante inteligencia artificial (formato, forma de enseñanza, entorno educativo, herramientas de comunicación de consulta, motivos). A partir de las preferencias y peticiones de los estudiantes, se generó y probó un programa experimental de aprendizaje personalizado. Se pidió a los participantes en el proceso educativo que evaluaran el papel de la inteligencia artificial en la personalización del aprendizaje según los siguientes criterios: motivación para aprender, nivel de resultados educativos, productividad de la comunicación en el sistema profesor-alumno, comodidad y accesibilidad de la educación. La mayoría de los participantes en el proceso educativo señalaron el impacto positivo del programa experimental de aprendizaje personalizado desarrollado mediante inteligencia artificial a partir de sus peticiones debido a su comodidad y accesibilidad, así como a la productividad de la comunicación en el sistema profesor-alumno. Los resultados del estudio pueden utilizarse en el proceso educativo de instituciones de enseñanza superior de otros perfiles. La perspectiva de la investigación es elaborar recomendaciones para utilizar herramientas de inteligencia artificial en la preparación de programas de aprendizaje personalizado en la enseñanza superior.*

***Palabras claves*:** *Aprendizaje innovador. Enseñanza superior. Inteligencia artificial. Individualización de la educación. Proceso educativo.*

1 INTRODUCTION

Today, the student is the central figure in the educational process. Modern educational transformations aim to maximise the orientation of the educational process to their interests, needs, demands and capabilities. Personalised learning helps to achieve it, allowing not only to successfully implement the content of students' educational training but also to do so in ways and means that are most accessible to students, including innovative ones. Today, innovations related to artificial intelligence tools are being actively implemented in the education sector. However, the use of artificial intelligence (AI) in education allows, on the one hand, the personalisation of learning and, on the other hand, calls into question the academic integrity of all participants in the educational process, data privacy, and other challenges. Nevertheless, AI tools can optimise the educational process model and bring the student training system in higher education institutions in line with students' needs, expectations and capabilities. Therefore, the modern educational community is called upon to use the positive aspects of AI to personalise learning while minimising the destructive challenges associated with this innovation. There is much research on the benefits and challenges of introducing AI into education today. However, most of the research in Ukraine focuses on the problem of students and teachers violating academic integrity when using AI tools. At the same time, there's a lack of studies demonstrating positive practices of using AI to personalise learning. Therefore, the scientific and pedagogical staff of the Departments of Physics, Automation and Computer-Integrated

Technologies of Bohdan Khmelnytsky National University of Cherkasy decided to test the role of AI in personalising student learning empirically. This paper aims to test the role of AI in personalising student learning empirically. The objectives of the work are:

a) surveying students to determine the criteria for formulating queries when developing personalised learning programmes for students using AI;
b) experimental testing of an experimental educational programme developed using AI tools as a means of personalising the educational process;
c) studying students' and teachers' opinions on the role of AI in personalising the educational process;
d) formulating conclusions and prospects for using AI tools to personalise the educational process.
e) The research hypothesis is that personalising educational content using AI ensures convenience, accessibility, and productivity of communication between the educational process's participants.

2 LITERATURE REVIEW

Many scientific studies have highlighted the problem of criticising the traditional educational system due to its insufficient ability to meet students' individual needs and contrasting it with systems of a personalised, student-centred approach using AI tools. The introduction of AI makes it possible to consider students' learning requirements, skills and abilities, create optimised models of student learning, and adjust current educational programmes following a particular student's learning requirements and learning abilities (BHUTORIA, 2022). Scientists see the main goal of personalised learning as developing an effective algorithm for learning, which considers the student's strengths and weaknesses and determines the expected desired learning outcome (Maghsudi, Lan, Xu, Van Der Schaar, 2021). The authors of scientific research convincingly prove the effectiveness of using AI tools in the educational sphere, confirming the positive impact of artificial intelligence on the quality of the educational process (Chen, Chen, Lin, 2020). Scientists summarise various ways of using artificial intelligence elements to personalise learning, including websites, social media blogs, chatbots, expert educational systems, and virtual learning environments. AI-assisted personalised learning paths include useful options such as 24/7 access to learning, virtual learning, adaptation of learning content to students' needs, and regular and real-time feedback. Researchers generally consider personalised learning one of the leading trends in the modern educational system. Through the introduction of personalised learning, teachers not only create an optimal route for students to acquire knowledge, skills and abilities but also allow teachers to analyse large amounts of student data, track educational progress, tailor learning to the needs of students and ensure high-quality learning (Tapalova, Zhiyenbayeva, 2022). Personalised learning can be considered an innovative model that reflects the student's desires and society's development (Xiao, Yi, 2021). Scientific research also confirms the high potential of artificial intelligence to significantly stimulate and develop teachers in the research context (Ouyang, Jiao, 2021). The possibilities of using artificial intelligence in education are constantly expanding, as intelligent tutoring systems for special education are used today, educational robots, neural networks for learning assessment, and affective computing to identify students' emotions, etc., are created (Chen, Zou, Xie, Cheng, Liu, 2022). Foreign empirical studies confirm the positive practices of using AI-driven recommendations for personalising learning, including improving students' learning efficiency and increasing their motivation to learn (Huang, Lu, Yang, 2023). The educational system is conducting research on the use of artificial intelligence in the following areas: adaptive learning and personalisation of education, deep and machine learning algorithms for online learning processes, human-AI interaction in education, and the

