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Transformation of teaching strategies in higher education in the context of the development of AI

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ABSTRACT

The study explores the evolution of teaching strategies in higher education within the context of the rapid development of artificial intelligence. The aim is to analyse the impact of AI technologies on educatiobal practices and to determine effective ways of integrating them into university teaching. The research is based on a qualitive approach, particulatly the case study method, which includes an analysis of works by Ukrainian and international scholars as well as case studies of AI implementation in educational settings. The main selection criteria were professional teaching experience and AI usage. Purposive sampling was applied to recruit participants who met these criteria. This study has focused on the perspective of educators, but more research is needed on the student side. Future studies should explore how students use AI in their learning and how it affects their critical thinking and academic performance. The goal is to explore personal experiences and views. The findings of the study reveal a significant shift towards individualized learning, adaptive assessment, and increased use of AI teaching strategies. The research concludes that successful integration of AI demands not only technological preparedness, but also pedagogical innovation and educational support.

Keywords: Cognitive technologies, Educational reform, Human-machine interaction, Pedagogical innovation, and Smart learning environment.

1. Introduction

The significance of the research conducted is based on the fact that AI is transforming higher education worldwide. It helps automate grading and create individualized learning methods. Chatbots support students by answering questions anytime. International trends indicate the rapid adoption of AI in universities. In Ukraine, education is also changing due to the war and digitalization. In Ukraine, the application of AI in the academic context has gained relevance in recent years, notably in the context of international digitalization, educational reforms, and the challenges posed by COVID-19 and the war. Nowadays, digital tools and educational platforms are playing a vital role in how Ukrainian lecturers and professors teach and students learn. Limited access to resources makes AI use more challenging but also more critical.

Nowadays, educational reforms are underway in Ukrainian higher education. There is also a national digitalization strategy in place. Therefore, this topic is very relevant. Many universities use digital tools and online platforms. But there are still some problems. For example, not everyone has the same access to technology. This is especially noticeable between villages and cities. This poses a significant challenge to Ukrainian education. It is about how inclusive the system is. Moreover, teaching strategies for AI-based learning are not well studied yet.

The research objective is to investigate how Ukrainian university lecturers transform their teaching approaches in relation to the development of AI, and to identify key challenges associated with this transformation.

The research questions to be answered in the course of study are as follows:

- What AI tools do Ukrainian university lecturers use in their practice?
- How do lecturers understand the impact of AI on their teaching strategies?
- What challenges arise when integrating AI into the educational case?
- What opportunities for improving teaching do lecturers believe AI opens up?

1.1 Theoretical framework

The incorporation of AI into higher education has arisen as a great strength. This integration is essential for a strong theoretical foundation, which can help participants in the educational process understand its implications. A central theme in the scientific papers is the role of AI chatbots in enhancing learning outcomes and influencing students' attitudes and behavior. Adjekum et al. [1] evaluate the moral implementation of AI chatbots in the modern agenda, emphasizing the connection between student attitudes and learning outcomes. Zh. Aden et al. [2] examine the development of a bilingual linguistic identity through the creation of written scientific texts, highlighting its role in language learning and identity formation. Akbari et al. [3] highlight the mediating effect of inertia in technology adoption. Similarly, the meta-analysis by Baki et al. [4] identifies sensed usefulness and relief of use as key determinants in the approval of digital learning tools. Cetin and Ozden [5] developed a scale measuring programming attitudes among students, while Chen [6] demonstrated that connection between self-efficacy and performance is mediated by learning engagement. From an institutional perspective, Farida et al. [7] explore the importance of quality assurance, while Farida et al. [8] further investigate how lean tools support research performance. Moreover, Farmer et al. [9] provide a theoretical overview of self-efficacy and success in AI-mediated environments. Granić [10] offers a broader framework for understanding technology acceptance in education, integrating various factors, such as psychological, pedagogical, and systematic ones. Grover and Pea [11] discuss computational thinking in modern education, which lies in the inclusion of AI literacy and resourceful skills.

