

## **ARTIFICIAL INTELLIGENCE IN THE SYSTEM OF DIDACTIC CULTURE OF POSTGRADUATE STUDENTS AND TEACHERS**

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### **INTRODUCTION**

When analyzing the problem of science, three of its main functions are traditionally distinguished: descriptive, causal, and predictive. The events of recent years have increased the attention of researchers to the third aspect. It can be stated with regret that modern pedagogy is not keeping up with the dynamics of change. This was manifested during the pandemic and distance learning, the war in Ukraine, the modernization of didactic culture, qualitative changes in computer systems, the pinnacle of which today has become artificial (or better to say computer) intelligence. The experience of other countries is not sufficiently used. For example, the “Report on Intellectual Capital” (Sweden – 1999, Israel – 2000, Taiwan – 2003, Poland – 2008) became an important document for changes in education. Polish researchers draw attention to the fact that the concept of “intellectual capital” was first used by economists in 1969. Although this issue requires further study. Management begins with objective diagnostics. The aforementioned “Report on the Intellectual Capital of Poland” based on international statistical data clearly traced the trends of advantages and disadvantages from birth to old age. As for the planned changes, the first place was taken by a more effective family policy (currently, parents receive PLN 800 per month for each child until adulthood), and the second was “improving the quality of education”. PISA program also showed the level of individual countries, outlined priorities for educational systems. Note that if since 2000 there were three priority areas: reading and understanding the text, mathematics, natural sciences, then from 2025 experts added two more priorities, namely financial literacy and creativity. It is no coincidence that books with the title “Didactics of Creativity” are gradually beginning to occupy one of the leading places. At the time of writing the history of didactics. For example, the outstanding teacher Heinrich Rovid, back in 1926, published the book “Creative School”. All of the above is directly related to the didactics of higher education. Without qualitative changes in universities, changes will not occur in other areas. Note the need for a systemic approach to solving the problem. For example, in the PRC, systematic familiarization with the features of artificial intelligence begins with primary school.

The dynamics of changes in Ukraine are of interest. At the first stage, theoretical works of a general direction were published, corresponding to European traditions. The transition to a qualitatively higher level was important after the appearance of works with the eloquent title “Digital Pedagogy”. The next stage was the emergence of regulatory documents at the government and ministerial levels. In 2020, the Cabinet of Ministers of Ukraine approved the “Concept for the Development of Artificial Intelligence in Ukraine until 2030”.

Holding scientific and methodological conferences contributed to the exchange of experience in finding new approaches to using artificial intelligence in the educational process. In June 2023, a round table “Using Artificial Intelligence in Education: ChatGPT and More” was held.

In March 2024, an important international conference “Artificial Intelligence in Science and Education” (AISE 2024) was held in Kyiv. A master class “GPT- store. AI services in education” was held. The resolution of the conference participants was important for science and practice: “I. During 2024–2025, it is necessary to conduct a number of scientific and educational activities on various aspects of the application of artificial intelligence for: scientific research, education of schoolchildren, students, advanced training of scientific, pedagogical and scientific and pedagogical workers. II. It is important to conduct a number of scientific research, both fundamental and applied, on various aspects of the application of artificial intelligence for scientific and educational purposes, in particular: the application of artificial intelligence to process large volumes of data for various fields of knowledge (economics, medicine, sociology, psychology, ecology, etc.); implementation of artificial intelligence in information and analytical, information and reference, search systems for various fields of knowledge; development of critical and scientific thinking of education seekers with the use of AI; advanced training of scientific, scientific and pedagogical and pedagogical workers in the application of artificial intelligence in professional activities; training and advanced training of scientific, scientific and pedagogical and pedagogical workers in the use of artificial intelligence in work with education seekers; use of artificial intelligence to ensure inclusion and special educational needs. III. Areas of application of AI for educational purposes: 1) individualization of the educational process. AI programs can analyze the level of knowledge and needs of each individual education seeker and offer personalized materials and recommendations. AI can be used to create interactive educational materials (exercises, tests, questionnaires); 2) gamification of the educational process. AI programs can be used to create interactive educational games and function as virtual characters or guides that interact with players and provide explanations and tasks; 3) automation of checking educational tasks.

AI platforms can be used to automatically check and evaluate the tasks of education seekers. Certain AI programs can analyze the answers of education seekers and compare them with samples of correct answers, which will help reduce the time spent by teachers (lecturers); 4) improvement of educational communication and mentoring. AI platforms can be used to improve communication between participants in the educational process. Language models, in particular Chat GPT, can act as a mentor, providing assistance to education seekers in various subjects. Virtual assistants can answer questions, provide examples, and also solve tasks together with education seekers; 5) information support for the teacher (teacher): AI language models can help teachers (teachers) generate ideas for lessons (lectures, practical classes, etc.), materials and tasks. AI can help create interesting scenarios, answers to questions and tasks for different subjects. IV. The use of AI in teaching learners should be carefully designed and maintain a balance between technology and human interaction. Teachers and lecturers should play an important role in supporting and collaborating with pupils/students, and AI should serve as a tool to improve learning and develop learners' skills."<sup>1</sup>

Employees of the Institute for Digitalization of Education of the National Academy of Pedagogical Sciences of Ukraine, together with universities, held the II International Scientific Conference "Artificial Intelligence in Science and Education" (AISE 2025) on April 15, 2025. The tradition of holding master classes during the conference is becoming promising "Using Generative AI Tools in Scientific and Pedagogical Activities", "Fundamentals of Using Generative Artificial Intelligence to Develop an AI Application". The names of the four sections are eloquent: artificial intelligence in education; artificial intelligence in science; artificial intelligence in economics; neural networks and machine learning.

