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Volodymyr P. Zinchenko, Candidate of Pedagogical Sciences (Ph.D.), Associate Professor,
Department of Pedagogy, Psychology, Social Work and Management, Oleksandr Dovzhenko Hlukhiv
National Pedagogical University. Hlukhiv, Ukraine.

E-mail: volod_zin@i.ua

ORCID 0000-0002-2101-903X, WoS GYQ-8950-2022

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The State of Artificial Intelligence Tool Usage by Future Educators

Abstract:

The rapid integration of AI into contemporary educational environments has significantly transformed teaching and learning practices, increasing the relevance of research focused on teachers' professional readiness to use AI tools. In the context of ongoing educational reforms and the implementation of competency-based standards, the ability of future teachers to effectively, critically, and ethically apply AI in pedagogical activity has become a key factor in ensuring the quality of education. Despite the widespread accessibility and active use of AI services by students, their application in educational contexts often remains unsystematic and insufficiently regulated. This situation generates pedagogical and ethical challenges, including superficial engagement with learning content, reduced critical thinking, and risks related to academic integrity, which are exacerbated by the lack of targeted preparation of future teachers for the pedagogically appropriate use of AI. The novelty of the study lies in its comprehensive analysis of future teachers' readiness to use AI as an integrative personal and professional construct encompassing motivational-value, cognitive, operational-activity, and evaluative-reflective components. The study proposes an authorial definition of such readiness based on both theoretical analysis and empirical data. The subject of the study is the process of forming future teachers' readiness to use AI tools, while the object is their professional training within higher pedagogical education institutions. The study aims to identify and analyse the current state of this readiness. A mixed-methods approach was employed, combining a survey based on an original questionnaire with an analysis of students' learning outputs obtained from practical assignments in bachelor's and master's programmes. The results demonstrate that AI has become an integral part of students' learning activities; however, most students acquire AI-related skills independently and rely on a limited range of tools. Insufficient verification of AI-generated information and the use of AI for academically inappropriate practices were also identified. The study concludes that although future teachers actively use AI, their readiness for its informed, critical, and ethically responsible pedagogical application remains insufficiently developed, which substantiates the need for systematic integration of AI-related competencies into teacher education programmes.

Keywords: artificial intelligence, AI, future educators, educational process, readiness to use artificial intelligence, information verification.

Abbreviations:

AI is artificial intelligence.

Introduction

The transformation of the system of professional training for future teachers in Ukraine has acquired exceptional relevance in the context of large-scale educational reforms initiated through the implementation of the Concept of the New Ukrainian School and the approval of updated professional standards for educators. These reforms have fundamentally changed the requirements placed on teachers, shifting the focus from a predominantly knowledge-based model to a competency-oriented paradigm that emphasises integrated learning, learner-centred pedagogy, and the extensive use of digital technologies in educational practice.

Within this framework, digital competence has emerged as one of the key professional attributes of a contemporary teacher. Among its various components, the ability to effectively and responsibly use AI tools in educational activities occupies an increasingly significant place. AI is no longer perceived solely as a technological innovation or an auxiliary digital resource; rather, it is becoming an integral element of modern educational environments, influencing teaching methods, learning strategies, assessment practices, and the organisation of pedagogical interaction.

The quality of the implementation of educational reform largely depends on the capacity of higher pedagogical education institutions to equip graduates with the competencies required by contemporary educational systems. This includes not only technical skills related to the use of digital tools but also the ability to critically evaluate information, ethically integrate new technologies into pedagogical practice, and adapt educational processes to rapidly changing technological conditions. In this regard, the readiness of future teachers to use AI tools across various forms of pedagogical activity becomes a crucial indicator of the effectiveness and sustainability of teacher education programmes.

Despite the strategic importance of AI for the development of education, preliminary analyses and recent studies indicate that the renewal of the content of pedagogical education often occurs with a considerable delay in relation to current technological and social challenges. In many cases, this delay is accompanied by the insufficient preparedness of pedagogical staff to implement innovative technologies and to guide students in the meaningful and responsible use of AI tools.

Although AI services are increasingly accessible and widely used by students, their application in educational contexts frequently remains unsystematic, intuitive, and insufficiently regulated. Students often acquire AI-related skills independently, through trial and error, without structured methodological support or clear institutional guidelines. As a result, the use of AI in learning activities may lead to superficial engagement with educational content, reduced critical thinking, and, in some cases, violations of academic integrity.