use of artificially generated data in the educational process (Bozkurt, Karadeniz, Baneres, Guerrero-Roldán, Rodríguez, 2021; Chen, Xie, Zou, Hwang, 2020). Along with creating an optimal educational route for students, AI can assess learning outcomes, support student learning with chatbots, and conduct predictive analytics (Igbokwe, 2023). AI has found significant application in the remote format of the educational process. Its capabilities are used for online teaching and learning, identifying and predicting student behaviour, and implementing adaptive learning. However, the widespread use of AI in education requires the resolution of ethical issues in this area (Dogan, Dogan, Bozkurt, 2023; Akgun, Greenhow, 2022). Some positive examples of using artificial intelligence in the personalisation of learning are tutoring, virtual facilitators, online learning environments, learning management systems, and learning analytics (Ahmad, Rahmat, Mubarik, Alam, Hyder, 2021). However, using AI in education requires settling legal, ethical, psychological, and social challenges (Gocen, Aydemir, 2020). Along with the significant capabilities of AI, its important role in the intellectualisation of society and the development of the education system (Syzdykbayeva, Baikulova, Kerimbayeva, 2021), scientists note the impossibility of completely replacing live communication and direct pedagogical work with AI (Ocaña-Fernandez, Valenzuela-Fernandez , Garro-Aburto, 2019). Researchers tend to hypothesise the positive impact of AI on all spheres of life and activity and on increasing the competitiveness of countries on the world stage (Pedro, Subosa, Rivas, Valverde, 2019). The growing role of AI in education necessitates paying attention to promising areas of its use in higher education (Abgaryan, Asatryan, Matevosyan**,** 2023). The leading role of artificial intelligence in language education, particularly in mastering various types of speech activities, is noted (Huang, Zou, Cheng, Chen, Xie, 2023). An AI tool, Chat GPT, has gained popularity, and its feasibility in the educational sphere is being actively discussed (Tajik, Tajik, 2024). At the same time, there are problems associated with using Chat GPT, including academic integrity, reliability, high probability of falsification of educational achievements, bias, etc. Another significant risk is the possibility of a negative potential impact of Chat GPT on critical thinking skills (Michel-Villarreal, Vilalta-Perdomo, Salinas-Navarro, Thierry-Aguilera, Gerardou, 2023).

Participants in the educational process note that ChatGPT helps users find information and ideas, translate texts, and provide alternative questions to deepen their understanding of the material (Firaina, Sulisworo, 2023). Therefore, the idea of using the prerogatives of ChatGPT to improve the quality of education and student productivity and minimise all possible risks is becoming more relevant (Fauzi, Tuhuteru, Sampe, Ausat, Hatta, 2023). Hence, all available AI tools should be designed to personalise the learning process and adapt to the individual needs of students (Krupenyna, Sabadosh, 2023) to create personalised learning environments (Sikora, Marchuk, Nesterov, 2024). At the same time, attention should be focused on the use of AI algorithms to analyse students' behaviour, abilities, preferences to create individual conditions for their development (Terepyshchyi, 2023), to provide feedback to participants in the educational process, taking into account such risks as reducing the role of the teacher, reducing students' creativity and critical thinking skills, increasing the gap between students with high and low socio-economic status (Marienko, Kovalenko, 2023).

The above studies focus on the advantages and disadvantages of using AI in the educational sector and emphasise the importance of maximising the prerogatives of AI in higher education and minimising the associated threats and risks. However, we can state that there is a lack of thorough, empirically significant research on the role of AI in higher education in Ukraine. At the same time, the critical priority of using AI in higher education, as described in theoretical studies, is the personalisation of learning. Therefore, there is a need to empirically test the role of AI in personalising learning for modern students.

3 METHODS

3.1 RESEARCH PROCEDURE

To determine the role of AI in the personalisation of the educational process in higher education, we conducted a study through the stages: organisational, methodological, empirical, and final. At the organisational stage, the aim and objectives of the study were determined, and the sample was formed. The methodological stage involved the development of the author's instruments for interviewing respondents. The empirical stage of the study involved the development of personalised learning programmes using AI based on student requests, a survey of students and teachers after experimental testing of the personalised learning programme developed using artificial intelligence, and the analysis and interpretation of the empirical data. During the final stage of the study, the results were summarised, conclusions were drawn, and further areas of work were identified.