In October 2024, a scientific and practical conference "The World of Didactics: Didactics in the Modern World" was held. Many reports mention computer technologies and their role in the educational process. Regarding AI, let us name a few materials: A.V. Ozarchuk "Artificial Intelligence as a Driver of the Transformation of the Educational Process", S.I. Ryabets "Didactic Potential of Artificial Intelligence", O.Ya. Stoyka "Integration of Artificial Intelligence into the Educational Process: Theoretical Principles and Prospects for Implementation".

Let's pay attention to the names of conferences in Ukraine in recent years: "AI Conf 2025", "Informatics, Management and Artificial Intelligence", "Artificial Intelligence for Sustainable Development", "Educational

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<sup>1</sup> Штучний інтелект у науці та освіті (AISE 2024). Artificial intelligence in science and education : збірник матеріалів міжнародної наукової конференції (Київ, 1–2 березня 2024 р.) [Електронний ресурс] / [упоряд: А. Яцишин, В. Матусевич, В. Коваленко]. Київ : УкрІНТЕІ, 2024. С. 591–592.

Robotics and Artificial Intelligence”, “ Immersive technologies in education” and others.

Public initiative is important. Among the most successful examples, we can name the work of members of the public organization “Ukrainian Club of Artificial Intelligence” (date of entry in the Unified State Register 17.08.2023). The authors have prepared a solid charter, analyze popular publications, in particular about GPT-5, the use of AI in business, benefits and threats to health, use in sports, culture, ethical issues, impact on the labor market, general trends.

Based on the above, we can conclude that the possibilities of artificial intelligence should be studied at a qualitatively higher systemic level with a gradual transition to the implementation of the tasks of the experts of the Club of Rome regarding integral thinking.

### **1. Didactic culture of participants in the educational process**

If we analyze the publications on the possibilities of AI, the concern for academic integrity and threats prevails, especially at the beginning. Our goal is to focus attention on the possibilities of artificial intelligence. To do this, we will use specific examples, emphasizing the relevance in the system of didactic culture of all participants in the educational process. “Student-centricity” is no better than its absence, belittling the role of the teacher.

In the preface to the book “The Scientific School of Professor Anatoly Vykrushch” on March 10, 2015, we proposed twenty promising, equally important monographic topics for further research. This list is quite interesting from the height of ten years of experience: 1. Regularities of development of educational systems (on the example of Ukraine and abroad. 2. Regularities of personality education. 3. Fundamentals of methodology of pedagogical science. 4. System of pedagogical concepts. 5. Pedagogy of creativity. 6. Pedagogical personology. 7. Regularities of mental education (on the example of boys and girls). 8. Mobbing and bullying in the student environment. 9. Pedology. 10. Pedagogical culture of higher school teachers. 11. Development of students’ creative abilities. 12. Pedagogy of success. 13. Pedagogy of old age and death. 14. Pedagogy of mourning. 15. Pedagogical culture of a professional. 16. Author’s pedagogical schools. 17. Ethnopedagogy of the Slavs. 18. Theoretical foundations of didactics. 19. Theoretical foundations of the history of pedagogy. 20. Pedagogy of religion<sup>2</sup>.

In 2025, we addressed a similar task to the artificial intelligence Perplexity. AI with a similar task.

The answer in a moment was as follows: 1. Using non-standard lessons to develop students’ creative abilities. 2. Introducing game technologies into

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<sup>2</sup> Наукова школа професора Анатолія Вихруща: Науково-популярне видання до ювілею. Тернопіль: art s. 2015. С. 8.

the educational process. 3. Humanizing the educational process as a means of preventing offenses by secondary school students. 4. Individualizing the educational process in educational institutions. 5. The role of the class teacher in the educational and cognitive activities of students. 6. Developing the teacher's communicative culture as a factor in pedagogical skill. 7. Forming empathy in schoolchildren in an inclusive environment. 8. Developing the emotional culture of schoolchildren using training technologies. 9. Forming tolerance in students through game technologies. 10. Forming a healthy lifestyle in schoolchildren using health-saving technologies. 11. Prevention of deviant behavior of students through collective creative activities. 12. Technological approach in education as a means of forming values of a healthy lifestyle. 13. Development of metacognitive skills in schoolchildren in the conditions of the New Ukrainian School. 14. Psychological and pedagogical principles of bullying as a social phenomenon. 15. Use of information and communication technologies to form digital competencies of schoolchildren. 16. Development of creative potential of future teachers. 17. Systemic approach in professional pedagogical education. 18. Pedagogization of professional education in the conditions of lifelong learning. 19. Formation of civic culture in the system of educational work. 20. Strategy and tactics of partner pedagogy as a priority direction of educational reform. We will not compare the innovation of the results. We will leave this for the readers. At the same time, we note that in the process of using "brainstorming" it would be interesting to compare the results of creative teams and AI. At least attempts at such work in student teams of Ternopil National Medical University showed the high effectiveness of such a competition.

