(Online) ISSN 2712-0562
Sustainable Engineering and Innovation *Original Research*
Vol. 7, No. 1, 2025, pp.97-116
https://doi.org/10.37868/sei.v7i1.id418

Assessing the impact of artificial intelligence integration on educational processes in higher education institutions of Ukraine and Kazakhstan

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Received Dec. 12, 2024
Revised Feb. 10, 2025
Accepted Feb. 19, 2025
Online Mar. 4, 2025

Abstract

The study focuses on assessing the impact of artificial intelligence on educational processes in higher education institutions. It considers aspects of administrative task automation, personalization of learning, and ethical challenges. The topic's relevance is driven by global trends in the digital transformation of education and the need to adapt systems to modern challenges. A descriptive approach was used, using secondary data from scientific publications, statistical reports, and analytical studies. The data were analyzed using statistical and correlation methods, allowing us to identify the key patterns of implementing artificial intelligence in higher education in Ukraine and Kazakhstan. Integration of artificial intelligence increases the efficiency of administrative processes by 40%, reducing the time spent on routine tasks. Personalized learning contributes to the growth of students' academic performance by 7-30%. Using AI to monitor educational processes can reduce the risk of expulsions by up to 15%. At the same time, the risks of reduced social interaction and possible ethical issues, such as the opacity of algorithms and the risk of data leakage, have been identified. Artificial intelligence has significant potential for optimizing educational processes, provided ethical standards are met. Technological solutions must be combined with a socially oriented approach, particularly through integrating hybrid learning models. It is recommended that Ukraine use Kazakhstan's experience in centralizing solutions, investing in analytical tools, and training teachers.

Keywords: Automation of administrative tasks, Personalisation of learning, Collection and analysis of educational data[

1. Introduction

1.1. Research problem

The modern development of digital technologies opens up new opportunities for integrating innovative solutions in education. Artificial intelligence (from now on referred to as AI) is becoming a powerful tool that can significantly transform educational processes, increasing their efficiency, personalization, and accessibility. The integration of AI into the educational processes of higher education institutions is a hot topic that significantly impacts modern learning development. Today, in the period of rapid digitalization of society, technology is becoming a powerful tool for improving the quality of education and optimizing learning processes, in particular through the automation of administrative tasks, personalization of learning, and efficient collection and analysis of educational data [1,2]. An innovative approach to learning based on AI technologies can ensure flexibility and accessibility, which is especially important in global challenges such as the COVID-19 pandemic and the transition to distance learning. However, the introduction of AI brings not only new opportunities but also risks associated with ethical issues, data privacy, and reduced human participation in the learning process [3].

According to research by [1, 2, 3], personalized AI-based systems increase student motivation by 25-30% and help reduce dropout rates. The rapid development of artificial intelligence technologies creates unprecedented opportunities for transforming the educational process in higher education institutions. AI integration allows for the automation of routine tasks, personalization of learning, and increased efficiency. According to recent studies, the global AI market in education will reach $85 billion by 2025, with an annual growth rate of 45% [4,5].

The study's relevance is due to several important factors. Firstly, the introduction of AI in education is one of the priority areas of digital transformation, as evidenced by the Concept of Artificial Intelligence Development in Ukraine until 2030 [6]. This document envisages the active introduction of AI in education to improve its quality and efficiency. Secondly, global trends show a growing demand for specialists capable of working with AI technologies. According to the Institute of Educational Analytics of the Ministry of Education and Science of Ukraine, the demand for such skills may increase by 55% by 2030 [6]. Therefore, higher education institutions should ensure the training of relevant personnel by integrating AI into their educational processes.

In addition, like most countries in the world, Ukraine is facing the problem of an aging population and a decline in the working-age population. This, in turn, causes a shortage of labor resources and an increased workload for higher education institutions [7]. Integration of AI can be a crucial solution to increase the productivity and efficiency of educational processes. The study's relevance is also driven by the need to systematize knowledge about the impact of AI on educational processes and identify the best ways to implement it. Previous studies show that the use of AI can significantly improve the quality of education [8,9]. However, there are significant gaps in understanding the complex impact of these technologies on all aspects of the educational process: automation, personalization, and data analysis. Despite numerous studies in the field of AI and its application in education, research gaps require further analysis.

One of the main problems is the need for more comprehensive research on the long-term impact of AI on students' academic performance and critical thinking skills. There is also a need for an in-depth understanding of how AI tools can affect the social and ethical aspects of the interaction between students and teachers and their emotional state in the learning process [10]. Research by [11] shows that while AI is effective in data management and personalized learning, its impact on the educational ecosystem, in particular on the role of the teacher as the primary knowledge carrier, needs to be better understood. Despite the active development of AI in education, aspects such as the long-term impact of AI on students' critical thinking and interpersonal skills, the social implications of the diminishing role of the teacher, and the effectiveness of adaptive learning systems in the face of cultural and economic differences remain insufficiently understood.

The current development of AI technologies is significantly transforming various spheres of social life, including education. Higher education institutions are increasingly interested in implementing intelligent

solutions to improve the efficiency of administrative tasks, personalize learning, analyze educational data, etc. Despite this, the long-term impact of AI integration on educational processes, including students' academic performance, social interactions, and ethical aspects, still needs to be studied more. The balance between automation capabilities and preserving human participation in learning is a matter of debate among modern scholars.

In the international context, attention is paid not only to the development and implementation of innovative solutions but also to the analysis of the specifics of AI integration into the educational systems of different countries. A separate issue is the cross-section of the experience of Ukraine and Kazakhstan. In both countries, the integration of AI demonstrates their socio-economic and cultural nuances.

