AI IN DIGITAL TRANSFORMATION OF HIGHER EDUCATION IN UKRAINE: LITERACY IN FOCUS

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Abstract. The paper is devoted to overcoming undue address of practical use of AI in society and economy. Last 5 years the number of AI related publications has been growing in geometric progression with huge variety of issues raised which brings in the need for proper priority setting by inertial HE system, institutions, professionals and students. Smart development is one of best examples which could popularise the spread of AI wider usage in sectors of economy. There are challenges and promising areas of application of AI in HE identified in the paper. Finally, authors come to conclusion that it is vital to change the situation with AI literacy in global society.

Keywords: AI, higher education, learning process, adaptive learning platforms, integrity, smart development.

Introduction.

The advent of the Fourth Industrial Revolution has ushered in a new era of technological advancement, with Artificial Intelligence (AI) emerging as a transformative force across various sectors. AI, once a realm of science fiction, now stands poised to revolutionize the educational landscape. The integration of AI in higher education aligns with the broader global trend towards smart development, when technology is used to improve the quality of life, economic growth, and social well-being.

Ukraine, a nation striving for digital transformation, as many other countries, is actively exploring the potential of AI to enhance the quality and accessibility of higher education. The educational process has been changing dramatically over the past decade. And a significant impetus for such changes has been, among other things, the rapid spread of the use of AI by scientists, teachers, students, etc. In a broader context, this trend promises both significant benefits and significant problems for society, economy, law and culture.

Results.

Since the early 1970th when number of papers devoted and encompassing AI issues in education started to grow steadily till now the situation has changed dramatically. We have found about 8446 publications in the Scopus database devoted to AI in higher education, ¾ of which have got less than 6 citations. In the last decade the topic has been developing with ever highest rate with 60% of total number of publications becoming available since 2020. However, we must admit

that most cited papers were prepared before 2020 with few exceptions like paper by Cotton D., Cotton P. & Shipway J. (2024) gaining more than 585 citations in few weeks. This made us look at most important topics which have been brought around in last 5 years. So, a semantic map shows high level of interconnectedness of higher education and AI (figure 1.)

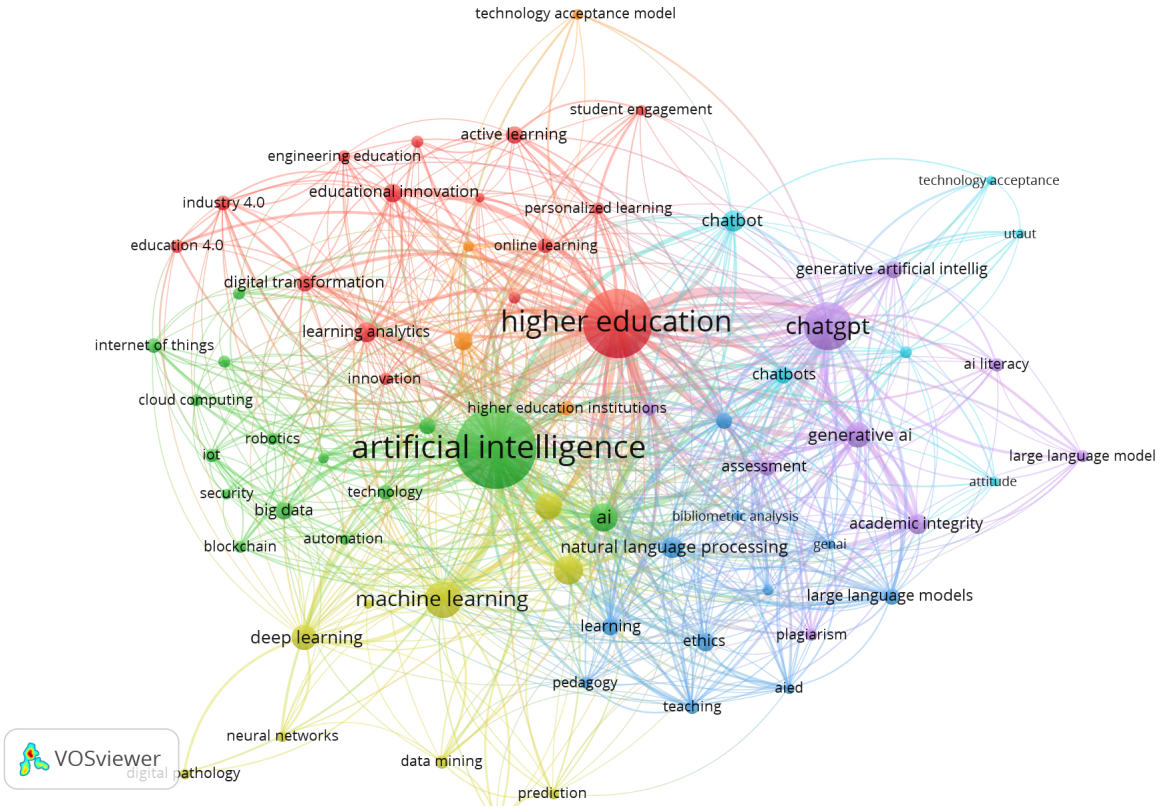

Fig. 1. *Semantic map of higher education and AI since 2019*
Source: authors compilation based on Scopus data and use of VOSviewer