This idea has its development. In 2025, we will complete work on the monograph "Regularities of the Development of Didactic Systems". In one of the final paragraphs, we named 16 promising didactic topics of the monographic level: 1. History of domestic didactics. 2. History of foreign didactics. 3. Authorial didactic systems. 4. Regularities of teaching. 5. Regularities of learning. 6. Theoretical foundations of the content of teaching. 7. Regularities of the development of teaching methods. 8. Didactics of creativity. 9. Information culture of the individual. 10. Didactics of higher education. 11. Integral thinking of the individual. 12. Questions in didactics: theory and practice. 13. Methodology of the "early scientific start". 14. Academic writing: theory and practice. 15. Didactic foundations of communication. 16. Scientific schools in didactics.

Obviously, we couldn't help but challenge artificial intelligence to a friendly competition. The Perplexity System AI answered: 1. Theory and methodology of modern didactic processes. 2. Organization of the educational process in conditions of martial law. 3. Compensation

for educational losses in conditions of war and in the post-war period. 4. Innovative approaches, technologies, models, techniques, methods and means of teaching. 5. Psychological and didactic problems of organizing education in the information society. 6. Trends in the development of modern didactics: foreign experience. 7. Transformational processes in education of the 21st century: distance and blended learning. 8. Formal, non-formal and informal education. 9. Professional training of future teachers using didactic systems. 10. Methods of forming students' emotional intelligence using training methods. 11. Use of game teaching methods in primary school. 12. Development of inclusive education in secondary schools. 13. Prevention of emotional burnout among students of pedagogical institutions. 14. Integrative-dial pedagogy in a modern school. 15. The use of pedagogical technologies based on the principles of integrative-dial pedagogy. 16. Modern approaches to designing the educational process taking into account innovative technologies.

It is obvious that this work must be continued. At least for now, a person wins the creative competition. This direction is important, because in the process of developing science, the value of an innovative topic increases. Innovative not by the “fashionable” use of a foreign word, but by its essence, depth, and importance for personal development. In order to at least approach the level of innovation to the level of the Socratic dialogue, which has become a true revolution in didactics.

To understand the capabilities of artificial intelligence in the context of reviewing scientific texts, we used a unique method. We directed the introductory part of our paragraph to Perplexity with a proposal to find three positive aspects and three shortcomings. Thus, readers have the opportunity to take a direct part in assessing the capabilities of AI. Let's consider the results. It should be noted that for decades, while teaching students, we emphasized the requirement to search primarily for positive features both when self-evaluating one's work and when evaluating the work of other people. If you want, this is a principle of the methodological level. Incidentally, we note that Ukrainian youth is prone to low self-esteem. This phenomenon requires in-depth study.

AI named the following three positive features of our introduction (we did not edit the text of the review): “1. Comprehensive overview of the topic. The text offers a broad and systematic coverage of the role of artificial intelligence (AI) in modern didactic culture, covering historical, methodological, normative and practical aspects. The author refers to both international experience (for example, PISA, Reports of different countries) and local Ukrainian initiatives, which creates a complete picture of the development of the topic. 2. Relevance and connection with modern events. The text takes into account the challenges of recent years – the pandemic, the war in Ukraine,

digital transformation – and shows that it is these factors that have pushed the educational sphere to actively implement AI. The mention of conferences, master classes and regulatory documents gives the work practical and relevant value. 3. Orientation to a systemic, comprehensive approach. The author emphasizes the need for interdisciplinary work, a systematic approach and integrated thinking, which emphasizes a deep understanding of the problem of complexity. Recommendations for further steps in scientific research and educational activities look thoughtful and promising. Such goodwill could not but touch the author, especially since in the scientific world, as well as in creativity, a good word is more the exception than the rule. But we were more interested in critical remarks. Especially since for a similar task in the past, AI found two true remarks, and simply “made up” the third. The text did not talk about this at all.

In this case, the experiment was more successful: “1. Overload of information. The text is named with numerous names of conferences, programs, regulatory documents and examples, which sometimes creates the impression of maximum detail and complicates the perception of the main ideas. The lack of a clearer structuring and delimitation of blocks can distract the reader’s attention. 2. Stylistic complexity and demonstration of smooth transitions. Local transitions between individual parts are sometimes too sharp. The use of terms is sometimes unstable – for example, in one place AI is correlated with “artificial”, and in the introduction it is specified as “computer intelligence”. There are also complex sentences with an excess of components, which complicates the perception of the text. 3. Limited disclosure of some key aspects. Although many facts and references are provided, some important issues remain at the list level. For example, the topic of integrating AI into teaching graduate students and teachers does not receive a deeper analysis of practical methods or challenges that may arise during the implementation process, which would make the text more coherent and convincing.” Pay attention to another feature. AI overdid the task, prepared a general conclusion: “The text is an informative and relevant review of current trends in the development of AI in the higher education system, in particular in aspects of didactic culture. It lacks greater structure and deeper practical experience, but it serves as a good basis for further research and discussions. “And also offered his services: “If necessary, I can help with editing or detailing individual parts.” What can be said at the level of preliminary generalizations. Such a methodology will allow researchers to improve the text, especially when it comes to shortcomings, to show students and graduate students examples of the correct use of AI for self-improvement.