The proposed article is based on a descriptive analysis of secondary data. The data was obtained from international and national sources. Sources include scientific articles and statistical data provided in reference sources. The integration and impact of AI were assessed by comparing the current state of technology implementation in Ukraine and Kazakhstan. The work used statistical analysis methods. They were used to assess the effectiveness of AI implementation and to compare learning achievements before and after their implementation. The study describes the educational process and personalized learning in the experience of Ukraine and Kazakhstan in light of the integration of AI into education management. Identification of key trends, differences, and potential ways to improve the education systems of both countries was possible through comparative analysis.

1.2. Research focus

This study focuses on analyzing the impact of AI integration on educational processes in higher education institutions (HEIs), including the automation of administrative functions, personalization of learning, and ethical risk assessment. The main goal is to develop practical recommendations for educational institutions aimed at increasing the effectiveness of AI use. Particular emphasis is placed on comparing the experience of Ukraine and Kazakhstan, which allows us to assess the cultural and organizational aspects of innovation. The results are expected to contribute to closing research gaps in this area.

1.3. Research questions

1. How can AI improve the efficiency of administrative processes in educational institutions?
2. How does personalized learning using AI impact student achievement and engagement?
3. What ethical risks arise when using AI in educational processes, and how can they be minimized?
4. How can international experience (based on Kazakhstan's example) help improve AI integration into the Ukrainian educational system?

These questions aim to close the research gaps related to AI's insufficiently studied impact on the educational sphere. An in-depth study will help assess the prospects for introducing AI technologies in higher education, outline potential problems, and provide recommendations for further integrating artificial intelligence into educational processes.

1.4. Research hypotheses

1. Integrating AI into the administrative processes of higher education institutions reduces the time spent on routine tasks by at least 40%, increasing overall management efficiency.
2. Personalised AI-based learning platforms help increase students' average scores by 10-20% compared to traditional teaching methods.
3. The introduction of AI is associated with decreased interpersonal interaction between teachers and students, which requires special corrective measures.

2. Literature review

A review of the scientific literature shows a growing interest in exploring the potential of artificial intelligence in education. In particular, researchers are developing AI tools to automate administrative tasks, create individualized curricula, and make informed decisions based on educational data analysis [12]. Reviewing existing publications allows the systematization of knowledge and the identification of scientific gaps that require further research. The main goal of the review is to study the prospects and challenges associated with AI integration and identify those aspects that have not been sufficiently explored. Previous studies by modern scholars focus on the effectiveness of automating administrative processes and personalizing learning with AI but insufficiently consider the impact of these innovations on the social aspects of the interaction between students and teachers, as well as the ethical challenges associated with algorithm transparency and data privacy. There is also a lack of empirical research on the long-term impact of AI on the quality of education and the development of students' critical thinking.

2.1. Automation of administrative tasks

Automating administrative tasks using AI technologies significantly optimizes management processes in higher education institutions. It allows automating routine tasks such as timetable management, attendance monitoring, student application processing, and data analytics. Using AI in these areas helps increase accuracy, reduce time and errors, and free up administrative staff to perform strategically important tasks. At the same time, there are issues related to the ethical and legal aspects of personal data protection and the need for further research on the long-term effects of such innovations (Table 1).

Table 1. Analysis of research on the automation of administrative tasks using artificial intelligence

Authors	The aspects under study	Main conclusions	Limitations of the study
Prokopenko O. and Sapinski A. [13]	Implementation of virtual environment systems in the educational process	Increasing student motivation and interactivity in the learning process	The impact on academic performance is not considered
Prokopenko O. [14]	Experience in implementing e-learning during the pandemic	Bibliometric analysis shows advantages in the rapid transition to distance learning	Lack of analysis of the long-term impact of e-platforms
Kaminskyy V. [15]	The role of e-learning during martial law	Ensuring access to education in difficult conditions	Technical challenges during implementation are not covered
Chan C. [16]	Educational framework for teaching AI policies	The proposed model of AI integration policy in educational programs	Lack of experimental data on effectiveness
Iskakova M. [17]	Prospects for using the concept of "lifelong learning"	Supporting continuing education through AI integration	Insufficient analysis of cultural and social factors
Ryabova Z., Prykhodkina N. and Ponomarevskyi S. [18]	Leading the way in e-learning	Developing management skills through e-learning	The specifics of application in other cultural contexts have not been studied

Authors	The aspects under study	Main conclusions	Limitations of the study
Katsouda A., et al. [19]	Philosophy of openness in distance education	Virtual worlds facilitate access to learning	Limited analysis of effectiveness in the traditional educational system
Chiu T. et al. [20]	Planning sustainable training programmes	Considering motivational aspects to ensure a sustainable learning environment	Insufficient analysis of the cost-effectiveness of implementation
Fullan M., et al. [21]	The impact of AI on school leadership	Facilitating strategic management of educational processes	Insufficient recommendations for educational systems of different scales
Chen X., et al. [22]	Analysis of AI in education over the past 20 years	A comprehensive overview of the use of AI in educational systems	The latest innovations in AI are not taken into account
Rawas S. [23]	Support for the concept of lifelong learning	Increasing access to knowledge and skills development	Limited analysis of the impact on the socio-emotional development of students

These studies demonstrate AI's significant potential in automating administrative tasks but reveal gaps that require further analysis, particularly in the areas of ethical aspects and the long-term impact of automation on educational processes.

2.2. Collecting and analyzing educational data

Collecting and analyzing educational data with the help of artificial intelligence opens up new opportunities for optimizing management processes and improving learning outcomes. One of the key aspects is the use of AI to manage class schedules, predict educational needs, and identify patterns in the learning process. Studies show that automation of these tasks can significantly improve the efficiency of educational institutions. The paper [21] confirms that introducing automated timetable management systems can reduce the time spent creating and adjusting timetables by 50%. Ihnatiev V. et al. [21] note that such systems successfully integrate data on the availability of teachers, classrooms, and the specifics of curricula and also note the limitations associated with adapting algorithms to sudden changes, such as the absence of a teacher or the need to reschedule classes urgently.