Furthermore, while professional standards for teachers in Ukraine emphasise the importance of information and digital competence, they do not yet provide a sufficiently detailed or systematic framework for integrating AI into pedagogical practice. This creates a gap between normative requirements, actual educational practices, and the rapidly evolving technological landscape. Consequently, there is a pressing need to examine how future teachers currently use AI tools, how prepared they are to integrate these tools into their professional activities, and what shortcomings exist in their training.

The novelty of the study lies in its comprehensive analysis of the readiness of future teachers to use AI tools in educational activities, combining both theoretical conceptualisation and empirical investigation. Unlike many existing studies that focus primarily on the technological

potential of AI or its general impact on education, this research examines readiness as an integrative personal and professional construct that encompasses motivational, cognitive, operational, and reflective components.

The study introduces and substantiates an authorial definition of future teachers' readiness to use AI, conceptualising it as a unity of motivation to implement AI, a system of knowledge about its didactic possibilities and moral-ethical risks, and the ability to effectively apply AI tools to optimise educational processes. This multidimensional approach allows for a more nuanced understanding of how AI is actually integrated into students' learning activities and how this integration corresponds to contemporary educational objectives.

In addition, the study provides empirical data on the frequency, forms, and purposes of AI tool usage by students of pedagogical specialities, identifies the most commonly used AI services, and analyses the extent to which students verify and critically evaluate AI-generated information. By combining survey data with an analysis of students' learning outputs, the study offers original insights into both declared practices and actual patterns of AI use.

The subject of the study is the process of forming the readiness of future teachers to use AI tools in educational activities within the system of higher pedagogical education. This includes students' attitudes towards AI, their motivation to use it, their level of knowledge about AI technologies, their practical skills in applying AI tools, and their ability to critically assess the results produced by such tools.

The object of the study is the educational and professional training of future teachers in higher pedagogical education institutions, specifically as it relates to the integration of AI tools into learning and teaching practices.

The study aims to identify and analyse the current state of readiness of future teachers to use AI tools in educational activities, considering both theoretical considerations and empirical evidence obtained from pedagogical practice.

To achieve the stated purpose, the following study objectives were formulated:

- determine the frequency with which students of pedagogical specialities use AI services in their learning activities;
- identify the pathways through which future teachers acquire skills related to the use of AI tools;
- establish which AI tools are most frequently used by students and for which types of educational tasks;
- analyse the extent to which students verify and critically evaluate information generated by AI;
- identify existing problems and shortcomings in the use of AI tools by future teachers in the learning process.

The results of this study are intended for a broad audience involved in education. This includes researchers in pedagogy and educational technologies, academic staff of higher pedagogical education institutions, developers of teacher education curricula, and educational policymakers responsible for the implementation of professional standards. The findings may also be of practical value to practising teachers and students of pedagogical programmes who seek to develop a more informed and responsible approach to the use of AI in educational contexts.

Methods

The study is based on a comprehensive methodological framework that combines general scientific methods with specialised empirical research techniques. Such an approach ensures

the reliability, validity, and analytical depth of the research findings and allows for a systematic examination of both declared attitudes and actual practices related to the use of AI tools by future teachers. The selection of methods was determined by the aim of the study, the specificity of its object and subject, and the need to analyse AI usage as a multidimensional pedagogical phenomenon encompassing motivational, cognitive, operational, and evaluative components.

The study design follows a mixed-methods approach that integrates quantitative and qualitative elements. This combination made it possible to obtain statistically generalisable data on the frequency and forms of AI use, while simultaneously analysing qualitative characteristics of students' educational activities and their interaction with AI-generated content. The methodological framework enabled the identification of both typical patterns of behaviour and problematic aspects of AI integration in the learning process.

Among the general scientific methods employed in the study, analysis played a central role. It was used at the theoretical stage to examine scholarly publications, regulatory documents, and professional standards related to digital competence, AI, and teacher education. This analysis made it possible to systematise existing approaches to the integration of AI in education and to identify unresolved issues in the professional training of future teachers. At the empirical stage, analytical procedures were applied to survey data and students' learning outputs in order to identify recurring trends, inconsistencies, and deficiencies in the use of AI tools.