We also conducted a kind of testing of AI's capabilities in solving creative tasks in poetry<sup>3</sup> and the psychology of loneliness<sup>4</sup>. The results are interesting, call for further research, and this is encouraging.

## **2. Prospects for using artificial intelligence in the educational process**

To assess the prospects, it is important to determine the level of achieved results and, based on them, try to outline theoretical and practical tasks. This is extremely necessary to do promptly, as artificial intelligence is becoming an everyday reality from school desks to new technologies for conducting information warfare and organizing combat operations using drones and robots.

First of all, we need to pay attention to management decisions. Without state support, the country is doomed to technological lag. Ukraine understands the relevance of this problem. For example, let's consider the document that the Cabinet of Ministers of Ukraine approved in December 2020. We mean the "Concept for the Development of Artificial Intelligence in Ukraine until 2030". It is worth noting that the authors went beyond the traditional state resolution, combining managerial, scientific, and methodological aspects. First, a definition of the main concept is proposed. Artificial intelligence is considered as "an organized set of information technologies, with the use of which it is possible to perform complex complex tasks by using a system of scientific research methods and algorithms for processing information obtained or independently created during work, as well as create and use your own knowledge bases, decision-making models, algorithms for working with information, and determine ways to achieve the set tasks"<sup>5</sup>.

It is obvious that the topic of defining the essence of this complex concept will still become the basis for scientific articles and monographs. In our opinion, the beginning of the definition is successful. But the final part is either superfluous or requires clarification. After all, the idea of achieving results "by using a system of scientific research methods and algorithms for processing information obtained or independently created during work, as well as creating and using one's own knowledge bases, decision-making models, algorithms for working with information and determining ways to achieve the set goals" characterizes any type of scientific activity.

For the first time in a document of this level, the authors not only recognized the importance of artificial intelligence for "the development of socio-economic, scientific and technical defence, legal and other activities

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<sup>3</sup> Вихрущ, А. В. Штучний інтелект і самотність: особистісний вимір. Закарпатські філологічні студії. 2024. Вип. 37. С. 298–305.

<sup>4</sup> Вихрущ А.В. Компютерний інтелект і ... творчість. *Studia methodologica*, 2025. No. 59. С. 79–89.

<sup>5</sup> Концепція розвитку штучного інтелекту в Україні. URL: <https://zakon.rada.gov.ua/laws/show/1556-2020-%D1%80#Text>.



in areas of national importance”, but also named the problems that need to be urgently resolved, which, strictly speaking, is the basis for understanding promising tasks, including in the field of education. For domestic researchers, the 17 named problems are a guide to action, and for foreign colleagues, they are an opportunity to compare priority tasks, use our experience, and offer their own additions. The list of problems is quite interesting: “low level of digital literacy, awareness of the population regarding general aspects, opportunities, risks and safety of using artificial intelligence; lack or imperfection of legal regulation of artificial intelligence (including in the areas of education, economy, public administration, cybersecurity, defence), as well as imperfection of legislation on the protection of personal data; low level of investment in the development of artificial intelligence technologies; low level of implementation and implementation by business entities of innovative projects using artificial intelligence technologies compared to leading countries in the world, which leads to a decrease in labour productivity and the emergence of a large percentage of jobs that need to be automated; low level of mathematical competence of graduates of general secondary education institutions, necessary for development and research in the field of artificial intelligence; insufficient level of quality of higher education and educational programs aimed at training specialists in the field of artificial intelligence in higher education institutions; lack of modern advanced training programs for teachers of higher education institutions in the field of artificial intelligence; low level of investment in conducting research on artificial intelligence in higher education institutions; lack of grant funding for scientific activities in the field of artificial intelligence; small number of publications in publications of leading industry conferences (CVPR\ICCV\ECCV – for computer vision, NeurIPS , ICML, ICLR – for machine learning, etc.) and leading peer-reviewed publications; insufficient level of information security and data protection in information and telecommunication systems of state bodies due to the obsolescence of automatic systems for detecting and assessing information threats, failure to use the potential for forecasting and anticipating threats in order to timely prepare the system for a possible attack; an increase in the number of attempts at unauthorized interference in the work of automated systems and computer networks; imperfection of management decision-making mechanisms in the public sphere, bureaucratization of the system for providing administrative services, limited access to information and its low quality, insufficient level of implementation of electronic document flow between state bodies, as well as a low degree of digitization of data owned by state bodies; difficulty in verifying the compliance of artificial intelligence systems with legislation and existing ethical principles; lack of unified approaches used in

determining ethical criteria during the development and use of artificial intelligence technologies for various industries, types of activity and spheres of the national economy; the presence of risks of increasing unemployment due to the use of artificial intelligence technologies; the lack of application of artificial intelligence technologies in judicial practice”<sup>6</sup>.