3.2 SAMPLE SELECTION

To conduct a study on the role of artificial intelligence in the personalisation of the educational process in higher education, we selected 97 students of different years of study (first year - 25 students, second year - 23 students, third-year- 24 students, fourth-year- 25 students) of Bohdan Khmelnytsky National University of Cherkasy. The research included students of all years of study to track the impact of AI on the personalisation of the educational process. The study also involved 25 research and teaching staff of the Departments of Physics, Automation and Computer-Integrated Technologies of Bohdan Khmelnytsky National University of Cherkasy.

3.3 METHODS

To determine the role of AI in personalising the educational process in higher education, we used the following methods: a survey based on the author's questionnaire, quantitative and qualitative analysis of empirical data, and modelling of an experimental educational programme using the AI tool Chat GPT.

The survey aimed to determine the criteria for generating experimental programmes with AI and to study the opinion of teachers about the role of artificial intelligence in the educational process. The survey included answers to 5 questions from the author's questionnaire (Appendix A). The students' survey included the following criteria: learning format, forms of conducting classes, communication tools for learning process participants, learning environment, and learning motives. The survey of teachers (Appendix B) included the following criteria for the impact of AI on the personalisation of the educational process: students' learning motivation, level of academic outcomes, productivity of communication in the teacher-student system, convenience and accessibility.

The survey was conducted using Google Forms. The primary data was recorded in the Excel spreadsheet processor. Cronbach's analysis was used to determine the reliability of the author's questionnaires (Cronbach's alpha value was 0.83).

Based on the survey data, an experimental educational programme for students of each course was developed using artificial intelligence. The AI-generated programme was experimentally tested in the educational process during the first semester of the 2023/2024 academic year. To generate the programme, the data provided by students on the method and format of learning and presentation of educational outcomes, data on student competencies, period of study, and forms of classes established by the qualification characteristics were used.

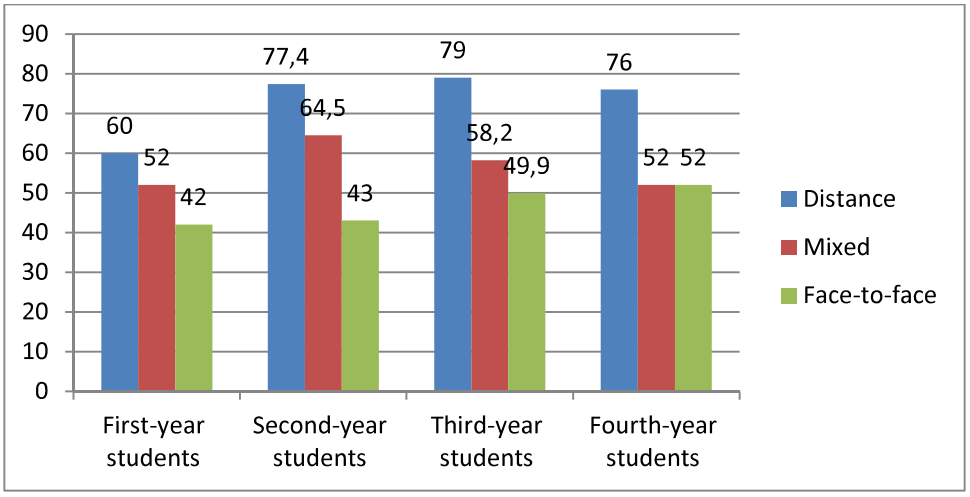
4 RESULTS

The study of the role of AI in personalising the educational process in higher education involved identifying the main requests and wishes of students regarding the design of the educational programme. The initial student survey

determined the education format, forms of training, communication tools for participants in the educational process, the educational environment, and learning motives. The figures below show the predominant student requests for each of the criteria.

As shown in Figure 1, most students chose the distance learning format, regardless of the course, and the commitment rate to this format increases with each course. This demonstrates the convenience and accessibility of distance learning for students.

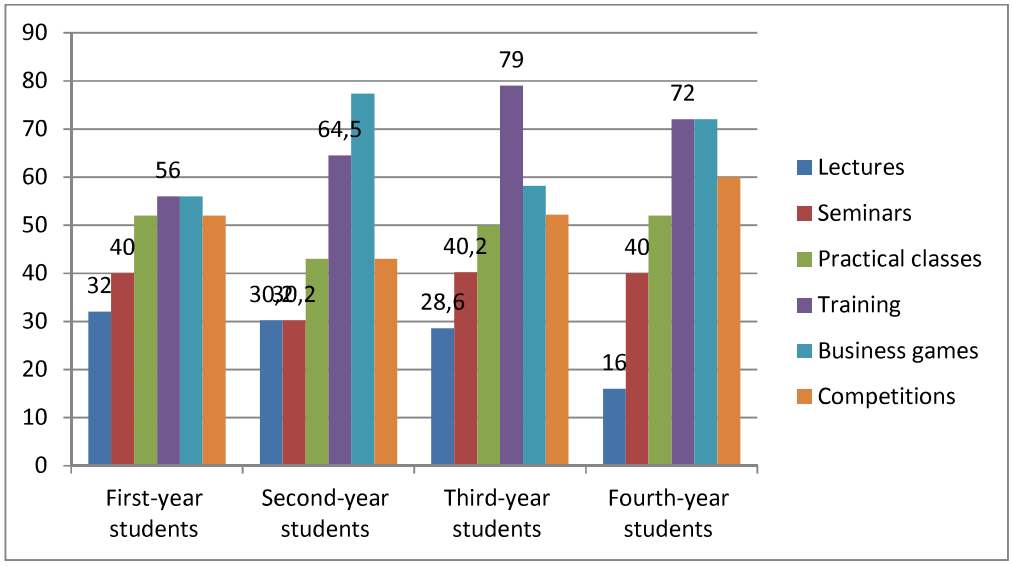
Figure 1- Students' choice of learning format for building personalised programmes using AI



Source: Elaborated by the authors (2024).