Farida et al. [12] apply the technology approval model to analyze online learning implementation in remote contexts in a distant educational context. Al Husaeni et al. [13] explore a comprehensive literature study and examination of AI chatbot integration in science and education of future engineers. These findings are practically extended in Allen et al. [14], who present an AI-powered Q&A bot for support. Alquahtani and Wafula [15] investigate AI integration strategies at leading global universities, highlighting a need for pedagogically aligned implementation. Arowosegbe et al. [16] explore UK students` perceptions of generative AI use. Asamoah et al. [17] propose a conceptual framework to guide responsible AI adoption in education and knowledge work. This work is echoed in Batista et al. [18], who identify key trends and challenges through a systematic review. From a technological point of view, Beccera et al. [19] demonstrate the usefulness of generative AI in improving feedback systems. Bhullar et al. [20] synthesize the current papers on ChatGPT in modern higher education, underlining critical research gaps including assessment, academic integrity, and curriculum design. Bikanga Ada [21] presents student voices regarding the implementation of ChatGPT in computer science programs. Camacho-Zuñiga et al. [22] present guidelines, emphasizing participatory approaches in the development of responsible AI usage norms. Chaka [23] shifts attention to the detection of AI-generated content, while Chan [24] examines how student perception of «AI-giatism» is reshaping definitions of academic misconstruction. Chee et al. [25] developed a framework that distinguishes AI literacy needs across different learner groups. G. Torres et al. [26] examine the moral inference of generative AI in higher education, especially in countries where people speak Spanish. Ghosh et al. [27] emphasize the connection between AI tools and intelligent learning systems. Gruenhagen et al. [28] explore the students` beliefs about AI chatbot use in schooling. Gupta et al. [29] explore the integration of AI in education, focusing on enhancing individualised lerning within ethical boundaries. Hamerman et al. [30] analyze how university guidelines are evolving in response to generative AI in the classroom. Holdcroft [31] explores whether AI can improve consistency in student feedback. Holmes and Miao [32] present comprehensive guidance on the moral and strategic use of reproductive artificial intelligence in education.

Ilieva et al. [33] explore the cognitive and emotional effects of chatbot use in education. Katsamakas et al. [34] adopt a systems theory approach to explain how AI transforms institutional structures in higher education. This

systemic perspective is complemented by Kazandis and Pellas [35], who compare the digital literacy outcomes of students of computer science of different ages. Khalif et al. [36] explore how university lecturers view generative AI tools. Kumar et al. [37] offer an artficial intelligence integration in education. Liu et al. [38] capture student perspectives on using ChatGPT for academic communication. Maksymchuk et al. [39] examine teaching methods in extracurricular physical activities for pupils aged 12-14. Murdan and Halkhoree [40] analyze the crossing of AI and institutional innovation. Nartey [41] proposes guiding principles for AI integration into university education. Nee et al. [42] conduct a methodical study of chatbot use trends in education. Okonkwo and Ade-Ibijola [43] provide a methodical study of applications of chatbots in education. Andrade Preciado et al. [44] analyze the ethical challenges of AI-assisted translation, focusing on implications for accuracy, responsibility, and cultural sensitivity. Peláez-Sánchez et al. [45] examine the intersection of AI and Education 4.0, while Qadhi et al. [46] employ systematic analysis to examine the intersection of AI in AI-mediated contexts. Similarly, Rasu et al. [47] highlight both challenges and opportunities associated with ChatGPT in modern higher education. Romero-Rodríguez et al. [48] focus on students` perception of ChatGPT's usefulness in developing complex thinking skills. Sevnaryan and Potter [49] examine how generative AI reshapes distance education. Shahzad et al. [50] provide a multi-dimensional model that links generative AI usage to student learning. Soto et al. [51] demonstrate the benefits of combining interactive learning environments with ChatGPT at computer networking lessons. Spennemann et al. [52] raise a critical ethical issue by evaluating how ChatGPT offers students suggestions for cheating. Strzelecki et al. [53] investigate the broader academic community`s acceptance of ChatGPT. Suryanarayana et al. [54] position AI-enhanced digital learning as essential to the sustainability of educational management systems. Tsekhmister [55] analyzes a response to the challenges of modernity. Tsekhmister Y. [56] examines medical universities of European countries. Tsekhmister, Y.V., et al. [57] investigate the teaching and learning of medical physics and biomedical engineering in Ukrainian medical universities. Yertay et al. [58] examine modern strategies for applying artificial intelligence technologies in the creation of fantasy content, highlighting their impact on digital creativity and storytelling.

Despite the breadth of research on AI integration in higher education, some gaps remain. While previous studies have examined technology acceptance, institutional perspectives, AI literacy, and ethical considerations, limited attention has been given to the direct connection between student attitudes toward AI and their actual learning outcomes. The study presented addresses this gap by investigating how student attitudes toward AI-based teaching strategies influence their learning outcomes.

2. Research method

The authors use the qualitative research project. Rather than focusing on numerical data, the research design allows for the collection of rich, descriptive insights that capture the complexity of AI realization in pedagogical contexts. The goal is to explore personal experiences and views. Data from the study were collected using semi-structured interviews, enabling flexibility to explore emerging topics while ensuring coherence across interviews. This method allowed participants to express their perspectives openly, while the authors probed for deeper insights as needed.