The second part of the Concept regarding the goal, principles, ways and means of solving the problem is less successful and not sufficiently specified.

In our opinion, a series of conceptual tasks are needed based on this document. In the context of the topic of our study, this should be the “Concept of Artificial Intelligence Development in the Higher Education System”, which would draw attention to the activities of teachers and students of all specialties, and heads of educational institutions. Finally, the authors of the concept identified 5 tasks for the sphere of higher education: “creation of specialized educational programs of artificial intelligence within the “Information Technologies” branch, inclusion of artificial intelligence issues in other educational programs in various specialties, creation of interdisciplinary, including joint, master’s and doctoral programs; involvement of specialists from the IT industry and other industries in the formation of qualification requirements for specialists in artificial intelligence, development and implementation of educational programs, certification of higher education applicants; integration of leading online courses on the topic of artificial intelligence into educational programs; “organizing and ensuring internships for IT teachers in IT companies, IT departments of enterprises and institutions, as well as public organizations that develop and apply artificial intelligence technologies; establishing international cooperation and programs of double and joint degrees in the field of artificial intelligence, including with foreign partners”<sup>7</sup>.

Practitioners feel the need for such a document. For example, by order of the rector in Chernihiv, the decision of the Academic Council of April 28, 2025 with the eloquent title Concept of introducing artificial intelligence into the educational process and scientific activities of the National University “Chernihiv Polytechnic” was put into effect. It is obvious that this is a task for the author teams of theorists and practitioners.

Taking into account the specifics of training students and postgraduates as future teachers, we will name several promising areas of further research, emphasizing that we are considering them in the context of didactic culture.

In modern science, the definition of a system of basic concepts remains a significant problem. We have repeatedly emphasized the need to define,

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<sup>6</sup> Концепція розвитку штучного інтелекту в Україні. URL: <https://zakon.rada.gov.ua/laws/show/1556-2020-%D1%80#Text>

<sup>7</sup> Ibid.

in compliance with the requirements of logic, such main groups as: person, individual, personality; regularity, system, science; word, concept, term, concept; upbringing, education, pedagogy; activity, development, creativity, etc. In the context of new realities, it is worth supplementing this list: information, intelligence, artificial intelligence. The following facts indicate the complexity of the problem. In 2021, the sixth All-Ukrainian scientific and methodological seminar “Conceptual and terminological apparatus of historical and pedagogical research: history and modern approaches” was held in Poltava. O.V. Sukhomlynska, who has long been a leading specialist in the methodology of the history of pedagogy, prepared a speech “On the question of the formation of Ukrainian pedagogical terminology: a historiographical aspect” in which she drew attention to the works of foreign scientists, who understand pedagogical terminology as “a system of lexical means and names used to describe the theory and practice of upbringing, teaching and education. In a narrow sense, it includes a set of terms that capture the most important concepts of pedagogical science” and came to the important conclusion that Ukrainian science does not even have a definition of the essence of “pedagogical terminology”<sup>8</sup>.

There are a number of inaccuracies in this definition by foreign researchers. First, the “system of lexical means and names” is inherent in any definition. Second, the definition is “deserted”. Third, the attempt to list “upbringing, teaching, education” is not entirely successful, since there is always the possibility of expanding the list. Fourth, the long-standing tradition of considering pedagogical phenomena in a “broad” and “narrow” sense is unpromising, since there are no criteria for “expansion” and “narrowing”. At first glance, this is a theoretical problem. But it is not so. During hundreds of lectures for teachers, we were interested in their definition of the concept of “upbringing”. The answers were so diverse that one can easily predict the result. Obviously, this is not the fault of practitioners, because we observe something similar in manuals and textbooks. We emphasize that according to a long tradition, the technical term “formation” prevails in education, which has nothing to do with the educational process.

Let us note another contradiction that the integrated thinking of researchers must overcome. Teachers do not pay enough attention to the achievements of representatives of other sciences. In turn, representatives of other sciences “do not see teachers.” This is not criticism, but a statement of fact.

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<sup>8</sup> Понятійно-термінологічний апарат історико-педагогічних досліджень: історія і сучасні підходи : зб. матеріалів VI Всеукр. наук.-методол. семінару з історії освіти, 19 трав. 2021 р., Київ / НАПН України, Від-ня заг. педагогіки та філософії освіти, ДНПБ України ім. В. О. Сухомлинського [та ін.] ; [редкол.: Березівська Л. Д. (голова редкол.), Сухомлинська О. В., Тарнавська С. В. ; літ. ред. Хопта С. М. ; бібліогр. ред. Деміда Є. Ф.]. Вінниця : Нілан-ЛТД, 2021. 72 с.