Based on the data in Figure 2, it can be argued that when choosing the forms of classes, students of all courses give the most significant preference to trainings and business games. This is because, during such classes, students have high opportunities to master the practical skills necessary for their future professional activities. Also, within the selected types of classes, students apply the professional skills they have acquired in conditions as close to real life as possible. Practical classes and competitions are less popular among students, as in these classes, students test their acquired skills and have the opportunity to improve them. Lectures and seminars are the least popular, as students with a certain level of teaching support can partially master the content of education conveyed in lectures and workshops.

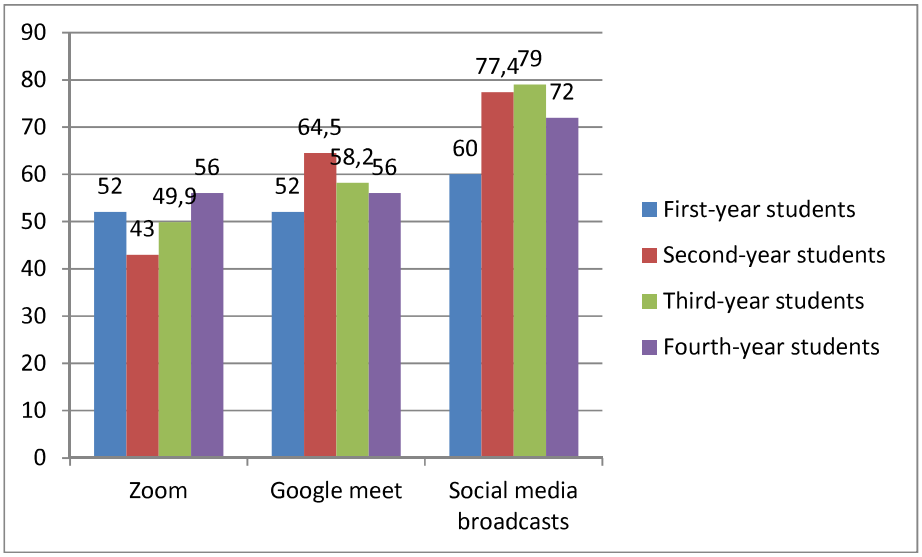
Figure 2-Students' choice of forms of training for building personalised programmes using AI



Source: Elaborated by the authors (2024).

As we can see from Figure 3, to build personalised learning programmes, it is worth considering that students are ready to work with teachers in any environment- Zoom, Google Meet, and various social media platforms. However, social media platforms are the most popular because modern students are highly addicted. Google Meet is less popular, and Zoom is the least popular.

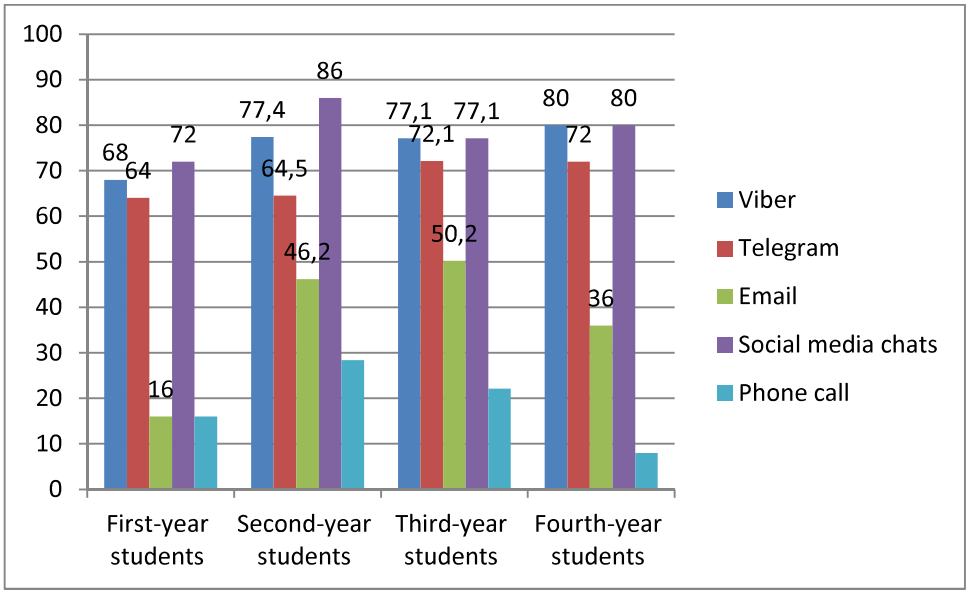
Figure 3 - Students' choice of learning environment for building personalised programmes using artificial intelligence



Source: Elaborated by the authors (2024).