The method of synthesis was applied to integrate theoretical insights and empirical findings into a coherent conceptual framework. On this basis, the readiness of future teachers to use AI was conceptualised as an integrative personal and professional construct that combines motivation to implement AI, knowledge of its didactic possibilities and ethical risks, practical skills in using AI tools, and the ability to critically evaluate AI-generated results. Synthesis also facilitated the formulation of generalised conclusions and practical recommendations aimed at improving pedagogical training programmes.

Induction was used to derive general conclusions from specific empirical observations. Individual survey responses and concrete examples of students' interaction with AI tools were aggregated to identify overall tendencies in usage frequency, preferred services, and typical forms of application in learning activities. Conversely, deduction was employed to interpret empirical findings in light of general theoretical principles and normative requirements outlined in professional standards for teachers. This deductive reasoning enabled an assessment of the extent to which observed practices correspond to contemporary expectations regarding digital and information competence.

The comparative method was used to analyse similarities and differences in AI usage practices among different groups of respondents, including bachelor's and master's students. Although no substantial differences were identified across certain demographic variables, comparison contributed to a more nuanced understanding of the uniformity of AI-related practices within the student population and confirmed the systemic nature of the identified issues.

The primary specialised empirical method used in the study was a survey conducted through an original questionnaire entitled *The Use of Artificial Intelligence (AI) in the Educational Process*. The questionnaire was designed to capture multiple dimensions of future teachers' interaction with AI tools and consisted of twelve questions grouped into three thematic blocks. The first block focused on general experience with AI, including frequency of use, commonly used services, and self-assessed proficiency levels. The second block addressed the use of AI for various types of learning activities, with particular attention to the verification of AI-

generated information. The third block examined students' attitudes towards AI, including perceived positive and negative effects on thinking, the availability of guidance from lecturers, and proposals regarding institutional policies on AI use. The survey method enabled the collection of quantitative data as well as qualitative insights into students' perceptions and behavioural strategies.

To complement self-reported data and to assess actual practices, the study also employed the method of analysing activity products. This method involved examining students' practical assignments completed within the courses *Fundamentals of Scientific Research* in bachelor's programmes and *Methodology and Methods of Scientific Research* in master's programmes. The analysis focused on identifying the extent to which AI tools were used in completing both theoretical and practical tasks, the degree of originality and critical engagement demonstrated by students, and the presence of unverified or erroneous AI-generated content. This approach made it possible to compare declared patterns of AI use with real learning behaviour and to identify discrepancies between them.

Quantitative data analysis was applied to process survey responses, calculate frequency distributions, and determine percentages related to the use of specific AI tools and types of learning activities. The results of the quantitative analysis were presented in tabular and graphical form, allowing for the clear visualisation of dominant trends and proportions. At the same time, qualitative interpretation was used to analyse open-ended responses and the content of students' learning outputs, providing deeper insight into motivational, ethical, and reflective aspects of AI use.

The empirical study was conducted at Oleksandr Dovzhenko Hlukhiv National Pedagogical University during October–November 2025. The sample included bachelor's and master's students enrolled in pedagogical programmes. The composition of the sample, including age and gender distribution, is presented in the article. The selected research setting ensured that the findings reflect authentic educational practices within higher pedagogical education and are relevant to institutions responsible for training future teachers.

All participants took part in the study on a voluntary basis, and the survey was conducted anonymously. The collected data were used exclusively for research purposes. Particular attention was paid to ethical considerations related to the analysis of students' learning outputs, with the focus placed on identifying systemic tendencies rather than evaluating individual performance.

While the applied methodological framework allowed for a comprehensive examination of future teachers' readiness to use AI tools, certain limitations should be acknowledged. The study was conducted within a single higher education institution, which may restrict the generalisability of the results. Moreover, the rapid development of AI technologies requires continuous updating of research instruments and methodological approaches in subsequent studies.

Literature Review

The integration of AI into education has become one of the most actively discussed topics in contemporary pedagogical research, reflecting broader processes of digital transformation, technologisation of learning, and the redefinition of professional competencies required of teachers in the 21st century. The growing body of scholarly literature demonstrates that AI is no longer viewed merely as an auxiliary technological tool but is increasingly conceptualised as a systemic factor influencing educational goals, content, methods, and outcomes.

A significant strand of research emphasises the strategic role of AI in national educational

development. Bakhrushyn (2020) argues that the application of AI across various sectors is a necessary condition for the sustainable development of Ukraine, with education occupying a central position in this process. According to the author, the education system determines not only the capacity to use AI technologies but also the ability to create, critically assess, and ethically regulate them. This position underscores the importance of teacher education as a foundational domain for the meaningful integration of AI into society.