In 2020, an interesting study by O.I. Stepanova “Dynamics of pedagogical terminology in the modern educational process: structural and semantic aspect” was published. The author is right, emphasizing the important fact that pedagogical terminology, which “forms the basis of the language of science and plays a leading role in the process of upbringing, training and development of the individual, has not yet received a systematic linguistic description that would reveal the features of the lexical and semantic structure of the terms of this field. The educational terminology system is an interesting in composition, significant in volume layer of the professional vocabulary of the languages of the European area and is an important object for analysis by specialists in the field of linguistics”<sup>9</sup>.

On the other hand, the content of the article confirms the importance of P.Yu. Hrytsenko’s conclusions about the dominance of the English-speaking *surzhyk* (*linguistic blend of languages*). At the beginning, there were unsuccessful attempts to “accustom” Ukrainians to education. It would be worth studying the experience of Polish colleagues who have trouble with this Latin word, directing it either to upbringing or to education. And now, under the slogan of internationalization of terminology, an incredible set is offered, from the usual and incomprehensible insight to *benchmarking*, *compilation*, *deethization*, *syllabus*. This was not enough and the scientific space was flooded with such pearls as: *bug*, *bot*, *meme*, *mobbing*, *bullying*. A kind of “top” became – *stakeholder*. The authors can be understood. It is one thing to talk about long-known best practices, and the mysterious “*benchmarking*” sounds completely different. Therefore, one can agree with O.I. Stepanova, in whose opinion “the study of the structural and semantic features of pedagogical terms shows that the analyzed lexico-semantic subsystem of the language is heterogeneous, dynamic, constantly developing, improving, contains rich material for observations by specialists in various fields of knowledge (linguists, teachers, psychologists, philosophers, cultural scientists, etc.) and requires unification and standardization. The analysis of the structural and semantic features of the terms of individual subsystems of pedagogical science – preschool, special, etc. is promising”<sup>10</sup>.

At the same time, it is necessary to realize that excessive “anglicization” is no better than the *surzhyks* from other countries. At the same time, the Ukrainian counterparts remain undervalued. A simple example. What language can boast of a thesis with a deep biblical basis “Education for light and peace”. But why look for biblical motifs (the word light is mentioned in the first words of God on the first page of the Bible five times, on the last –

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<sup>9</sup> Степанова О. І. Динаміка педагогічної термінології в сучасному освітньому процесі: структурно-семантичний аспект. Наукові записки Національного університету «Острозька академія»: серія «Філологія». Острого: Вид-во НаУОА, 2020. Вип. 9(77). С. 307.

<sup>10</sup> Ibid. С. 310.

three times, and the thought “If light, what darkness is in you. How great is that darkness” can “enlighten” more than one textbook), if you can call a teacher a coach, facilitator, tutor, moderator, advisor, manager, supervisor ... The argument is amazing. It turns out that a coach, unlike a teacher, does not give ready-made solutions. What a profound thought. Apparently, the authors were unlucky with teachers. Read Bohdan Lepky’s memoirs about teachers of the second half of the 19th century.

Let us pay attention to another feature of the development of pedagogical science. The process of differentiation of pedagogy continues. In the context of our topic, we emphasize the importance of the manual with the interesting title “Digital Humanistic Pedagogy” (2017). The authors noted the importance of the work published in 2012. (Brett D. Hirsch. *Digital Humanities Pedagogy: Practices, Principles and Politics*. Cambridge: Open Book Publishers, 2012. 426 pp.), relevance of research results of famous authors: P. Anderson, O. Bjork, S. Brier, Cathy N. Davidson, T. Clement, D. Jakacki, P. Fyfe, Brett D. Hirsch considered the definition of digital pedagogy as a science “about the regularities of creating a positive integrated pedagogical reality under the condition of convergence of physical and virtual (created using ICT) educational spaces (environments)”, substantiated four main opportunities for education as a result of the continuous development of ICT: “democratization of education (ensuring equal access to education for all participants in the educational process regardless of social, material status, racial, national, gender characteristics, health status); flexibility of the organization of the educational process (variable application of the spatial and temporal characteristics of the educational process is carried out: students’ accessibility to learning regardless of their location and at a time convenient for them); individualization of learning (implemented on the basis of taking into account the individual characteristics of students by specifying the content, methods and means of learning, activating independent activity); creation of conditions for joint research and creative activity (deepening and expanding the source and information base, implementation of educational and research projects), etc.”<sup>11</sup>

It is obvious that this is just the beginning of a series of studies in which one of the main places will be occupied by sections dedicated to artificial intelligence.

Increasing the level of didactic culture in the conditions of modern universities in the context of the requirements of the experts of the Club of Rome regarding the need for integral thinking, some aspects of which we analyzed in a speech at the International Conference “Development of

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<sup>11</sup> Биков В., Лещенко М., Тимчук Л. Цифрова гуманістична педагогіка. К. НАПН України. 2017. С. 4.