As shown in Figure 4, when building personalised learning programmes using AI, students' preferences in choosing tools for communicating with teachers about counselling were used. These are Telegram and Viber messengers, which are popular among students, and social media chats. Students use them for everyday communication, including communication with teachers.

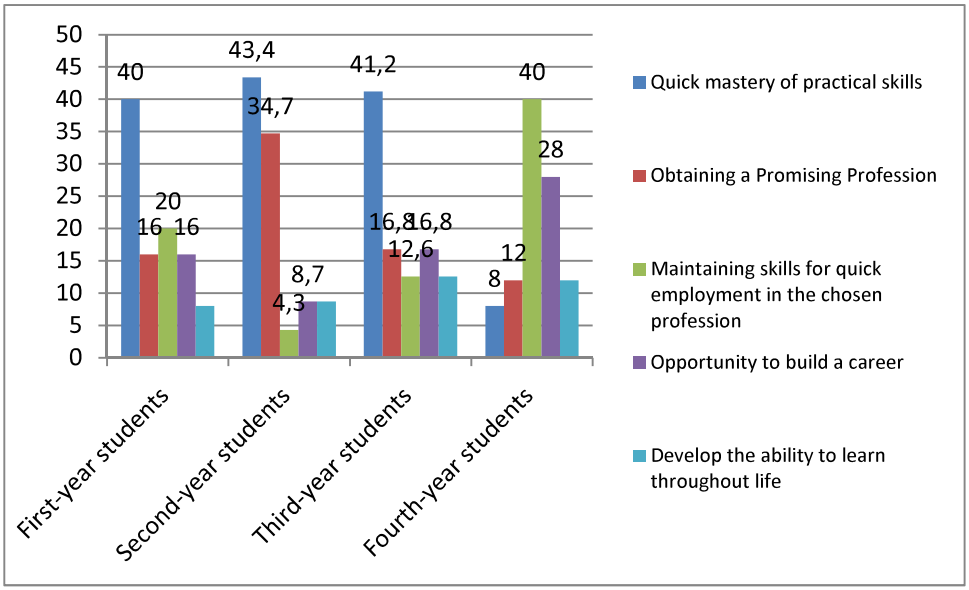
Figure 4 - Students' choice of communication tools for building personalised programmes using AI



Source: Elaborated by the authors (2024).

As seen from Figure 5, the leading motivation for students' learning is to quickly master practical skills (first- third years) and acquire skills for quick employment in the profession (fourth year).

Figure 5- Students' choice of learning motives for building personalised programmes using AI



Source: Elaborated by the authors (2024).

Based on the students' responses, the ChatGPT artificial intelligence tool was used to formulate queries, which were supplemented with the name of the speciality and course of study. The AI-generated version of the personalised learning programmes was adjusted by academic staff and experimentally tested.

As seen from Table 1, most of the surveyed teachers who worked with students using AI-generated experimental programmes noted their positive impact on the convenience and accessibility of use and the productivity of communication in the teacher-student system. The use of AI-generated educational programmes for personalised learning has a pronounced positive impact on educational outcomes. The personalised learning programme developed based on students' requests with the help of AI has the most negligible effect on the motivation of learning activities. This is because the learning formats (including distance learning), forms of training (lectures, seminars, workshops, business games, competitions), communication tools (messengers, social networks), and educational environment (remote platforms, labs) chosen for the development of AI-based personalised learning programmes are well mastered by all subjects of the educational process. Hence, they are convenient and productive to use. At the same time, it should be noted that there was no significant positive impact of the AI-personalised learning programme on students' motivation to learn. This indicates the absence of a decisive influence of AI-generated personalised learning programmes on students' desire to learn and gives grounds to assert that other factors unrelated to the educational environment influence learning motivation.

Table 1- The results of a survey of teachers on the role of AI in building personalised learning programmes

Criterion	First-year students	Second-year students	Third-year students	Fourth-year students	Average value
Motivation for learning	40	48	64	68	55
Level of educational outcomes	48	56	68	72	61
Communication efficiency in the teacher-student system	56	56	72	72	64
Convenience and accessibility of education	40	68	72	80	65
Average value	46	57	69	73	-

Source: Elaborated by the authors (2024).

The highest scores for each criterion for assessing the role of artificial intelligence in personalised learning for higher education students were obtained when analysing fourth- and third-year students, the average – for second-year students, and the lowest scores for first-year students. This indicates that with each year of study, students are becoming more transparent about their need to develop AI-personalised learning programmes.