At the international level, Baker (2021) analyses the potential of AI to adapt education to contemporary societal challenges, highlighting its capacity to personalise learning, support teachers' decision-making, and enhance the efficiency of educational systems. Within the OECD framework, AI is presented as a tool that can contribute to more inclusive, adaptive, and data-informed education, provided that its implementation is accompanied by appropriate pedagogical and ethical safeguards. This international perspective complements national studies by situating the discussion within a broader global context.

A number of researchers focus on conceptualising AI within the educational process. Bobro (2023) proposes a definition of AI in education as a set of technologies that enable computers to develop and implement teaching methodologies, imitate speech activity, automatically monitor learners' mastery of educational material, and perform analytical functions. This definition is particularly valuable for pedagogical research, as it frames AI not simply as a technological innovation but as a didactic agent capable of influencing instructional design and learning dynamics.

The practical application of AI tools in educational environments has been examined in several empirical studies. Lushchynska, Delenko, Antonyshyn, and Lyshak (2024) analyse the use of AI technologies in the educational environment of the New Ukrainian School, describing concrete examples of integrating services such as Copilot, Gamma, ChatGPT, and Google Gemini into teaching and learning activities. Their findings indicate that AI tools are primarily used for information search, content generation, and instructional support, while their potential for formative assessment and reflective learning remains underexplored.

Related research highlights the role of AI in transforming teaching and learning processes. Kacherova (2024) examines the use of AI in the professional development of primary school teachers within the context of distance learning, raising the question of whether AI is worth viewing as a creative tool or as a functional necessity. The author concludes that AI can serve both roles, depending on the pedagogical framework within which it is embedded. Similarly, Oliyars and Kopchak (2025) analyse the training of future primary school teachers for the technologisation of educational activities in the New Ukrainian School, emphasising the need to align teacher education curricula with emerging digital practices.

Psychological aspects of AI use in education constitute another important area of research. Snisarenko (2025) explores the psychological features of AI application in educational contexts, paying particular attention to its influence on learners' motivation, cognitive engagement, and emotional responses. Volyniuk (2024) further investigates the use of AI to develop sustainable motivation among higher education students, suggesting that AI-supported learning environments can enhance motivation when they are designed to support autonomy, competence, and meaningful feedback. These studies highlight the importance of considering not only technological efficiency but also psychological and motivational dimensions of AI integration.

Normative and regulatory frameworks also play a crucial role in shaping the use of AI in education. The professional standard *Teacher of a General Secondary Education Institution*, approved by the Ministry of Education and Science of Ukraine in 2024, defines information and digital

competence as a core component of teachers' professional profiles. This competence includes the ability to navigate the information space, critically evaluate information, effectively use digital resources, and integrate digital technologies into educational processes (*Professional standard, 2024*). Although the standard establishes a general framework for digital competence, it does not yet provide detailed guidance on the pedagogical use of AI, leaving this area open for further conceptual development.

Complementing professional standards, instructional and methodological recommendations issued by the Ministry of Digital Transformation of Ukraine outline general principles for the introduction and use of AI technologies in secondary education institutions. These recommendations emphasise responsible use, data protection, and ethical considerations, while also encouraging experimentation with AI-supported educational tools (*Instructional and methodological recommendations..., 2024*). However, their focus is primarily on institutional implementation rather than on the formation of teachers' readiness to use AI in pedagogical practice.

Comparative analyses of professional standards further highlight the evolving expectations placed on teachers. Lazarenko, Voloshyna, and Zabuzhanska (2025) conduct a comparative analysis of professional standards for teachers in the 21st century, demonstrating that digital competence has become a universal requirement across educational systems. At the same time, the authors note significant differences in the degree to which AI is explicitly addressed in these standards, suggesting an ongoing process of conceptualisation and adaptation.

Popular science and practitioner-oriented materials also contribute to the discourse on AI in education. For example, the article *Five Ways AI Helps Teachers* published by SKIM AI (2024) outlines practical benefits of AI for teachers, including lesson planning, assessment support, and personalised feedback. While such materials provide accessible insights into the potential of AI, they often lack a critical pedagogical perspective and do not address issues of readiness, ethical responsibility, or academic integrity in sufficient depth.