Generative AI has become the main technology trend of 2023. It has not only covered the giants of the industry, but has also begun to play an important role in small companies, even those consisting of one person. In 2024, generative AI is even more actively used to process and integrate different types of data, such as text, images and audio, as well as to create analytics, project management and coding (AI and the global economy (2024)). According to estimates by the international consulting company McKinsey & Company, artificial intelligence programs could bring from USD 2.6 to 4.4 trl to the global economy annually (Chui & Yee (2023)). AI already provides:

- voice bots working in telephone support, capable of understanding the complex intentions of the subscriber (Mastercard (2024)). And thanks to integration with solutions such as ChatGPT, they can conduct increasingly relaxed conversations;

- industry cloud technologies, thanks to which companies exchange data to increase profits by selling information and at the same time benefit from the knowledge of other companies;
- comprehensive business automation in two directions: integrating business with artificial intelligence solutions and consolidating all business processes under one umbrella, which can be, for example, a modern ERP system;
- big data analytics. For example, Netflix uses AI to recommend movies to people based on their viewing history, and Uber to plan price lists and car routes based on demand analysis (Abraham & Edelman (2024));
- supporting business decision-making processes. For example, AI will help analyze market data to predict the potential or suggest a price for a new product; organize chaotic information into clear categories to help make decisions; assess all risk factors in a specific project;
- cybersecurity, which is becoming even more relevant due to new powerful threats associated with the development of AI, such as false information, new types of fraud and deep fakes. Surprisingly, it is AI that becomes the best defence against attacks, because by analyzing millions of fragments of information and detecting violations in them, it is able to detect threats and respond to them faster than a person (Mastercard (2024));
- the development of the Internet of Things. The volume of the IoT market in 2024 is predicted to be 19.2 billion connected devices (Sinha S. (2024));
- the metaworld (virtual space) as a place where high-profile technologies of recent years are used, such as NFT, augmented reality or blockchain. Among the most likely possibilities for its use are the functioning of distributed teams, the sale and exchange of virtual works of art, urban space planning, gamification, etc. (AI and the global economy (2024)).

In the Ukrainian media space, artificial intelligence was mentioned in the context of educational topics almost 10 thousand times in 2023, which is more than IT (8.5 thousand) or content creation (over 7 thousand), although it lags behind war (19 thousand) and the state (12.3 thousand). Despite the relatively small number of mentions, they have a significant potential reach - over 56 million (AI in Ukraine (2024)). The most frequently used words in publications were education, science, national, and language.

Early authors have been too optimistic on the use of AI in education. There many fields for possible automation have been defined as Chen L., Chen P., & Lin Z. (2020) showed, while many more, especially specific ones are to come. Like use of AI to deal with real-time data which would let avoid many future challenges (Gill S. etc. (2025)). Urban development could also benefit from building smarter cities (Yigitcanlar T. etc (2020)), especially those with high concentration of HE institutions. Othengrafen F., Sievers L., & Reinecke E. (2025) have identified at least the following fields where AI could impact smart development - mobility and transport optimisation, energy and infrastructure, public management, public health, and safety, real estate, urban planning, and land use policies. But they can

not effectively develop without proper integration with higher education and becoming learning institutions themselves.

AI can significantly change traditional education, making it more adapted, personalized and accessible to each student. Promising areas of application of AI in the education sector include:

- Formation of adaptive learning platforms that contribute to the individualization of learning, the spread of intelligent tutoring, simplification of foreign language learning, etc. In general, the market for AI assistants is expected to grow to $46 billion in the next four years (Mastercard (2024));
- Automation of routine functions (Shulikin D. (2024)), including assessment and analysis of learning outcomes, administrative processes (e.g., student registration, schedule management, reporting), language translation, etc.;
- Diversification of education by creating virtual learning spaces or simulations where students can study material in an interactive way. This can also be useful for students with disabilities. The augmented and mixed reality technology market is forecast to reach $620.2 billion by 2032 (Mastercard (2024));
- Improving interaction with students: helping to access education in remote or underdeveloped areas; providing access to online courses, interactive materials and video lessons; analyzing the emotional state of students by tracking facial expressions, tone of voice or texts, which will help the teacher better understand the needs of students and, if necessary, provide them with support;
- Improving the content of education by: providing teachers with recommendations on teaching methods; helping to analyze student performance; analyzing feedback from students and improving based on this educational content (automatically improving tests, assignments or even creating personalized textbooks).

