ARTIFICIAL INTELLIGENCE IN EDUCATION: TOOL, OBJECT, "SUBJECT" OF LEARNING

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Abstract. The active development of innovative technologies led to the introduction of artificial intelligence in all spheres of human activity, particularly, in education. As an educational technology, artificial intelligence integrates social, cultural, pedagogical, and legal aspects of application, thereby opening up new opportunities for learning and generating knowledge. At the same time, education faces new problems and challenges, one of which is determining the role of artificial intelligence in the generation of knowledge. The article analyzes the main representations of artificial intelligence in education: as a tool of education, an object of learning, and a "simulative subject". In the complex system of "artificial intelligence & education & knowledge", representations of artificial intelligence are considered evolving and becoming more complicated by overcoming contradictions embedded in systems. To understand the impact of artificial intelligence on education, its features as a tool of education and as an object of learning are revealed, and productivity and problems that arise are clarified. Special attention is paid to the status of AI as a "simulative subject" in education, whose role in the transformation of "knowledge" into "understanding" is determined by the human teacher. The interdisciplinary theoretical base is represented by studies of thinking, knowledge, and education as complex systems. A phenomenological approach was used to justify the content of learning as a transformation of knowledge into meaning and understanding of the teacher's role in digital education.

Keywords: education, artificial intelligence, learning tool, the object of learning, "subject" of education, knowledge, understanding.

INTRODUCTION

In the era of globalization changes, clickbait headlines about artificial intelligence (AI) appear almost daily in the media, such as "What can artificial intelligence do to the world?", "Seven professions that may disappear due to artificial intelligence" or generally: "In The USA drone controlled by artificial intelligence "killed" its operator" (although in reality the person was not injured). In addition to publications in the mass media, there are scientific discussions about the use of AI and its role and impact on people, the results of which are published in scientific publications, and materials of international conferences. In this regard, the activity of the International Society IAIED, which is aimed at the development of science and technology of intellectual ecosystems of people and technologies in education, is indicative in this regard (IAIED, 2023, July 3-7). International conferences of IAIED (the 24th conference was held in July 2023) demonstrate high-quality innovative research on systems with the support of artificial intelligence and cognitive scientific approaches for the development and improvement of education.

Strategic directions are determined by the «Beijing Consensus on Artificial Intelligence and Education», which states that the development of AI should be carried out under human control and be oriented toward people, meet people's interests, and be able to enhance their potential (UNESCO, 2019). It is specifically emphasized that «... personal interaction and cooperation between teachers and students must remain a central element of education, ... teachers cannot be replaced by machines...» (UNESCO, 2019). Despite the encouraging provisions of the «Beijing Consensus», the main attention of researchers is still focused on the possibilities of artificial intelligence. The question "Why can't the teacher be replaced by machines?" remains open.

This indicates the relevance of the problem of the active introduction of AI into human life, interest in the relationship between humans and AI, but publications in the mass media speak of fears of this phenomenon, caused by certain dangers and limited knowledge about AI, and insufficient scientific awareness of this issue among broad sections of the population.

The Concept of artificial intelligence development in Ukraine, which corresponds to the principles of the European policy on AI, notes «a low level of digital literacy, public awareness of the general aspects, opportunities, risks and safety of the use of artificial intelligence» (The concept of artificial intelligence development in Ukraine, 2020). The solution to these problems depends on education, in particular, the need is emphasized:

- training of qualified specialists in the field of AI;
- improvement of the educational and methodological base;
- spread of digital literacy (including media literacy and information hygiene);
- creation of specialized artificial intelligence educational programs within the field of «Information Technologies», the inclusion of artificial intelligence issues in other educational programs from various specialties, creation of interdisciplinary, including joint, master, and doctoral programs;
- integration of leading online courses on the subject of artificial intelligence into educational programs;
- support/stimulation of scientific cooperation with international research centers and organization of events for the exchange of professional experience, etc. (The concept of artificial intelligence development in Ukraine, 2020).

As we can see, a significant role in the implementation of AI rests on education. Undoubtedly, these and other important tasks of education defined in the Concept will contribute to the development of artificial intelligence in Ukraine, but the question remains: how far are we ready to allow AI in the process of learning and interaction with students? Will AI reduce the value of knowledge, learning, and education? These and other questions can be combined into a single problem area of "artificial intelligence & education & knowledge".