Professional Skills of a Teacher in the Conditions of a New Socio-Cultural Reality”<sup>12</sup> requires interaction of different sciences at a qualitatively higher level. After getting acquainted with the proposals of the experts of the Club of Rome, we considered integral thinking in the context of the little-known ideas of J.A. Comenius regarding the three stages of the cognitive process: analysis – synthesis – syncrisis. The third level provided for an interdisciplinary approach. In our publications, we substantiated the conclusion that integral thinking should combine three main aspects: retrospective assessment of the phenomenon, interdisciplinary approach, and predictive model. When asked about the essence of integrated thinking by artificial intelligence (Gemini), we received the following answer: “Integrated thinking is the ability to perceive, organize, coordinate, and reunite individual fragments and achieve a true understanding of the underlying reality. It involves: a systems approach: understanding that the world is a complex system of interconnected elements, where changing one element affects others.; comprehensive analysis: the ability to see different perspectives and take into account various factors when making decisions; transdisciplinarity: combining knowledge from different scientific fields and cultural contexts; value aspect: taking into account ethical, social, and environmental aspects when solving problems.” If we consider the definition itself, our proposal is more structured and clearer. At the same time, in the further explanation, computer intelligence highlights the same aspects with the exception of the important retrospective assessment and predictive models. It is also necessary to recognize its advantage in paying attention to the value system. Let us pay attention to one more important aspect. The Gemini system independently deepens the task, explaining the importance of integral thinking (global problems: climate change, inequality, environmental crises – all these problems are complex and require systemic solutions; the complexity of the modern world: rapid changes, technological progress, cultural diversity complicate understanding the world; the limitations of traditional approaches: the fragmented approach characteristic of many scientific disciplines does not allow for an adequate description of complex systems). Moreover, it offers ways to develop integral thinking: education: including integral thinking in educational programs at all levels, dialogue: creating platforms for the exchange of ideas and experience between different disciplines and cultures; practice: applying integral thinking in different areas of life – from business to politics; personal development: developing critical thinking, empathy, and the ability to cooperate.

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<sup>12</sup> Вихрущ А.В. Интегральное мышление: минуле і майбутнє. Розвиток професійної майстерності педагога в умовах нової соціокультурної реальності: збірник матеріалів VII Міжнародної науково-практичної конференції (м. Тернопіль, Україна, 10–11 жовтня 2024 року). Тернопіль: ФОП Осадца Ю.В. 2024. С. 76–77.

The computer offers an interesting and logical conclusion that integral thinking is not just a tool for solving problems, but “a new way of thinking that allows us to better understand the world and our place in it. The challenge posed by the Club of Rome is urgent and requires the joint efforts of all humanity. The development of integral thinking is an investment in our common future.” The result is the proposal for further research:

- History of the development of integral thinking.
- Examples of the application of integrated thinking in various fields.
- Criticism of integral thinking and possible limitations.
- The role of integral thinking in shaping the consciousness of the new generation.

In our opinion, even based on this fragment, the benefits of cooperation between two intelligences become obvious.

Let us single out another insufficiently studied, despite the presence of a significant body of works, problem of rational use of game activity in universities, which is often considered somewhat simplified. Its possibilities for raising the level of postgraduate students and teachers are evidenced by the work of Nobel laureate Hermann Hesse “The Bead Game”. Summarizing the proposals of the outstanding thinker, twelve ideas can be singled out: “1) representatives of many sciences and arts, including specialists in mathematics and music, participate in the creation of the game; 2) the theme of each game is unique, is selected after discussing diverse projects on a competitive basis, the winner receives recognition from the community; 3) among mathematicians the game has acquired great “flexibility, the ability to turn into creativity and even a certain awareness of itself and its capabilities”; 4) the game is popular among the elite of intellectual youth, who had great pleasure from the game; 5) gradually the game moved to the level of synthesis; 6) the game, which was once a professional pastime of mathematicians, philologists, and musicians, began to increasingly attract all true intellectuals; 7) it is the important idea of the dynamic nature of the game, which in the course of its development became “the embodiment of the spiritual and aesthetic ideal, a lofty cult, a mystical unity of the dispersed members of the *universitas literarum*. In our life, it has taken upon itself partly the role of art and partly the role of abstract philosophy; 8) there are the interesting theses about the importance of contemplation and meditation in the game; 9) the game reaches an international level and gradually becomes a “public holiday”; 10) there is information about the technology of the game, which could begin with “a certain astronomical configuration, or the theme of a Bach fugue, or a phrase from Leibniz, or from the Upanishads , and then, depending on the intention and talent of the player, the leading idea brought to life either developed and spread, or enriched its expressiveness with the consonances of related concepts”; 11) the game involved comparison, contrast,

and harmonious combination (thesis – antithesis – synthesis); 12) as an example of choosing a game theme, the author of the novel offers an ancient ritual scheme of a Chinese manor with its orientation to the cardinal points, with a gate, a wall of spirits, the relationship and purpose of residential and outbuildings, with their subordination to the celestial bodies, the calendar, and family life, with symbolism and planning rules”<sup>13</sup>.