Danilyan O. et al. [22] analyzed the effectiveness of AI in monitoring the educational process and found that such systems allow for the accurate identification of problematic aspects related to student attendance, performance, and engagement. For example, institutions implementing such systems detect 20% more academic failure cases than traditional monitoring methods. A drawback of the study is the limited sample of educational institutions, so the conclusions may only partially reflect the situation in less technologically equipped institutions. The study [23] focuses on using educational analytics to predict student dropout risks. According to the results, using AI-based analytical platforms reduces the percentage of expulsions by 15%. However, Hubal H. [24] emphasizes that the effectiveness of forecasts depends on the quality of input data and the ability of algorithms to consider social and psychological factors that affect the learning process.

It is worth noting the results presented in the work of Kichuk Y. [25], which discusses how AI can facilitate the analysis of large amounts of educational data. Kichuk notes that using such systems can increase the accuracy

of strategic decisions by 30%. For example, analytical algorithms help to identify the most effective teaching methods for students with different learning styles. However, Kichuk emphasizes the risk of algorithmic bias if the data for analysis needs to be completed or updated. The research by [26,27,28] highlights the benefits of integrating AI into educational processes, particularly in resource management, algorithmic transparency, and adaptive curriculum planning. Cox A. et al. [26] demonstrated the effectiveness of AI in reducing logistics costs, while Kaldygozova S. [27] focused on improving trust in automated systems through transparent algorithms. Yuskovych-Zhukovska V. et al. [28] emphasized the speed of decision-making using adaptive platforms. The drawback of this work is the lack of in-depth analysis of the long-term effects of automation on educational processes.

Unfortunately, there is still a lack of empirical data on the social, cultural, and technical factors that influence the effectiveness of AI in the educational process. Therefore, there is a need for in-depth methodological research. Research should focus on cross-cultural aspects, long-term effects, and practical implementation of technologies in different conditions. Thus, the results of the proposed study confirm the great potential of AI in the automation and analysis of educational data. However, there are still limitations. For example, dependence on data quality, insufficient adaptability of algorithms to unpredictable conditions, and the need for technical support. These limitations require further research and improvement of technologies.

2.3. The impact of AI on social interaction and the role of the teacher

Artificial intelligence has a significant potential to improve educational processes, but its implementation can lead to decreased interaction between teachers and students. A study by [40] shows that automation of educational processes, including assessment, significantly saves teachers' time on administrative tasks. However, it reduces the amount of live communication between teachers and students. However, Paweloszek, Kumar, and Solanki note that integrating hybrid approaches, when AI complements rather than replaces the teacher's role, helps preserve social interaction. According to [29], adaptive AI platforms effectively adjust learning materials to individual student needs, but this often reduces the role of the teacher as a mentor. A potential solution is the active involvement of teachers in creating individual learning paths, which allows them to maintain their involvement in the learning process and maintain communication with students. A disadvantage is the limited resources and time required for teachers to master such platforms.

The problem of reduced social interaction due to integrating artificial intelligence into education requires a systematic approach. According to a study by [30], one effective solution is to develop the digital competencies of both teachers and students. This emphasizes that to overcome the decline in social interaction, it is important to develop the digital skills of teachers and students. This includes conducting interactive classes using AI technologies that stimulate discussions and teamwork.

At the same time, Oseredchuk et al. [30] emphasize that insufficient technical training of students may limit the effectiveness of such approaches. Orhani [31] focuses on the creation of AI tools that not only automate processes but also facilitate interaction. For example, using chatbots to answer students' questions can complement rather than replace communication with a teacher. However, this solution requires transparency of algorithms and consideration of language barriers, especially in a multicultural environment.

According to a study by Sieriebriak and Kozhushko [32], teachers should be curators of the learning process, even with the introduction of AI. This includes adapting curricula to new technologies, organizing group discussions to support social interaction, monitoring the personalization of learning, supporting students in using adaptive platforms, and addressing ethical issues related to the transparency of algorithms and data privacy. This approach helps to preserve human participation in learning. It strikes a balance between automation and personal mentoring, but there is still the problem of limited time for teachers to master new technologies.

Okonkwo and Ade-Ibijola [33] proposed introducing flexible learning models that combine automated processes and live communication. For example, students can work with AI independently while teachers organize group discussions to consolidate the material. Nevertheless, such a model can be difficult to implement

in a low-funding environment. Thus, practical solutions for preserving social interaction include creating hybrid learning approaches, engaging teachers in adaptive platforms, and developing interactive AI tools. However, for such approaches to be effective, technical, financial, and organizational constraints must be considered, underscoring the importance of further research.

2.4. Scientific gap and scientific novelty of the study

Despite numerous studies on integrating artificial intelligence into higher education, the long-term effects of personalized learning remain insufficiently understood. In particular, the impact of AI on such indicators as the development of student's critical thinking, the level of their interaction with teachers, and the social aspects of the educational process need to be investigated. Studies are also limited to analyzing immediate results, leaving out a comprehensive approach to assessing the long-term effects of adaptive learning systems. In addition, there is a lack of comparative studies analyzing the specifics of AI implementation in the educational systems of different countries. In particular, insufficient attention has been paid to cultural and social factors that influence the perception of AI in the learning environment.