MATERIALS AND METHODS

The interdisciplinary theoretical base is represented by studies of thinking, knowledge, and education as complex systems, the development and complications of which occur through overcoming internal contradictions caused by the use of artificial intelligence. A phenomenological approach was used to justify the content of learning as a transformation of knowledge into meaning and understanding of the teacher's role in digital education

RESULTS AND DISCUSSION

Because «artificial intelligence in education (AIEd) opens new opportunities, potentials, and challenges in educational practices» (Ouyang and Jiao, 2021), this issue needs thorough consideration. At the first stage of our reasoning, an analysis of the main representations of artificial intelligence in modern scientific research is presented.

Artificial intelligence as a tool of education. In the vast majority of scientific works of Ukrainian scientists, AI is considered an educational toolkit (Marienko and Kovalenko, 2023). I. Viznyuk, N. Buhlai, L. Kutsak, A. Polishchuk, V. Kylyvnyk, et al. highlight the issue of the implementation of information and communication technologies in education. By distinguishing three main paradigms of attitudes towards the renewal of education in Ukraine: 1) technocratic (unites those who avoid any discussion about school change); 2) reformist (brings together scientists who consider AI as an educational tool); 3) holistic (unites scientists who investigate socio-cultural problems), they dwell precisely on the forms and technologies of modern education and the need to master them (Viznyuk et al., 2021:15). This is due to the global transformations taking place in the world in recent years. The introduction of global lockdowns and military aggression against Ukraine has increased the demand for e-learning and expanded the possibilities of AI in the education sector. In the conditions of online and mixed learning, digital technologies in education have acquired the status of basic. A sign of the new education was the active implementation of AI: electronic textbooks, chatbots, educational platforms, in particular Zomm, mobile applications, GNMT - Google's neural machine translation service, and others. They are constantly updated. Artificial intelligence has demonstrated the ability to successfully determine whether a learner has given the correct answer; and detect the psychological state of students (for example, boredom, disappointment, sadness). Computer-based feedback systems that offer immediate help in the form of answers to questions are widely used by students and teachers in higher education. However, according to the conclusions of a meta-analysis of intelligent learning technologies by American scientists, feedback in most such systems is provided evenly, without taking into account the needs and difficulties of individual learners. And because such feedback focuses on improving students' general cognition rather than the specific higher-order thinking skills required for scientific writing

(Belland et al., 2017), there is a need for a new type of feedback support, which is not aimed at the consumption of ready-made information, which is not always correct, but at the development of critical thinking. This form of communication with AI will allow students to activate their mental abilities, and help them use their knowledge to provide convincing and reasoned answers to an authentic/difficult educational task. AI is thought to be able to provide this type of assistance through the many opportunities STEM education offers.

The practice has shown that thanks to AI, education has become globally accessible to all learners, even if they have certain disabilities, communicate in different languages, or are at a great distance from each other.

The positive qualities of AI as an educational tool are considered, as a rule, within the educational process of a certain institutional group (school class, educational group, etc.), but the educational process involves not only a collective form of education but, first of all, an opportunity for a student to achieve a personal educational goal, for example, obtaining certain knowledge, developing one's creative abilities, forming a personal value space, etc. Therefore, we single out help in self-education as a positive ability of AI.

Even though artificial intelligence has demonstrated its significant potential as an educational tool in various formats, we must pay attention to the problematic aspects of the application of AI in education. AI is developing at an extremely fast pace, and education does not have time to cover all the potential changes associated with it. Researchers note that although AI integrates advanced computing technologies and information processing methods in education, it does not guarantee good educational results and high quality of education (Castañeda and Selwyn, 2018).

At this time, the issues of providing meaningful and high-quality education are still unresolved. First of all, they manifest themselves at the level of communication. In communication with AI, according to our observations, certain difficulties arise for those seeking education, caused by the inability to formulate the question of the request, which leads to an ineffective search for information. Therefore, the issue of forming a culture of logical dialogic communication, and the need for educational courses aimed at teaching precise and clear formulation of requests is becoming an actual issue on the agenda of modern education. In addition, certain difficulties in communication with AI are caused by terminological uncertainty, which many researchers talk about. Analyzing this situation, Pelánek, R. concludes that «educational technology terminology is messy. The same meaning is often expressed using several terms. More confusingly, some terms are used with several meanings. This state is unfortunate, as it makes both research and development more difficult» (Pelánek, 2022:151). We believe that this also complicates the legal regulation of AI. And it is. How should AI students work, let alone lawyers or other specialists, if, for example, 139 definitions of the concept of the Internet of Things (IoT) have been recorded in world scientific and journalistic publications and documents since 1999? Moreover, it is represented by a significant number of synonyms: «Concepts generally included in the IoT vision strongly relate to visions under other names such as Web of Things, Web of Goods, Internet of Everything, and Cloud of Things, while other concepts including Cyber Physical Systems (CPS), Industry 4.0, Machine to Machine Communications (M2M), System of Systems (SoS), and Made in China 2025 closely relates to IoT but should be considered as part of or complementary to the IoT» (Lapenna Sergio, 2022). Else «terminology is particularly