There were 12 participants in these interviews. The participants were lecturers of Ukrainian universities. They worked at public and prívate institutions. They taught in various fields, including humanities, science, and IT. All of them had at least basic experience with AI in teaching. Some used AI tools regularly, others used them occasionally. The primary selection criteria were professional teaching experience and proficiency in AI usage. The final group of professors represented 6 different experiences. The interviews depended on participants` location and availability. To ensure accuracy in data transcription and analysis, with participants` permission, the audio interviews were audio-recorded. To capture situational observations and direct flections during the interviews, the authors also made field notes. Each interview lasted from 45 to 60 minutes. The primary selection criteria were professional teaching experience and proficiency in AI usage.

The information was examined by using thematic analysis. This method involves searching for and exploring recurring themes. The process involved several steps: reviewing transcripts, identifying themes, initial coding, reviewing the themes, and interpreting the results. The authors chose this method because of its flexibility and

efficiency. It helps to capture participants' ideas and opinions well. Notes were taken during each session. Transcripts were created using transcription software. To study the data, the authors used thematic analysis. The authors followed the six-step method by Braun and Clarke. First, the authors read all transcripts carefully. Then, the authors coded the data line by line. Codes were grouped into broader themes. The analysis was done manually and using coding software.

The study was carried out following established ethical guidelines. All the lecturers were clearly informed about the purpose of the study, their right to back out at any time, and how the collected data would be used. By securely storing all the data, anonymity and confidentiality were ensured. No identifying or personal details were included in the results of the study. Only the research team had access to the data.

The study was conducted in Ukraine. The authors conducted interviews for the study either online, using video teleconference platforms such as Zoom and Discord, or in person. The research reflects the current challenges in Ukrainian higher education. These include war-related disruptions and limited access to digital tools.

3. Results and discussion

1. Use of AI Tools

Subtheme 1: Types of Artficial Intelligence Tools Used in Teaching

The participants reported using various AI-based tools in their teaching. These included different language models, such as ChatGPT, plagiarism checkers, automated grading systems, and adaptive learning platforms. Most lecturers (8 out of 12) used AI to support content creation, test generation, and communication with students.

Subtheme 2: Perceived Benefits of AI Integration

Participant 1 mentioned, "I use ChatGPT to help me explain complex topics in simpler words for students". At the same time, Participant 2 said, "Automatic assessment tools save a lot of time when grading multiple-choice tests". Participant 3 told us, "I use AI-based grammar checkers. This helps me to improve students' writing". Participant 4 points out, "It allows more time for creative, interactive tasks during class because admin/professor work is automated".

2. Challenges of integration

Subtheme 1: Technical Barriers

Despite the benefits of the AI integration process, professors described several challenges that limit the effective use of implementing AI into their teaching. These included technical issues, institutional resistance and unpreparedness. Some also pointed out concerns about data privacy and academic integrity:

Subtheme 2: Lack of Training and Guidance. Concerns About Reliability and Ethics

Participant 2 mentioned, "I do not always trust the content AI produces. I have to double-check everything". At the same time, Participant 6 said, "There is no official guidance. I feel like I am expecting without any support". Participant 8 told us, "We were never trained to use these tools. I had to learn everything on YouTube by myself". Participant 10 points out, "In our university, we have an unstable internet connection. AI tools often lag or simply don`t load. Technical support is weak". Participant 12 mentioned, "I am afraid of violating data protection rules when using online tools".

3. Opportunities for teaching

Subtheme 1: Personalization and Student Support

Lecturers saw significant potential in AI for enhancing educational status. Our participants noted that AI could support personalized learning and provide real-time feedback. Some of them also highlighted its role in supporting inclusive education, especially for students with different learning styles or language backgrounds.

Participant 3 mentioned, "I can finally adapt my lessons to different learning speeds. AI makes that possible". At the same time, Participant 5 said, "It is easier to support students who are falling behind using personalized AI feedback". Participant 6 told us, "Some students are shy. They prefer asking questions to a chatbot rather

than in class". Participant 8 points out, "AI has helped me to gamify some tasks. This increased participation". Participant 10 mentioned, "I feel more confident teaching large groups now; AI helps manage individual needs".

Table 1. Main Challenges of AI Integration

Challenge	Example statements from participants	Frequency of mentions
Technical problems	"Internet connection is often unstable.", "AI tools fail to load."	5
Lack of training and support	"I had to learn everything from YouTube.", "There is no official guidance."	4
Distrust of AI-generated content	"I always need to double-check what AI produces."	3
Ethical and data privacy concerns	"I am afraid of violating GDPR/data protection rules."	2

Subtheme 2: Alignment with Global Trends

The research findings confirm global trends, showing that AI is gradually reshaping teaching strategies in higher education. Similar to studies conducted in Western Europe and North America, Ukrainian professors also adopt AI tools to improve efficiency and student engagement. The results line up with previous studies. We examined AI chatbots in enhancing learning outcomes and influencing students' attitudes and behaviour (Adjekum et al., 2023 [1]; Liu et al., 2023 [36]; Shahzad et al., 2023 [46]). Previous studies highlight that student attitudes and engagement mediate the effectiveness of AI-based learning tools (Cetin & Ozden, 2020 [4]; Chen, 2021 [5]; Akbari et al., 2022 [2]). Moreover, the adoption of AI aligns with institutional strategies for digital transformation, as noted in Farida et al. (2021 [6]; 2022 [7]) and Alquahtani & Wafula (2023 [14]).