The study significantly contributes to the field due to its novelty, which covers several key aspects. First of all, the long-term effects of personalized learning were assessed. In particular, it identifies how adaptive learning systems affect the development of students' critical thinking, academic performance, and social interaction. Secondly, the study analyses the cultural factors of artificial intelligence implementation. The comparison of the experience of Ukraine and Kazakhstan takes into account socio-cultural differences, which allows for a deeper understanding of the specifics of AI adaptation in the educational processes of these countries. The third important aspect is the consideration of ethical issues. The paper offers recommendations for ensuring the transparency of algorithms, data confidentiality, and maintaining trust in AI in the learning environment. The study also includes an international comparison. An analysis of approaches to AI integration is presented, which allowed us to identify the best practices in Kazakhstan that can be used to improve Ukraine's educational system.

3. Research method

This study is descriptive research aimed at systematizing and analyzing the impact of artificial intelligence integration on educational processes in higher education institutions. The main goal is to study the automation of administrative tasks, personalization of learning, and analysis of educational data. Secondary data was used as a research approach. This made it possible to assess the state of opportunities and challenges of AI implementation.

3.1. Data design

The aim of the article was achieved through the use of a descriptive method. This method allowed for the analysis of existing phenomena and trends. The study used secondary data obtained from scientific articles, analytical reports, statistics from Scopus, Web of Science, and Google Scholar, as well as reports from research centers and government agencies in Ukraine and Kazakhstan, including data and research from the Institute of Educational Analytics of the Ministry of Education and Science of Ukraine and the Osvita.ua portal on the implementation of educational innovations [34]. These secondary data provide an opportunity to assess the current state of AI integration, identify key trends, and identify potential challenges in using AI in the educational environment. The secondary data allowed for a comprehensive analysis based on existing research, providing an opportunity to focus on relevant issues and apply data mining techniques to identify patterns and trends. We also studied publications on the impact of AI on education, including automation of administrative tasks, adaptation of educational materials, and ethical aspects of AI implementation.

The data's objectivity was ensured by avoiding politically biased sources and focusing on academic research that contained transparent methodologies and up-to-date findings.

3.2. Data selection

The data selection process consisted of four stages (Table 2):

1. The first stage is the search for sources: the keywords used to find sources were: "artificial intelligence in education", "automation of administrative processes", "personalization of learning", and "collection and analysis of educational data". A total of 780 publications were identified.

2. The second stage was filtering by topic: sources specifically related to educational AI technologies were selected, excluding those that dealt with general aspects of AI. 320 relevant sources remained.

3. The third stage was time filtering: only publications from 2018 to 2024 were included in the analysis, allowing us to exclude 120 published sources before 2018.

4. The fourth stage used additional criteria; only those works that considered international experience (including Kazakhstan and Ukraine) were selected, leaving 54 sources.

Table 2. Data selection process

The selection stage	Number of sources
Initial search	780
Filter by topic	320
Filtering by time	200
Additional criteria	85

3.3. Data analysis

To analyze the collected data, we used such methods as statistical analysis (determining the average efficiency of automated processes, such as saving time on timetable management and attendance monitoring), correlation analysis (studying the relationship between personalized learning and academic performance), and predictive models (assessing the long-term impact of AI on the educational system).

The data was analyzed using Microsoft Excel, ensuring the processed information was structured and the results were clear. The identified patterns, such as a 40-50% increase in efficiency due to automation, became the basis for formulating recommendations.

3.4. Ethics

The ethical standards of the study were ensured through several important measures. Firstly, the principle of data confidentiality was respected, as the study was based exclusively on secondary sources and did not provide access to the personal information of students or teachers. Secondly, the transparency of the research process was ensured through a clear description of the methods of data collection and analysis, which allowed for verification of the results. In addition, data security was guaranteed by storing all information on secure media in compliance with the requirements for its integrity.

3.5. Limitations

This study has several limitations, namely, the use of secondary data limits control over the accuracy and relevance of the information, the focus on two regions (Ukraine and Kazakhstan) reduces the generalisability of the results to other countries, and the rapid development of AI technologies may affect the long-term relevance of the results.

This approach provided an in-depth analysis of the integration of AI into educational processes, taking into account cultural peculiarities and international experience, which allowed us to formulate practical recommendations for improving the educational system.

4. Results and discussion

The integration of artificial intelligence into administrative tasks not only helps to optimize time but also to increase accuracy and reduce the risk of human error. For example, automated resource forecasting systems based on historical data analysis allow educational institutions to plan logistics more efficiently, reducing the cost of unnecessary resources. This is achieved through the use of machine learning algorithms to analyze attendance, student needs, and classroom availability, which minimizes the risk of overload. The integration of this approach makes it possible to adapt to changes in the educational process. After all, distance learning or increasing the number of students during the admission campaign can become real challenges in certain situations. Modern research shows that the use of artificial intelligence in the administrative processes of educational institutions is effective for organizing educational and management processes. Studies have shown that integrating artificial intelligence into the administrative work of higher education institutions significantly improves the organization of the educational process and the management system in general. Automation of class schedules, processing of student applications, and attendance monitoring can reduce the workload of administrative staff [35-40]. Studies show that introducing AI in higher education institutions reduces time spent on routine tasks by up to 40%. Table 3 shows the average time spent on administrative processes before and after the integration of artificial intelligence, which shows an increase in efficiency based on data.

Table 3. Average time spent on administrative processes before and after AI integration

Administrative process	Time spent before AI implementation (hours)	Time spent after AI implementation (hours)	Time savings (%)
Schedule management	20	10	50
Attendance monitoring	15	6	60
Processing of student applications	12	5	58

AI technologies allow not only to adapt learning materials to the student's level of knowledge but also to anticipate their needs for additional support. AI-powered systems can track each student's progress, identify weaknesses, and automatically suggest support materials or consultations with teachers, which creates opportunities for an interactive and individualized approach to each student. This is especially important for students with different backgrounds, as such systems reduce stress and increase engagement in learning, providing an effective environment for academic success. According to research, adaptive systems that use student performance data increase academic performance by up to 30% (see Table 4).