Despite the growing body of literature on AI in education, several gaps remain evident. Many studies focus on the technological capabilities of AI tools or on isolated aspects of their application, such as motivation or distance learning. Fewer studies address AI as an integral component of teachers' professional readiness, encompassing motivational, cognitive, operational, and reflective dimensions. Moreover, empirical research often relies on self-reported data, with limited attention to the analysis of actual learning outputs and practices.

Ignatenko, Tolmachov, and Ryabko (2024) indicate that the training of future teachers for working with information systems requires a structured and systematic approach that goes beyond technical instruction. Their findings suggest that without such an approach, digital tools may be used superficially, without contributing to deeper pedagogical transformation. This observation is particularly relevant in the context of AI, where uncritical use of AI-generated content may undermine learning outcomes and academic integrity.

Thus, the reviewed literature demonstrates a growing recognition of the importance of AI in education and highlights its potential to transform teaching and learning processes. At the same time, it reveals a lack of comprehensive frameworks for developing future teachers' readiness to use AI in pedagogical activity. Although contemporary studies address individual aspects of AI integration, a systematic approach that aligns theoretical conceptualisation, empirical analysis, and normative requirements remains insufficiently developed. This gap is especially evident with regard to forming teachers' readiness to use AI in an informed, critical, and ethically responsible manner, which underscores the relevance and originality of the study.

Results

Readiness of Future Teachers to Use AI in Learning

Under current conditions, it is advisable to introduce into professional standards a requirement for proficiency in AI tools. Every teacher should be prepared to use AI in the educational process. Accordingly, such readiness must be formed among students of pedagogical specialities.

The readiness of future teachers to use AI constitutes an integrative personal construct characterised by the unity of motivation to implement AI, a system of knowledge about the didactic possibilities and moral-ethical risks of AI application, as well as the ability to effectively use AI tools to optimise the educational process.

This readiness encompasses four interrelated components.

The *motivational-value component* involves awareness of the significance of AI for contemporary education and a desire to improve pedagogical mastery through the use of new technologies.

The *cognitive component* ensures an understanding of the principles of neural network functioning, knowledge of specific AI tools, and awareness of AI errors and moral-ethical aspects.

The *operational-activity component* represents skills in formulating queries (prompts), generating educational materials, using AI to assess students' work, and analysing data.

The *evaluative-reflective component* is characterised by the ability to critically evaluate the results produced by AI, verify generated information, and analyse one's own experience of using digital assistants.

Thus, the indicated readiness is worth forming from the very beginning of students' training. However, the question arises as to how effectively future teachers actually use AI services.

General Experience of AI Use by Future Teachers

In response to the question "Do you use artificial intelligence tools in your learning activities?" students answered as follows (*Figure 1*):

Yes, regularly (several times a week)—52.4%.

Yes, occasionally (several times a month)—32.4%.

Rarely (less than once a month)—15.2%.

No, I have never used them—0%.

An analysis of the results of students' practical assignments showed that more than 80% of the answers to theoretical questions were generated by AI. Practical tasks related to individual topics and problems were completed using AI in 45% of cases. Moreover, approximately 50% of the assignments completed with the help of AI lacked proper verification and correction.

Thus, AI resources are used by all students. No significant differences were identified in the responses of bachelor's and master's students or between students of different genders.

The study also examined how students had learned to use AI services (*Figure 2*). The respondents' answers were distributed as follows: through specialised courses—6.1%; introduced by lecturers—4.7%; assisted by other students—6.8%; independently, through trial and error—82.4%.

This information raises concerns regarding the lack of targeted preparation of students for the appropriate use of AI in learning activities. Consequently, there is a need to introduce courses aimed at developing AI competence. The formation of future teachers' readiness to use AI is a

complex process that requires the integration of technical tools, methodological approaches, and moral-ethical education.

The following measures are proposed:

- the introduction of dedicated courses such as *Artificial Intelligence in Education* and *Digital Technologies in Pedagogical Activity*;
- the integration of AI-related topics into the methodologies of teaching individual subjects;
- the analysis of real situations of AI use in educational institutions, particularly with a focus on identifying errors in AI-generated texts and correcting them.

In response to the question “Which AI tools do you most frequently use for learning?” the answers were distributed as follows:

- ChatGPT is 84.9%.
- Gemini/Bard is 48.6%.
- GitHub Copilot / other coding tools is 8.9%.
- Image generators (Midjourney, DALL-E) is 23.3%.
- Grammarly Premium and similar tools for checking and editing is 11.6%.
- Other tools (Google, Google Chrome applications, DeepSeek, photo editors, Gamma, Perplexity, DeepSeek, Claude) is 5.6% in total.