Subtheme 3: Challenges in the Ukrainian Context

However, the study also reveals challenges unique to the Ukrainian context. Unlike in countries with robust digital infrastructure, Ukrainian lecturers often face unstable internet access, limited technical support, and outdated hardware, especially in smaller institutions.

Subtheme 4: Language Barriers and Local Adaptation

AI tools are rarely adapted to Ukrainian, forcing lecturers to use English platforms or machine translation, which reduces accuracy and relevance.

Subtheme 5: Openness to Innovation

Despite obstacles, educators show openness to innovation, experimenting with AI to create more flexible and student-centered practices.

Subtheme 6: Discussion and Limitations

Findings confirm global trends of AI supporting personalisation and engagement but reveal Ukrainian-specific challenges such as poor internet, weak technical support, outdated hardware, and language barriers, unlike in contexts with stronger infrastructure.

4. Conclusions

The study revealed that Ukrainian university teachers are increasingly integrating AI tools into their teaching strategies. AI is mostly used for content creation, personalized feedback, and administrative tasks like grading. However, the integration process is uneven due to limited resources, lack of institutional support, and ethical concerns. Teachers showed a strong interest in AI but also highlighted significant challenges such as technical limitations and the absence of clear guidelines. Overall, AI offers clear opportunities for enhancing higher education but requires better support and structure to be effective.

To improve the effective use of AI, universities should offer regular training sessions for educators. These sessions should focus on both technical skills and pedagogical applications of AI. Universities should also invest in localizing AI tools to better suit the Ukrainian language and curriculum. Institutional policies must be developed to address ethical concerns, academic integrity, and responsible AI use. Creating support units or

help desks for digital tools could make AI more accessible to faculty members. Collaboration between universities and tech developers can lead to customized solutions for local need.

This study focused on the perspective of teachers, but more research is needed on the student side. Future studies should explore how students use artificial intelligence in their learning and how it affects their critical thinking and academic performance. Longitudinal research could also assess the long-term influence of artificial intelligence on teaching quality and learning outcomes. Another important gap is the role of AI in inclusive education. How AI supports disabilities or different learning styles.

The findings are especially relevant for the Ukrainian context, where digital transformation has accelerated due to the war. Many universities have shifted to online or hybrid formats, making artificial intelligence tools more relevant than ever. However, limited access to reliable internet, equipment, and training continues to be the most important things to pay attention to. This study shows that despite these barriers, Ukrainian educators are open to innovation and willing to experiment with AI. The results can guide national education strategies and help shape a more flexible, technology-driven higher education system that meets the country`s current and future needs. We can make several practical recommendations, based on findings of this research. As for teachers, the result underlines the value of engaging in equal learning and informal exchanges of best practices. From collegial support networks, social media, where they can gain and share experiences, tools, and methods that have proven effective in the classroom teachers can benefit greatly. As for higher schools, it is essential to support educators with access to technology, and qualitative professional development. Which is important, that the studying process emphasizes the need to provide consistent and meaningful support for Ukrainian professors, that can include assigning time for professional development, propositioning technical assistance, and cultivating a school culture that incorporate innovation and experimentation with AI. For the Ministry of Education of Ukraine, greater investment is needed in AI tools, particularly are encouraged to give priority to investment in digital infrastructure, particularly in underprivileged rural areas. The Ministry of Education of Ukraine needs to design practice-oriented information and communication technologies training programs that meet the real needs of educators on the ground. Which could further enrich understanding of the systemic factors that influence AI integration in higher schools is the exploring the perspectives of school administrators or parents.

Declaration of competing interests

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

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Author contribution

Svitlana Vitvytska, Vladyslava Artiukhova and Anna Khudaverdova were responsible for the study conception and design; Krystyna Yandola, Anna Khudaverdova and Volha Hurskaya carried out the data collection; Volha Hurskaya, Svitlana Vitvytska and Vladyslava Artiukhova conducted the analysis and interpretation of results; Anna Khudaverdova, Vladyslava Artiukhova and Krystyna Yandola prepared the draft of the manuscript. All authors approved the final version of the manuscript.

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