Table 4. Average student scores by type of study before and after AI integration

Type of training	Average score before AI implementation	Average score after AI implementation	Time savings (%)
Schedule management	70	75	7,1
Attendance monitoring	70	91	30

Artificial intelligence facilitates the analysis of large amounts of educational data, which helps educational institutions make informed decisions based on predictive models. Thanks to the collected and processed data, it is possible to identify students with learning difficulties and offer additional support. For example, AI can predict the risk of students dropping out based on their academic performance, attendance, and engagement in the educational process. This allows for timely intervention and a 10-15% reduction in the dropout rate.

The use of AI in educational processes raises numerous ethical issues related to data privacy, algorithm transparency, and the risks of reducing the role of the teacher. Automation of learning can lead to decreased social interaction, loss of interpersonal skills, and create situations of discrimination due to potential biases in

algorithms. To mitigate these risks, it is necessary to use data encryption technologies and ensure the transparency of processing algorithms. Table 5 shows the main ethical risks and suggested measures to minimize them.

Table 5. Key ethical risks and proposed measures to minimize them

Ethical risk	Description	Minimization measures
Breach of confidentiality	Data leakage or misuse	Use of encryption, access restriction
Transparency of algorithms	Lack of awareness of AI decision-making processes	Open algorithms, development of clear models
Reduced social interaction	Reduced contact between students and teachers	Involving teachers in the integration of automated tools

One of the key ethical risks of using AI in education is the possibility of discrimination or bias if algorithms are trained on incomplete or outdated data. Opaque algorithms, known as "black boxes," are also a concern, as students and teachers do not always understand how certain personalization or assessment decisions are made. To minimize these risks, it is recommended that open and transparent algorithms be implemented that can be easily interpreted and understood by users. In addition, the use of data controls and compliance with privacy standards will help prevent data leakage or misuse.

Artificial intelligence has powerful potential to personalize the learning process, allowing content to be tailored to the needs, level of knowledge, and pace of learning of each student. Such systems can automatically adjust the complexity of tasks and formulate recommendations to improve understanding of the material, which is especially important for students who face difficulties in studying certain disciplines (Figure 1).

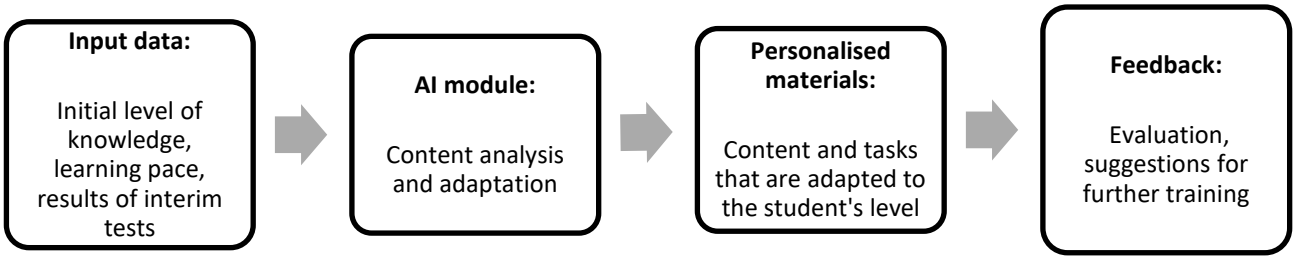

Figure 1. Structure of an adaptive AI-based learning system

With the development of AI, there are opportunities to support the concept of lifelong learning, which allows people to acquire knowledge and skills throughout their lives. Artificial intelligence provides access to materials, personalized recommendations, and feedback, enabling people of all ages to remain competitive in the labor market. The global AI in education market is expected to grow significantly in the coming years. According to the Institute of Educational Analytics of the Ministry of Education and Science of Ukraine, such trends reflect the demand for adaptive learning systems. Educational data analytics and automation of administrative processes are also among the key factors [40-45].

The integration of AI into education has great potential for a profound transformation of learning processes. The flexibility of educational programs and support for individual student needs are now becoming a priority. Artificial intelligence helps analyze big data and automate administrative processes. This allows educational institutions to adapt to modern challenges and prepare students for globalization trends.

Today, one of the leading trends in education is personalized learning using AI, adaptive systems that make it possible to create individual learning paths and provide the necessary materials. In the future, the demand for

such systems is growing every day. AI approves its effectiveness in improving learning outcomes and reducing the dropout rate. Adaptive learning based on artificial intelligence is an important tool in ensuring the quality of education and student motivation [46-48]. AI analytics helps to gain a deeper understanding of learning processes and outcomes, to anticipate potential difficulties and challenges. For large volumes of data, analytical systems are effective. They motivate, engage, and adapt students.

This helps teachers identify issues that need attention more quickly and provide support before students begin to experience serious difficulties. AI technologies are increasingly being used to automate administrative tasks such as course registration, timetable management, academic performance, attendance monitoring, etc. This reduces the workload on administrative staff, improves accounting accuracy, and ensures efficient resource allocation [49]. Modern AI-powered learning management systems can automatically adapt administrative processes to changing conditions, which is especially important in the event of unforeseen situations such as the COVID-19 pandemic. Automation increases productivity and allows you to focus on strategic tasks aimed at improving the quality of education.

In terms of improving AI integration, it is worth noting that Kazakhstan is making significant progress in introducing artificial intelligence into the educational system. One of the key areas is the automation of administrative processes and the introduction of personalized learning platforms. According to research by [50, 51], Kazakhstan is actively implementing digital platforms for managing schedules and monitoring student performance and attendance, which reduces the administrative burden by up to 40%. Kazakhstan has successfully implemented projects that combine administrative processes, personalized learning, and monitoring of student performance into a single system. To quickly process information about student performance, centralized databases are actively used. They create individual learning trajectories and integrate this data with other administrative functions.