As Table 2 shows, most students noted the positive impact of the experimental AI-personalised learning program based on their requests for the convenience and accessibility of education and communication efficiency in the teacher-student system. According to students, the impact of personalised learning programmes developed using artificial intelligence on educational outcomes is much lower, and the most negligible impact is on learning motivation. This is because when formulating requests regarding the learning format, forms of classes, educational environment and communication tools, students were most guided by their desire to work in a convenient format using tools they know. Moreover, this confirms the lack of awareness of students' learning motives, which makes it challenging to develop them.

Table 2- Results of a student survey on the role of AI in building personalised learning programmes

Criterion	First-year students	Second-year students	Third-year students	Fourth-year students	Average value
Motivation for learning	52	43	49,9	56	50,2
Level of educational outcomes	42	64,5	58,2	56	55,1
Communication efficiency in the teacher-student system	60	77,4	79	72	72,1

Convenience and accessibility of education	68	86	86,3	68	77,1
Average value	55,5	67,725	68,35	63	-

Source: Elaborated by the authors (2024).

Second- and third-year students showed the highest scores for each of the criteria for assessing the role of artificial intelligence in personalised learning for higher education students. Fourth-year students demonstrated the average results, while first-year students showed the lowest. This indicates the lack of sophistication of artificial intelligence tools in generating personalised programmes based on student requests.

5 DISCUSSION

The most valuable advantage of AI tools in the educational sphere is the ability to personalise the educational process using AI (Maghsudi, Lan, Xu, Van Der Schaar, 2021). The authors of empirical studies state the positive impact of personalised learning programmes built with the help of AI, in particular in monitoring students' educational outcomes, improving the quality of the educational process, and shaping students' positive learning experience (Chen, Xie, Zou, Hwang, 2020).

It's worth using social networks and chatbots, virtual learning environments, 24/7 learning, adaptation of learning content to the personal needs of students, regular and accurate feedback, and improvement of curriculum development (Tapalova, Zhiyenbayeva, 2022), as well as personalised learning programmes based on individual student requests and wishes. AI plays a vital role in maximising the adaptation of conceptual visions of personalised learning to the needs of student communities (Xiao, Yi, 2021). Our research also provides empirical evidence regarding the positive impact of AI-designed personalised learning programmes on the quality of knowledge, skills and abilities of students who are eager to learn, i.e. moderately motivated to learn. After all, AI-developed educational programs can increase but not create learning motivation from scratch (Huang, Zou, Cheng, Chen, Xie, 2023). Our study is distinguished by a comprehensive approach to maximising the consideration of important aspects of learning for students when developing personalised programmes using AI. These aspects are the learning format, the form of conducting training sessions, tools for consulting communications in the student-teacher system, and learning motives.

Summing up the results of our study, we can fully agree with the positive and negative impacts of AI tools on the educational process identified by other researchers. Among the positive effects, we should note the significant role of AI in generating personalised programmes. The main negative impact is students' violation of academic integrity in the performance of educational tasks. The personalised curriculum generated by AI by student requests requires unconditional corrective intervention by academic staff of specialised departments to achieve perfection.

Research studies consider examples of ethical violations in the use of AI in higher education (Bozkurt, Karadeniz, Baneres, Guerrero-Roldán, Rodríguez, 2021), provide promising practices for using AI to predict student behaviour in the educational space, and pay attention to the development of effective models of human-centred online learning (Dogan, Dogan, Bozkurt, 2023).

Our study is critical because it may resolve the different points regarding the feasibility of using AI in the educational sphere and personalising the educational process.

5.1 RESTRICTIONS

The study's main limitation is that it was conducted among teachers and students of the Departments of Physics, Automation and Computer-Integrated Technologies of Bohdan Khmelnytsky National University of Cherkasy.

However, the problem of using AI to personalise the educational process is typical for all educational institutions and at different levels.

5.2 RECOMMENDATIONS

The main recommendations are to expand the study's sample to include students of different specialities from different HEIs in Ukraine and to study the use of AI tools to personalise learning not only in higher education but also in general secondary education.

6 CONCLUSIONS

The study raises the topical issue of using artificial intelligence to personalise the educational process in higher education. The main focus is on taking into account the needs and requests of students when building personalised learning programmes using AI. The development of personalised learning programmes using AI considers students' wishes regarding the training format, forms of exercise, tools for consulting communication between students and teachers, educational platforms for conducting classes, and students' learning motives. The study found that students prefer distance learning in the form of trainings, business games, broadcasting online courses via social media, and using social media chats and popular messengers for consulting. The primary motivation for students' learning is to quickly master practical skills and acquire skills for quick employment in the profession they have learned. The personalised learning programme generated based on students' educational requests was tested, after which the opinions of students and teachers on the role of AI in personalising learning were studied.

The study found that most students and teachers noted the positive impact of the experimental personalised learning programme developed using AI based on their requests due to its convenience and accessibility, as well as the communication efficiency in the teacher-student system. The study results show that using AI is appropriate for personalising the educational process.

The study confirms the hypothesis that personalising educational content using AI ensures convenience, accessibility, and communication efficiency between the educational process's participants.