In conclusion, we will single out another important and insufficiently studied problem for improving the level of training of students and postgraduates. We mean academic writing. Currently, well-known authors (N. Grechykhina, V. Zinchenko, O. Kuznetsova, T. Lyuty, S. Revutska, O. Semenog, Yu. Surmin, S. Tarasova, T. Tymoshenko, O. Fast, G. Kho-ruzhiy, I. Shlichta, N. Shlichta, etc.) have prepared original proposals for the study of this discipline.

In one of the publications (2021), we proposed 14 topics for the structure of studying the basics of academic writing: 1. System of basic concepts (science, regularity, academic writing; person, individual, personality; education, creativity, innovation; theses, article, paragraph). 2. Regularities of development of educational systems. 3. Academic writing in a modern university. 4. Modern researcher. 5. Choosing a topic for scientific research. 6. Structure of a scientific text. 7. Citation, citation, bibliography. 8. Editing an academic text. 9. Information culture of the researcher. 10. Psychological culture of a scientist. 11. Plagiarism and anti-plagiarism. 12. Presentation and publication of research results. 13. Preservation and protection of the results of academic writing. 14. Characteristics of the most common errors in academic writing<sup>14</sup>.

In 2024, we approached Gemini with a similar task regarding the structure of a book on this topic. The answer is as follows: “Possible structure of the book: Introduction. 1. Relevance of the topic: Why is academic writing important in the modern world? What challenges do students and scholars face? 2. Purpose of the book: What will the reader learn from this book? What skills will he be able to develop? 3. Structure of the book: A brief overview of each chapter. Section 1: Basics of academic writing. 4. What is academic writing? Differences from other types of writing. 5. Principles of academic writing: Accuracy, objectivity, argumentation, structure. 6. Audience: Who are we writing for? Who will read scientific texts? 7. Ethical aspects: Plagiarism, citation, academic integrity. Section 2: The process of writing a scientific text 8. Finding information: How to find relevant sources? 9. Drawing up a plan: Structuring the text, from abstract to detailed plan. 10. Writing a draft. 11. Editing and

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<sup>13</sup> Велика гра Германа Гессе. *Закарпатські філологічні студії*. Випуск 35. Т. 2. С. 320.

<sup>14</sup> Вихрущ А.В. Академічне письмо: структура і завдання. *Медицина освіти*. 2021. № 1. С. 112–116.



proofreading: How to make the text clear, concise and error-free. Chapter 3: Stylistics and language of scientific texts 12. Scientific style: Features of vocabulary, grammar, syntax. 13. Academic discourse: How to build arguments, use terminology. 14. Clarity and brevity: How to make the text understandable to a wide range of readers. Chapter 4: Types of scientific texts 15. Essay: Structure, requirements for argumentation. 16. Abstract: How to summarize information from different sources. 17. Scientific article: Requirements for publication in scientific journals. 18. Thesis: Structure, research methodology. Conclusion 19. Conclusions: What the reader should remember. 20. Future prospects: Trends in academic writing, development of digital technologies. Additional sections (optional): Using digital tools: Link managers, plagiarism checkers, data visualization tools. Presenting scientific results: How to give an oral presentation, prepare a presentation. Academic communication: How to participate in scientific conferences, write reviews of articles.

Summarizing all of the above, we can say that we are on the verge of changes in the organization of the educational process, the rational use of AI to improve the level of academic culture of teachers, graduate students, and students.

## **CONCLUSIONS**

The correct use of artificial intelligence will allow to increase the speed of information exchange, introduction of innovative technologies in the educational process. It is time to prepare the “Report on the intellectual potential” of each European country. To achieve success in experimental work, it is important to combine the efforts of theorists and practitioners. Modelling of the educational process, predictive assessment requires significant analytical work. At the same time, the importance of practical experience is growing, assessment of student development, which in the conditions of war and post-war conditions is gaining particular relevance. The importance of comparative research cannot be underestimated. After the spread of the PISA program in 2000, in which one of the main places was allocated indicators of the level of mastery of natural sciences, mathematics, reading and comprehension of the read text, fundamental reforms were carried out in many countries regarding the content, forms, and methods of teaching. Currently, attention is also focused on financial literacy and, what is especially important, creativity. Similar ideas for universities are time.

Cooperation with specialists from medical universities will be appropriate, especially in the context of preventing stressful situations, overwork, and overcoming depressive states. The system of scientific and methodological support of the educational process will also need updating.

The war and the post-war period pose new challenges to pedagogy, which can be successfully overcome only through systematic international interaction and the use of the capabilities of modern information technologies, which have become an everyday reality.

## SUMMARY

The article concerns the issues related to the development of intellectual capital, the scientific foundation of the creativity didactics, and practical aspects of implementing the conceptual principles of integrating artificial intelligence into the university educational process. Perspective topics for further monographic research are proposed, the importance of identifying patterns in the development of didactic systems is substantiated, and the potential of AI for peer-reviewing scientific works and defining a system of basic concepts is examined. Certain aspects of implementing the tasks set by the Club of Rome regarding integral thinking are considered, as well as the use of gameplay elements based on the ideas of Nobel laureate Hermann Hesse. The author also proposes a program for studying the fundamentals of academic writing.

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