To determine the individual needs of students and create adaptive curricula, educational analytics is now appropriate, which takes into account different levels of access to knowledge and designs different educational strategies. In Kazakhstan, thanks to projects to implement personalized platforms, the average student performance has increased by 15% [52]. Kazakhstan has implemented a unified approach to integrating AI for both public and private educational institutions. This helps to harmonize standards, simplify the integration of new solutions, and ensure equal access to high-quality technologies regardless of the region.

Despite similar challenges in the education sector, such as the need to optimize resources and ensure equal access to quality education, the systems of Ukraine and Kazakhstan have their specificities. In Kazakhstan, the focus is on centralized initiatives to introduce digital platforms and automate processes. In Ukraine, however, most implementations focus on local solutions that are not always integrated into the national system [53]. An important aspect is the development of analytics tools for making decisions based on big data. In Kazakhstan, predictive models are more actively used to identify students who need additional support. This allows for timely intervention in the educational process, minimizing the risk of expulsion [54].

The experience of Kazakhstan highlights the importance of centralized initiatives and investment in modern technology. For Ukraine, this may include a centralized platform for managing the educational process (it will allow integrating administrative tasks, progress monitoring, and personalized learning into a single system, simplifying access for teachers and students), investments in analytical tools (Kazakhstan's experience shows that the use of predictive models significantly increases the efficiency of management decision-making and helps reduce risks for students) and training teachers to work with AI (which is an important aspect). Therefore, Kazakhstan provides a good example of the introduction of AI in education. Using its experience can help integrate AI into Ukraine's education system more effectively by introducing centralized solutions, improved analytics, and increased teachers' digital literacy.

Based on the study, several recommendations were developed for implementing artificial intelligence in the educational process. A detailed description of these recommendations is shown in Figure 2.

The research findings show the significant potential of artificial intelligence in changing educational processes. AI integration is effective for implementing administrative tasks, personalizing learning, and improving the analysis of educational data. Student motivation and success are increased due to automated systems. They reduce the risk of human error and increase the accuracy of data processing. However, in the process of rapid implementation of artificial intelligence, one should not forget about ethical issues: data confidentiality and transparency of algorithms are the first ethical issues. The development of adaptive learning allows education to quickly adapt to modern challenges. With a systematic approach, investments in technology, support for the professional development of teachers, and adherence to ethical standards, the implementation of AI transforms education for the better. At the same time, using new technologies raises several ethical issues that need to be addressed. Data privacy protection and algorithmic transparency are becoming crucial factors in effectively using these technologies. The further development of the digitalization of education involves improving adaptive learning, supporting lifelong learning, and automating management processes, which helps educational institutions respond more quickly to the challenges of the times. Successful implementation of the latest technologies requires a comprehensive approach that includes investing in technological equipment, promoting the professional development of teachers, and adhering to ethical standards in handling student data. The study allowed us to test the hypothesis about artificial intelligence's impact on the efficiency of administrative processes in higher education institutions. The results show that the introduction of AI in areas such as timetable management, attendance monitoring, and student application processing can reduce time spent by 40-50%, which confirms the hypothesis. Table 3 shows the reduction in time spent on administrative tasks after the introduction of AI.