The study's results can be used in the educational process of HEIs of other profiles and become the basis for developing recommendations for using artificial intelligence tools to prepare personalised learning programmes. The use of AI to create or adjust educational programmes at other levels of education is of promising scientific interest.

REFERENCES

ABGARYAN, H., ASATRYAN, S., & MATEVOSYAN, A. Revolutionary changes in higher education with artificial intelligence. **Main Issues of Pedagogy and Psychology**, v. 10, n. 1, p. 76-86, 2023. https://doi.org/10.24234/miopap.v10i1.454

AHMAD, S. F., RAHMAT, M. K., MUBARIK, M. S., ALAM, M. M., & HYDER, S. I. Artificial intelligence and its role in education. **Sustainability**, v. 13, n. 22, 12902, 2021. https://doi.org/10.3390/su132212902

AKGUN, S., GREENHOW, C. Artificial intelligence in education: Addressing ethical challenges in K-12 settings. **AI and Ethics**, v. 2, n. 3, p. 431-440, 2022. https://doi.org/10.1007/s43681-021-00096-7

BHUTORIA, A. Personalised education and artificial intelligence in the United States, China, and India: A systematic review using a human-in-the-loop model. **Computers and Education: Artificial Intelligence,** v. 3, 100068, 2022. https://doi.org/10.1016/j.caeai.2022.100068

BOZKURT, A., KARADENIZ, A., BANERES, D., GUERRERO-ROLDÁN, A. E., RODRÍGUEZ, M. E. Artificial intelligence and reflections from educational landscape: A review of AI Studies in half a century. **Sustainability**, v. 13, n. 2, p. 800, 2021. https://doi.org/10.3390/su13020800

CHEN, L., CHEN, P., LIN, Z. Artificial intelligence in education: A review. **Ieee Access**, v. 8, p. 75264-75278, 2020. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9069875)

CHEN, X., XIE, H., ZOU, D., HWANG, G. J. Application and theory gaps during the rise of artificial intelligence in education. **Computers and Education: Artificial Intelligence**, v. 1, 100002, 2020. https://doi.org/10.1016/j.caeai.2020.100002

CHEN, X., ZOU, D., XIE, H., CHENG, G., & LIU, C. Two decades of artificial intelligence in education. **Educational Technology & Society**, v. 25, n. 1, p. 28-47, 2022. https://scholars.ln.edu.hk/ws/portalfiles/portal/41220986/25_1_03.pdf.

DOGAN, M. E., DOGAN, T. G., BOZKURT, A. The use of artificial intelligence (AI) in online learning and distance education processes: A systematic review of empirical studies. **Applied Sciences**, v. 13, n. 5, 3056, 2023. https://doi.org/10.3390/app13053056

FAUZI, F., TUHUTERU, L., SAMPE, F., AUSAT, A. M. A., HATTA, H. R. Analysing the role of ChatGPT in improving student productivity in higher education. **Journal on Education**, v. 5, n. 4, p. 14886-14891, 2023. http://dx.doi.org/10.31004/joe.v5i4.2563

FIRAINA, R., & SULISWORO, D. Exploring the usage of ChatGPT in higher education: Frequency and impact on productivity. **Buletin Edukasi Indonesia**, v. 2, n. 01, p. 39-46, 2023. https://doi.org/10.56741/bei.v2i01.310

GOCEN, A., AYDEMIR, F. Artificial intelligence in education and schools. **Research on Education and Media**, v. 12, n. 1, p. 13-21, 2020. http://dx.doi.org/10.2478/rem-2020-0003

HUANG, A. Y., LU, O. H., & YANG, S. J. Effects of artificial Intelligence–Enabled personalized recommendations on learners' learning engagement, motivation, and outcomes in a flipped classroom. **Computers & Education**, v. 194, 104684, 2023. http://dx.doi.org/10.1016/j.compedu.2022.104684

HUANG, X., ZOU, D., CHENG, G., CHEN, X., XIE, H. Trends, research issues and applications of artificial intelligence in language education. **Educational Technology & Society**, v. 26, n. 1, p. 112-131, 2023. https://doi.org/10.30191/ETS.202301_26(1).0009) .

IGBOKWE, I. C. Application of artificial intelligence (AI) in educational management. **International Journal of Scientific and Research Publications**, v. 13, n. 3, p. 300-307, 2023. http://dx.doi.org/10.29322/IJSRP.13.03.2023.p13536

KRUPENYNA, N., SABADOSH, V. The role of teachers in the new era of distance learning and artificial intelligence. **Current Issues Modern Science**, v. 10, n. 16, p. 565-578, 2023 https://doi.org/10.52058/2786-6300-2023-10(16)-565-578

MAGHSUDI, S., LAN, A., XU, J., VAN DER SCHAAR, M. Personalized education in the artificial intelligence era: what to expect next. **IEEE Signal Processing Magazine**, v. 38, n. 3, p. 37-50, 2021. http://dx.doi.org/10.1109/MSP.2021.3055032