important in the case of personalization techniques, where the nuances of meaning are often crucial» (Pelánek, 2022:151). Today, we are forced to state that even when using the concept of artificial intelligence, teachers and students attach completely different meanings to it. Due to the wide range of representations of the concept of AI, scientists can adhere to different points of view on its content. Also, its meaning varies depending on the field of knowledge in which this concept is used, which inhibits the overall understanding of the role of AI in education. And, as a result, scientists state that «shortly, any significant unification of terminology does not seem feasible. A realistic and still very useful step forward is to make the terminology used in individual research papers more explicit» (Pelánek, 2022:151).

New technologies also change the approach to teaching. More opportunities to activate the visual perception of information, for example, with the help of presentations. In addition, the sufficiently large potential of AI to improve the teacher's work is considered, because AI can take over the functions of evaluating learning results, and relieve teachers from the preparation of certain documents. Some elements and systems are already commonplace in our lives, for example, external examinations or the «Deanery» system in higher education institutions of Ukraine, but some, for example, holograms of teachers, robots with which they offer to replace living people, are still perceived as somewhat fantastic and far away But, if we take into account the funds invested by other countries in the development of AI and its introduction into our lives (for example, China, which currently ranks second in the development of AI after the USA, and plans to achieve a leadership position by 2025, accumulating in fundamental industry is 60 billion dollars, in related ones - 745 billion, and by 2030 such a percentage will be 150 billion dollars and - 1.5 trillion dollars, respectively), then such a development may occur shortly. Therefore, we must take into account all the potential dangers of relations with AI.

One of the dangers of working with technology is the lack of personal communication. More and more often, communication is not with people with the help of AI, but directly with AI, which can lead to social and psychological maladaptation.

Another «common problem is the lack of seamless communication or synergistic human-computer interaction. This interaction is complex because neither the learner's information and data nor the state of the system is static or simple. Both have a complex hierarchical structure and both change dynamically during the learning process» (Ouyang and Jiao, 2021). Ouyang F., Jiao P. In this regard, F. Ouyang and P. Jiao propose to create an opportunity for «an artificial intelligence system to support the continuous collection and analysis of learner-generated data and provide learners with real-time research opportunities to adopt learning decisions» (Ouyang and Jiao, 2021). They consider it «critical that AI systems offer real-time data analysis and immediate feedback to the learner, and that the learner can use this feedback to improve current learning processes» (Ouyang and Jiao, 2021). But here again, the question of the legality of collecting such information (especially from minors) arises, because currently there are still no mechanisms for the legal regulation of such moments.

Among the problematic issues of the educational and scientific space today, the question of raising the professional level of teachers and educational and methodological support of the educational process has emerged acutely. At first glance, everything here is clear, because AI creates opportunities for increasing the professional growth of teachers, in particular

through online participation in internships and scientific events - international conferences, are an auxiliary means for acquiring new knowledge. Digital technologies help authors of scientific articles to check for uniqueness and grammatical errors. At the same time, some innovations cause discussions. First of all, they relate to the possibility of generating scientific texts by artificial intelligence, and therefore to the problem of plagiarism, and more broadly to academic integrity. For education as a whole, this endangers the very essence of knowledge and the content of education.

Leading scientific publishing houses are also concerned about this problem. Thus, representatives of the Elsevier publishing house stated that AI cannot be credited as an author and that its use must be properly identified. The editors-in-chief of Nature and Science hold the same opinion (Liebrenz, 2023). In addition, there is the question of legal liability: who will be responsible if AI-generated articles contain inaccurate, false information or violate the principles of scientific ethics? In this regard, in March 2023, Elon Musk and many other experts in the artificial intelligence industry called for a six-month break in the work on the further development of AI to develop security protocols and create a legal framework in this field.

Artificial intelligence is an object of study. To understand the functioning of AI as a learning tool, it is advisable to find out the specifics of learning AI itself.