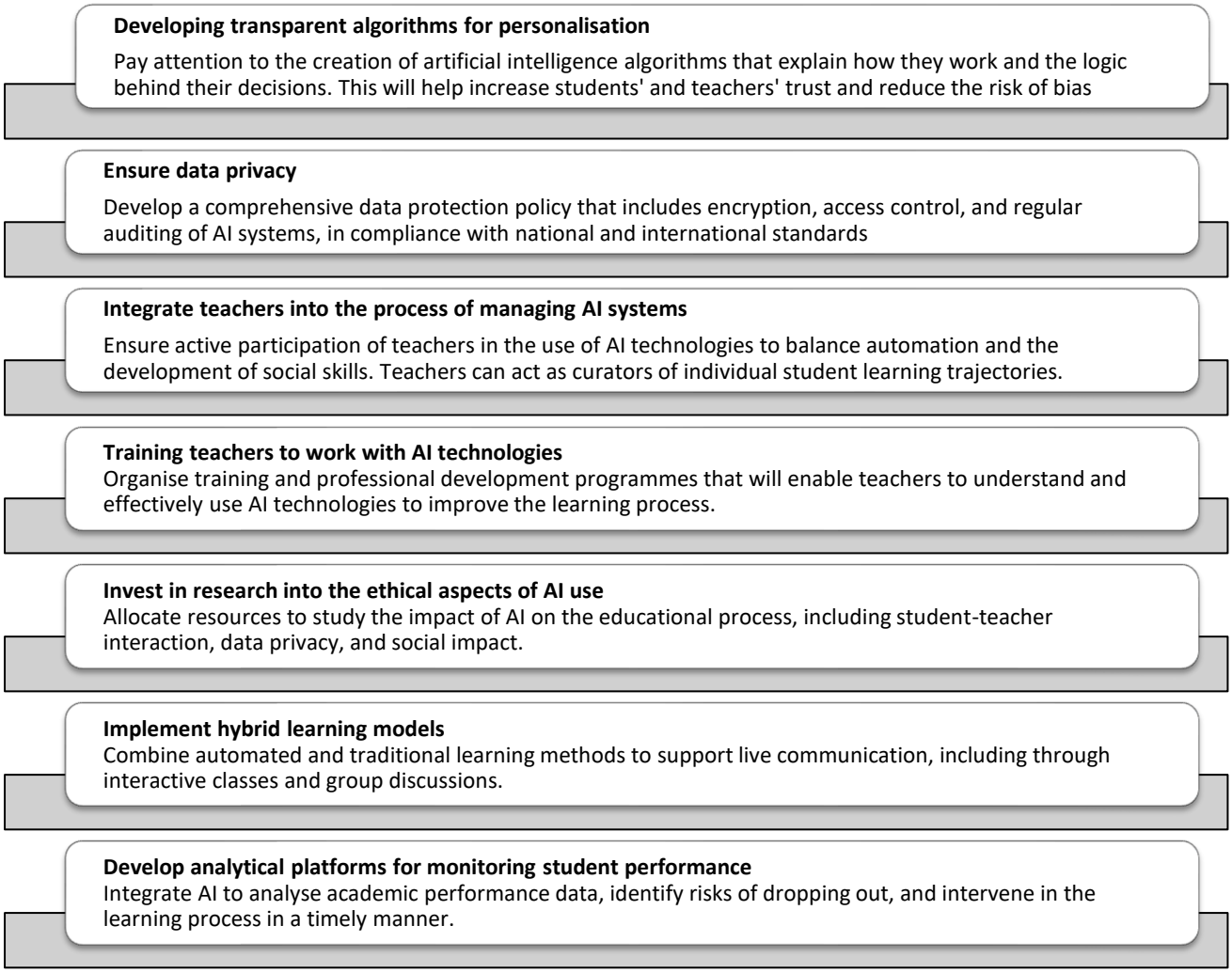

Figure 2. Recommendations for introducing artificial intelligence into the educational process

Personalized platforms have been determined to contribute to the growth of students' grade point averages. The use of adaptive AI-based learning platforms has increased students' average academic performance by 10-30%, depending on the type of study (Table 4). This confirms the second hypothesis, although the upper limit exceeds the predicted 20%.

It is proven that the introduction of AI reduces interpersonal interaction. Integrating artificial intelligence to automate the educational process reduces the level of communication between teachers and students. However, the proposed measures, such as involving teachers as curators of learning trajectories, contribute to the partial preservation of social interaction, which confirms the third hypothesis.

Given the above, the results emphasize the importance of artificial intelligence technologies in improving the organization and personalization of the educational process in higher education institutions. The study's results identify the need to adhere to ethical principles and preserve social interaction in the learning environment.

With the active introduction of artificial intelligence into educational processes, especially in higher education institutions, new challenges arise related to the transformation of the learning environment, personalization of educational services, as well as ethical and social issues. The aim of the article was to assess the impact of implementing artificial intelligence and its effectiveness in educational processes. In this context, the impact on administrative tasks, student success, and social interaction between teachers and students was analyzed. Digital transformation of education is the integration of AI into educational processes. The paper identifies ways to optimize educational processes and recommendations for their improvement through the integration of AI.

The results demonstrated the effectiveness of using artificial intelligence in administrative processes, in managing class schedules, and in monitoring attendance. Time costs are reduced before and after the implementation of AI. The workload on administrative staff is also reduced by up to 40%. These data are relevant to the results of other studies [1]. In addition, the personalization of learning with AI helps to increase student motivation and academic performance, which is confirmed by Tapalova and Zhiyenbayeva [9], noting an increase in average student scores by 7-30% due to adaptive learning systems. AI also significantly improves the efficiency of administrative tasks, such as managing schedules, monitoring attendance, and processing student applications. For example, AI algorithms can automate timetabling by analyzing data on classrooms, teachers, and curricula, which reduces time spent on these processes by 40-50% [3,4]. Attendance monitoring systems use face recognition technology or QR codes to ensure accuracy and reduce administrative burden. AI analytical tools can predict educational needs and identify risks associated with student dropout by analyzing data on academic performance, attendance, and engagement [5].

It is worth noting that Kazakhstan is actively implementing AI in the educational process through centralized digital platforms. These platforms combine timetable management, progress monitoring, and personalized learning. According to research by [6], such systems allow for the automatic creation of adaptive learning trajectories for students, considering their educational needs. Kazakhstan also uses predictive models to identify students at risk of academic failure, which contributes to the timely correction of the educational process and increases student performance by 15% [7]. Integrating AI into educational processes provides several benefits, but an unexpected result was identifying the risk of a decline in students' social interaction skills. This confirms the need to preserve the role of the teacher as a social mediator and mentor. A high level of automation can lead to student isolation, so balancing the use of AI and live communication is essential.

Another unexpected finding is that the effectiveness of personalized learning programmes depends on the student's initial academic skills. Students with high motivation and initial knowledge achieve better results, while students with low initial performance need additional support, as confirmed by other studies [27].

An essential limitation of the study is the use of secondary data, which reduces the ability to influence the accuracy and relevance of the information. Using such data limits the possibility of generalizing the results to other educational institutions where the level of technological equipment may differ. Also, the results may

depend on the specifics of the learning environment in which the study was conducted, namely Ukrainian higher education institutions. In addition, the study focuses mainly on administrative aspects, so it is impossible to draw a comprehensive conclusion about all possible areas of AI's impact on the educational process.

In addition to using secondary data, which limits the depth of analysis, an additional challenge is artificial intelligence technologies' dynamism and rapid evolution. Research results may become outdated as algorithms constantly improve and AI capabilities grow. Integration of new, more efficient data processing and learning methods requires continuous monitoring and updating of systems, which requires high financial and human resources. This aspect emphasizes the need for constant research and adaptation of the findings to the new conditions of technological progress.