MARIENKO, M. V., KOVALENKO, V. Artificial intelligence and open science in education. **Physical and Mathematical Education**, v. 38, n. 1, p. 48-53, 2023. https://doi.org/10.31110/2413-1571-2023-038-1

MICHEL-VILLARREAL, R., VILALTA-PERDOMO, E., SALINAS-NAVARRO, D. E., THIERRY-AGUILERA, R., GERARDOU, F. S. Challenges and opportunities of generative AI for higher education as explained by ChatGPT. **Education Sciences**, v. 13, n. 9, p. 856, 2023. https://doi.org/10.3390/educsci13090856

OCAÑA-FERNANDEZ, Y., VALENZUELA-FERNANDEZ, L., GARRO-ABURTO, L. Artificial intelligence and its implications in higher education. **Propósitos y Representaciones**, v. 7, n. 2,

p. 536-568, 2019. http://dx.doi.org/10.20511/pyr2019.v7n2.274

OUYANG, F., JIAO, P. Artificial intelligence in education: The three paradigms. **Computers and Education: Artificial Intelligence,** v. 2, 100020, 2021. https://doi.org/10.1016/j.caeai.2021.100020

PEDRO, F., SUBOSA, M., RIVAS, A., VALVERDE, P. **Artificial intelligence in education: Challenges and opportunities for sustainable development.** Paris: United Nations Educational, Scientific and Cultural Organization, 2019. http://repositorio.minedu.gob.pe/bitstream/handle/20.500.12799/6533/Artificial%20intelligence%20in%20education%20challenges%20and%20opportunities%20for%20sustainable%20development.pdf

SIKORA, Y. B., MARCHUK, N. A., NESTEROV, V. F. Technologies of the future: the role of artificial intelligence in personalised learning. **Science and Technology Today** (Series Pedagogy, Series Law, Series Economics, Series Physical and Mathematical Sciences), v. 29, p. 526-537, 2024. https://doi.org/10.52058/2786-6025-2024-1(29)-526-537

SYZDYKBAYEVA, A., BAIKULOVA, A., KERIMBAYEVA, R. Introduction of artificial intelligence as the basis of modern online education on the example of higher education. **2021 IEEE International Conference on Smart Information Systems and Technologies** IEEE, (p. 1-8), 2021. **https://doi.org/10.1109/SIST50301.2021.9465974.**

TAJIK, E., & TAJIK, F. A comprehensive examination of the potential application of Chat GPT in Higher Education Institutions. **TechRxiv**, p. 1-10, 2024. http://dx.doi.org/10.36227/techrxiv.22589497

TAPALOVA, O., ZHIYENBAYEVA, N. Artificial intelligence in education: AIEd for personalised learning pathways. **Electronic Journal of e-Learning**, v. 20, n. 5, p. 639-653, 2022. http://dx.doi.org/10.34190/ejel.20.5.2597

TEREPYSHCHYI, S. Media literacy in the era of artificial intelligence: integration of artificial intelligence tools and methods into modern pedagogical approaches. **Pedagogy. Top Issues Humanities,** v. 60, p. 195-202, 2023. https://doi.org/10.24919/2308-4863/60-4-31

XIAO, M., YI, H. Building an efficient artificial intelligence model for personalized training in colleges and universities. **Computer Applications in Engineering Education**, v. 29, n. 2, p. 350-358, 2021. https://doi.org/10.1002/cae.22235.

APPENDIX A

Questionnaire of students regarding the construction of an educational process using artificial intelligence.

Dear student! A personal training program will be generated for you. Determine the main positions for its development by choosing the answers to the questions below.

Questions 1-4 are multiple-choice, and question 5 is single-choice.
Thank you for the honest answers:

1. In what format would you like to study?
a) ocular;
b) remote;
c) mixed.

2. What form of classes do you like the most?
a) lectures;
b) seminars;
c) practical classes;
d) business games;
e) trainings;
f) contests;
g) trainings.

3. In which virtual environment would you like to study?
a) Zoom
b) Google meet
c) ethers of social networks.

4. What communication tools would you use if you needed a teacher's consultation to complete the task?
a) Viber;
b) telegram;
c) phone call;
d) e-mail;
e) social network chats.

5. Which of the study motives is leading for you?
a) quick acquisition of practical skills;
b) obtaining a promising profession;
c) obtaining skills for quick employment by profession;
d) the opportunity to build a career;
e) to develop the ability to learn throughout life.

APPENDIX B

Questionnaire for students and teachers about the role of artificial intelligence in the personalization of the educational process

Dear participant in the educational process!

You participated in the implementation of an experimental program of personalized training developed with the help of artificial intelligence. Based on your own position, evaluate its effectiveness by choosing the appropriate evaluation level.

Assessment level	High	Sufficient	Average	Low
Learning motivation				
The level of educational results				
Productivity of communication in the "teacher-student" system				
Convenience and accessibility of education				

Recebido em 24 de abril de 2024
Aceito em 23 de agosto de 2024