From the very beginning, «the phenomenon of artificial intelligence is connected with the beginning of the development of computer technologies and its awareness from the standpoint of cognitivism: as a tool for understanding the process of learning people with a further focus on the development of AI» (Varynskyi, 2023:302). Therefore, the first developers of artificial intelligence, John McCarthy, Allen Newell, Herbert Simon, Alan Turing, and others, focused on software that needed to identify the intellectual abilities of a person in their linguistic embodiment to be able to "imitate" similar ones by a machine, finding similarities and differences between the activities of the program and a human subject. Focusing on AI, they focused their efforts on creating a program that could explain and run programs, and ask and answer questions. The first programs were classified as simple, because they lacked the element of thinking, and provision and imitation, which were the main goals, are not analogs of the concept of education.

Over time, the programs became more and more complex. AI as a «learning object» was constantly improved. Updated theoretical principles combined with the availability of data and processing power have brought significant success in solving various, even very complex, tasks, such as speech recognition, image classification, autonomous vehicles, machine translation systems, and answering questions. As AI improved, the question arose: can we define such improvement as AI training or education? The concept of education is considered by scientists as a combination of knowledge and thinking, which is defined as «connective thinking». Dr. Dewey interprets «education as the scientific method through which man studies the world, acquires cumulatively knowledge of meanings and values, these outcomes, however, being data for critical study and intelligent living» (Dewey, 1986, 5). Consequently, education must employ progressive organization of subject- matter so that the understanding of this subject matter may illumine the meaning and suffice of the problems. Scientific study leads to and enlarges experience, but this experience is educative only to the degree that it rests upon the continuity of significant knowledge and to the

degree that this knowledge modifies or "modulates" the learner's outlook, attitude, and skill. The true learning situation, then, has longitudinal and lateral dimensions. It is both historical and social (Dewey, 1986:5). The specified characteristics are also reflected in the encyclopedic definition: «Education is the process and result of a person's assimilation of a certain system of sciences, knowledge, practical abilities, and skills and related to this or that level of development of his mental, cognitive and creative activity, as well as moral and aesthetic cultures, which in their totality determine the social face and individual uniqueness of this personality» (Honcharenko, 2008:616).

So, at the center of education is a person who is learning, and if it is incorrect to think about the education of AI, then the training of smart machines (Machine Learning) certainly takes place. AI «learns» in the process of long-term selection of the necessary option for solving the tasks assigned to it and is therefore able to recognize and eliminate familiar problems in a rather narrow range. A person learns in a fundamentally different way - he creates and searches for solutions to problems in a space not limited by instrumental rationality. In addition, if a robot has ever acquired an ability, it can be easily extended to other robots. Education and training of a person is a complex process of social and cultural inheritance, preparation for life and work in specific, but changing socio-cultural contexts. (Kultaieva, 2020:24). Therefore, AI training is a purely informational process, while human training is the assimilation and generation of knowledge, which «is included in the process of producing values and meanings of human existence, helps to achieve a state of understanding» (Donnikova and Kryvtsova, 2019:33).

Education is a specific sphere of human self-realization, in which learning is carried out through intellectual search, and knowledge is filled with personal meanings that encourage a person to self-realize (Donnikova and Kryvtsova, 2020:23). But the spread of digital education with the use of highly intelligent technologies threatens to turn learning into a simulation because, in the educational process, AI begins to act as an active, capable of communication and self-learning, subject of education.

Artificial intelligence is a «subject» of education. Most educators treat AI as an educational tool, but the functions of AI will continue to become more complex, radically changing the very essence of education. From a means of teaching and learning, it can turn into a full-fledged subject of the educational process, from an intermediary between a teacher and a student - into a subject that teaches both the teacher and the student. The situation is such that digital education can fill the educational space, which is structured through personal communication between the teacher and the student.

The success and at the same time the danger of artificial intelligence as an educational technology is determined by simulation - a technology embedded in AI, with the help of which it transforms pedagogical relations into «relations between autonomous subjects... but only in the form of simulation» (Kultaieva, 2020:26). About the successful expansion of artificial intelligence is evidenced by the appearance of homo digitalis - a person who feels very comfortable in the world of simulations. At the same time, he has lost his ability to compare with the ideals of education of past centuries and boasts not of erudition, but of diplomas and certificates that can be announced on the networks (Kultaieva, 2020:19).

The high quality of the simulations is reinforced by the language with which the AI demonstrates signs of «subjectivity». The word that carries meaning has always been the

«meeting place» of the teacher's wisdom and the student's personal life meanings awakened by his mastery. As an AI tool, the word gives it another simulation – the function of a teacher. The classical culture of writing is replaced by its digital literacy, in which the skills of working with information push the content of this work to the background. As E. Moren points out, a person has learned to operate with large amounts of information but has not sufficiently developed the ability to understand it and place it in context. Modern knowledge breaks the complex structure of reality and causes global misunderstanding and ineffectiveness of human actions. Separate, isolated thinking should be replaced by thinking of establishing connections, thinking that makes it possible «to perceive and conceive the Context, the Global (the whole/parts relation), the Multidimensional, the Complex» (Morin, 2001:29).