Another important limitation is the dependence on socio-cultural factors that influence the perception of AI among students and teachers. For example, cultural characteristics can determine the level of trust in technology and the degree of its adoption. The lack of comprehensive cross-cultural research on this topic limits the ability to generalize the results internationally. This points to the importance of studying the use of AI in educational institutions in different countries, which will allow us to assess the impact of social and cultural characteristics on the success of its implementation. It is worth noting that the study is based on the analysis of data from two countries, which limits the possibility of generalizing the results to other cultural contexts. In addition, the study used mainly secondary data, which could affect the depth of the analysis.

The perception of AI in the learning environment is largely dependent on the cultural context. In Kazakhstan, a centralized approach to educational reforms promotes trust in the introduction of innovative technologies. In Ukraine, however, due to the prevalence of decentralized initiatives, there is a need to integrate local systems into the national educational platform. The main obstacle in both countries is the insufficient level of digital literacy of teachers. In this context, intercultural training for teachers should be organized and learning platforms should be adapted to different linguistic and social conditions. The perception of AI is also significantly influenced by cultural factors. In Kazakhstan, the organization of AI implementation is centralized. In Ukraine, the approach is decentralized. This, in turn, requires the creation of a coordinated national platform.

Of course, the article had limitations. However, this study made a significant contribution to revealing the processes of AI implementation in education. Scientific novelty is the study of the specifics of the impact of automation on management tasks and personalization of learning in higher education institutions, which are little-studied issues. The work also touched on the ethical and social issues of using AI. The conclusions were drawn about the need to develop transparent algorithms. They can ensure data confidentiality, as well as develop recommendations for adapting international experience to improve the education system of Ukraine. The results showed the prospects for further implementation of AI in education. They emphasize the need to combine technology with a socially oriented approach to learning.

The practical contribution of the study - the results obtained can be used in the development of recommendations for the implementation of AI in educational institutions. The approach to the automation of administrative tasks described in the study allows for to reduction of the administrative burden on staff and the implementation of strategic educational tasks. Personalized learning systems help reduce student dropout and increase success. Such prospects are important for ensuring the high competitiveness of educational institutions.

The study highlights the significant potential of AI to optimize administrative processes, personalize learning, and support management decision-making in higher education institutions. Integration of Kazakhstan's experience allows us to identify strategic directions for the development of AI in education that can be adapted to Ukrainian realities.

6. Conclusions

Thus, this study has achieved its goal, namely, to assess the impact of artificial intelligence integration on educational processes in higher education institutions. Based on the analysis of the collected data, answers were

provided to the main questions related to the automation of administrative processes, the impact of personalized learning, and the ethical aspects of AI in education.

1. The introduction of AI significantly increases the efficiency of administrative tasks in higher education institutions. Automation in scheduling, attendance control, and processing of student applications saves time for these tasks by 40-50%. Thus, administrative staff can focus on strategic issues. Automation increases the performance of the educational process and facilitates the adaptation of institutions to unforeseen circumstances (pandemic, changes in the academic schedule).

2. The impact of personalized learning on academic performance and personalization of learning using artificial intelligence is positive. Adaptive systems based on AI and personalization of learning motivate students and engage them in learning. However, social interaction should be taken into account. Excessive automation can reduce the level of communication and interpersonal skills.

3. Ethical risks in the use of AI in educational processes and ways to minimize them: the introduction of AI in educational processes is accompanied by a number of ethical risks, including the threat of violation of student data confidentiality and lack of transparency in decision-making algorithms. To mitigate these risks, it is necessary to implement open and understandable algorithms that allow users to understand the principles of AI. In particular, it is recommended to use encryption and access restriction technologies to protect students' personal data, as well as to ensure that systems comply with privacy standards.

4. The international experience of Kazakhstan and Ukraine was used as an example. It was found that Kazakhstan implements centralized platforms for managing educational processes. This reduced the administrative burden by up to 40% and increased the average student success rate by 15%. In this sense, Ukraine can use this experience by creating a single digital educational platform. The Kazakh approach is based on predictive models, which can also be adapted to improve the educational process in Ukraine.

This comparative study of the experience of Ukraine and Kazakhstan allowed us to identify common trends. Recommendations were developed for the implementation of AI in the educational systems of both countries. There is a strong need to develop adaptive learning and automation of administrative processes, as well as to develop the digital literacy of teachers.

Therefore, it can be recommended that Ukraine and Kazakhstan integrate centralized platforms that combine schedule management, progress monitoring, and personalized learning to optimize educational processes and ensure the effective use of educational resources. The development of big data analytics can improve the management of the educational process and increase digital literacy. Ethical aspects, namely the transparency of algorithms and the protection of students' data, are a separate important issue.

Prospects for further research should include an analysis of the long-term effects of integrating AI into education. This will allow the creation of transparent algorithms to take into account the individual, cultural, and educational needs of education participants, improve the quality of personalized learning, and reduce ethical risks.

The results of this study are of great importance to educational institutions in Ukraine. The experience of Kazakhstan and recommendations for choosing the most effective methods of automation and adaptive learning are especially relevant in the context of the growing popularity of automated learning platforms. They reduce the need for direct teacher participation.

Further research may concern the creation and testing of new models of transparent and ethical AI algorithms. The proposed study will make a significant contribution to revealing the issues of integrating artificial intelligence into educational processes. All this is helpful for achieving greater efficiency and flexibility. The work identifies certain limitations. However, the results of the study showed the potential of AI. It is a tool that optimizes learning. In the field of automation and personalization, combined with traditional teaching methods, AI can ensure the harmonious development of students in all areas.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

Funding information

No funding was received from any financial organization to conduct this research.

Author contribution

Olena Bazyl, Oryngul Abilova: study conception and design; Olena Karpenko: data collection; Hnat Mierienkov, Anastasiia Poliakova, Olena Bazyl: analysis and interpretation of results; Olena Bazyl: draft preparation.

All authors approved the final version of the manuscript.

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