Many authors, like Vinothkumar & Karunamurthy (2023) call on responsible AI development to harness its transformative potential while safeguarding ethical considerations. In different sectors of HE the aptitude to AI use differ. In healthcare Sallam (2023) called to adopt code of conduct of AI in order proper use both in academia and practice. But what is even more important is that only those who could raise capital to fund the transformations will be able to get the rent. As Krstić L., Aleksić V. & Krstić M. (2022) said there is a need for a wave of investments.

That is, ideally in our dreams at the moment, thanks to AI, teachers will work easier and more productively, while students will learn more interestingly and, again, the results of such education will grow steadily. However, in today's realities, participants who use AI in the educational process face a wide range of limitations, problems, and risks:

1. Effective use of AI requires highly qualified teachers and high-quality educational materials.

1.1. Teacher training. Teachers may not be sufficiently qualified to effectively use AI in education. Therefore, they need advanced training and support to apply the technology to the maximum effect.

1.2. Adaptation of curricula. The implementation of AI requires updating curricula and methodologies, which is a complex and costly process. In addition, school systems and content must constantly adapt to changing technologies.

2. The dependence of participants in the educational process on technology increases.

2.1. Technical failures. When using AI in education, the negative impact on the educational process of technical failures or infrastructure problems increases, especially in the case of distance learning.

2.2. Technical inequality. Not all students or educational institutions have comprehensive access to the necessary technologies, which can lead to a digital divide. This creates unfair conditions for learning.

3. Ambiguous psychological and social consequences of excessive automation.

3.1. Decreased social skills. Excessive automation can lead to a decrease in live communication between students and teachers, which impairs the development of social skills, emotional intelligence and the ability to cooperate.

3.2. Limited creativity of artificial intelligence. AI is able to effectively help with the reproduction of existing knowledge, but it is ineffective in performing creative or non-standard tasks. The lack of human intuition and creativity can be a limitation for certain educational situations.

3.3. Teacher replacement. While AI can help in personalizing learning, there are concerns about replacing people in the educational process, which could lead to job losses or a reduction in the role of the teacher.

4. Moral and ethical aspects.

4.1. Opacity of algorithms. The algorithms on which AI systems are based are often complex and opaque. This makes it difficult to understand the logic of decision-making (e.g. regarding assessment) and reduces trust in AI.

4.2. Creation of biases. AI can reflect or even reinforce biases in educational materials or assessment algorithms. This will potentially lead to unequal opportunities for students from different social, ethnic or cultural groups.

4.3. Collection and processing of personal data. The use of AI requires the processing of large amounts of data about students, which raises privacy concerns (Shulikin D. (2024)). Data on students' performance, behavior, even emotional state can be vulnerable to leaks or abuse.

5. Potential for abuse and manipulation.

5.1. Impact on academic assessment. AI algorithms can influence assessments and decision-making, facilitating manipulation. For example, automated test scoring systems may bias student work.

5.2. Plagiarism. Using chatbots to assist in learning can facilitate plagiarism or the use of automated decisions, which reduces academic integrity (Rudolph J., Tan S., & Tan S. (2023)).

5.3. Legal plagiarism. AI helps to quickly create texts that look original, but are actually based on existing ideas or phrases. Therefore, students often use AI to write papers without adding their own original ideas or proper citations. In

addition, AI does not have built-in mechanisms to check whether a particular text is original or has already been used by someone else. This puts users in a situation where they may not realize that their text is actually plagiarized because it is very similar to other works.

On the other hand, it is not only automation HE system should think about. There global and basic points of view on this. The global one is about sustainability issues where AI could help both with overcoming global problems and reaching SDGoals. Global society should think in detail how to make best use of AI for this including global neural networks (Greif L. etc (2025)). However, AI competency and literacy is probably more vital topics for the whole suitability of society and there is a need to spread AI literacy on all spheres. Moreover, ss indicated by Ng, D. etc. (2021) the deployment of AI literacy may call the need to change literacy definition which is traditionally used. The AI Competency Framework for Teachers offered recently by UNESCO is one of best practices in this filed which could become basic for higher education (Cukurova, M., & Miao, F. (2024)).

Conclusions. AI has inevitably come into our lives. And it can only be about how to maximize the corresponding benefits while minimizing the real harm and potential risks. So far, the great prospects for the application of AI in education are balanced by significant requirements for additional training of participants in the educational process and significant disadvantages of unqualified or malicious use. The outlined problems require the development of more ethical, transparent and inclusive artificial intelligence systems, as well as proper training and support for teachers and students. In fact every member of global society will face the challenge of proper use of AI.

The successful implementation of AI in higher education requires careful planning, adequate resources, and a strong commitment to ethical principles. As Ukraine aligns its educational strategy with global trends in smart development, it is essential to address the challenges and opportunities associated with AI, such as data privacy, algorithmic bias, job displacement, infrastructure and support systems.

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