Artificial intelligence thus functions in education as a "simulative subject", which, nevertheless, becomes a serious competitor to the human teacher. But the situation is not so critical. Already at the stage of active implementation of AI in education, there is an understanding that there are problems that cannot be solved without a human teacher. In particular, it is about the organization of multicultural education, which takes into account the national, religious characteristics, and gender differences of the subjects of education; about the motivational provision of education; development of critical, creative thinking, ability to think, understand educational material; psychological and emotional support for learning, development of communicative interaction and skills, etc. (Kabashkin and Misnevs, and Puptsau, 2023:213). They mainly mean "soft skills", the need which gives the teacher and lecturer a chance to turn the situation of "challenge" into a situation of "competition/ collaboration" with AI. But if we go beyond the purely competence approach, we must admit that in the process of transforming information into knowledge, and knowledge into understanding, a key role is played by live communication between the teacher and the student.

In order not to turn into a simulation, modern high-tech education needs a person-teacher of a new generation, who is an intermediary between different levels of intellectual culture (including digital), combines the roles of researcher, teacher, mentor, manager, and at the same time remains «eternal student». The teacher does not imitate the search for truth but reveals to the students the process of the birth of thought and knowledge, searches for meaning, doubts, mistakes, and discusses (Donnikova and Kryvtsova, 2020:44). Understanding cannot be imitated, just as understanding cannot be taught, even with the help of the most modern information technologies, because, in addition to thinking, it is always an experience, a certain type of empathy, and therefore a way to achieve the unity of a person with the world.

As a «simulative subject», AI can be an assistant to a human teacher in awakening thinking, while remaining a competitor in the speed of processing large volumes of information. Man is responsible for its further transformations.

CONCLUSION

Investigating the impact of AI on education and knowledge generation, we discovered both positive aspects and problematic points that need to be resolved as soon as possible.

Among the main positive trends in the use of AI in education, we note:

1. active implementation of AI in education - electronic textbooks, chatbots, educational platforms, in particular, Zomm, mobile applications, GNMT - Google's neural machine translation service, and others;
2. AI capabilities to integrate advanced computing technologies and information processing methods in education;
3. global accessibility of AI for all learners, even if they have certain disabilities, communicate in different languages, or are at a great distance from each other;
4. opportunities for students and teachers to use computer feedback systems, which offer immediate help in the form of answers to questions, improve the general knowledge of students and pupils;
5. automatic translation capabilities;
6. AI capabilities for achieving a personal educational goal: from obtaining certain knowledge, and developing one's creative abilities to forming a personal value space;
7. AI capabilities to enhance the visual perception of information, for example, in the form of presentations;
8. the great potential of AI to improve the work of the teacher (AI can take over the functions of evaluating learning results, and relieve teachers from the preparation of certain documents);
9. creating opportunities to improve the level of education of teachers, in particular through online participation in internships and scientific events — international conferences;
10. as an aid in checking for grammatical errors and uniqueness.

Despite the numerous positive characteristics of the use of AI in education, some problematic points in the use of AI in education were identified, which require further interdisciplinary research:

1. AI is developing at an extremely fast pace, and education does not have time to cover all the potential changes associated with it;
2. insufficient number of qualified specialists in the field of AI;
3. low level of digital literacy;
4. insufficient educational and methodological base;
5. the wide variety of definitions, and the vagueness of the concepts of AI complicates both research and development of the implementation of AI in education and the issue of its legal regulation;
6. lack of synergistic human-computer interaction;
7. AI is deprived of value-oriented knowledge aimed at self-realization in the world;
8. lack of personal communication can lead to social and psychological maladaptation;
9. the possibility of obtaining a quick answer to a question inhibits the development of critical thinking related to the analysis and synthesis necessary for interpretation, justification, generalization, and putting forward ideas, and hypotheses, for carrying out scientific research;
10. communication problems with AI caused by the inability to formulate the question of the request;
11. the problem of generating AI scientific works;
12. the question of legal liability: who will be liable if the AI-generated articles contain inaccurate, false, or unethical information;

13. the problem of the legality of information collection, the issue of developing mechanisms for legal regulation of such points, and other related issues.

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