Thus, it should be noted that the primary AI tools used by students are ChatGPT and Gemini, while other services are used far less frequently. The overwhelming majority of students assess their level of AI proficiency as medium (71%), which is characterised by the use of AI for basic tasks and information search.

Types of Tasks for Which Students Use AI

The respondents’ answers indicated that the overwhelming majority of students use AI for the following types of learning activities:

- searching for and summarising information; preparing for practical classes;
- generating the structure of presentations, projects, and course papers;
- editing (grammar and style checking); creating draft texts (parts of reports or essays); generating answers to questions;
- preparing for examinations (explaining complex topics).

In addition to the types of tasks listed in the questionnaire, students occasionally use AI for activities that are classified as academic misconduct. These include the complete generation of essays, reports, and individual assignments without personal contribution; falsification of research data; completion of test tasks; and paraphrasing of texts.

Thus, this aspect requires particular attention from academic staff in higher education institutions.

Verification of AI-Generated Information

The study also examined what proportion of learning tasks students complete using AI without substantial revision. The following data were obtained (*Figure 3*):

- less than one tenth of tasks—38.1%;
- up to one quarter—42.9%;
- up to one half—13.6%;
- more than one half—5.4%.

A related question concerned the verification of information generated by AI (*Figure 4*). The

majority of students (51.4%) reported that they usually verify AI-generated information only if it appears questionable, while 43.1% indicated that they always verify it. However, the analysis of activity products showed that approximately 25% of the assignments contain information generated with errors and evident “*hallucinations*”, and not all students are able to identify these issues and perform proper verification.

Thus, an important aspect of preparing students to use AI is not only mastering various AI tools but, above all, developing their ability to analyse and critically evaluate the results produced by these tools.

Discussion

The findings of the study confirm that the issue of future teachers’ readiness to use AI tools extends beyond the boundaries of pedagogical education and is relevant to the entire system of higher education. The widespread and intensive use of AI by students, revealed in the empirical part of the study, demonstrates that AI has already become an integral component of contemporary learning practices. However, this integration is occurring largely spontaneously, without sufficient pedagogical regulation, methodological guidance, or institutional coordination.

The relevance of the study topic is further reinforced by the current transformation of educational systems under the influence of digitalisation and technologisation. AI is increasingly embedded in processes of information retrieval, content generation, assessment support, and learning personalisation. In this context, the role of the teacher is undergoing a profound transformation: from a primary source of knowledge to a mediator, facilitator, and critical guide in students’ interaction with digital and AI-based resources. Consequently, the readiness of future teachers to use AI tools becomes a key condition for ensuring the quality, integrity, and educational value of learning processes.

The results of the study demonstrate that while future teachers actively use AI tools, their readiness to do so in a pedagogically sound and ethically responsible manner remains insufficiently structured. This gap between the intensity of AI use and the level of pedagogical readiness underscores the urgency of addressing AI not merely as a technological innovation but as a significant pedagogical and professional challenge. Therefore, the topic addressed in this study is highly relevant not only in the national context of Ukraine but also within the broader international discourse on teacher education and digital competence development.

The analysis of empirical data reveals a number of problematic aspects that require careful consideration. First, although all surveyed students reported using AI tools in their learning activities, the majority acquired the relevant skills independently, primarily through trial and error. This indicates the absence of systematic and purposeful preparation of future teachers for the appropriate use of AI within the framework of their professional training. Such a situation increases the risk of superficial engagement with educational content and limits the development of reflective and critical thinking skills.

Second, the results show that AI is predominantly used for basic academic tasks, such as information search, summarisation, drafting texts, and preparing for examinations. While these practices may enhance efficiency, they also raise concerns about the potential reduction of students’ independent analytical activity. The frequent use of AI-generated content without sufficient verification and correction, identified through the analysis of students’ learning outputs, highlights a critical methodological and ethical issue. The presence of errors and evident “*hallucinations*” in a significant proportion of assignments indicates that students often lack the skills necessary to critically evaluate AI-generated information.

Third, the study reveals instances of AI use that fall within the domain of academic misconduct, including the complete generation of essays and reports without personal contribution, falsification of research data, and uncritical paraphrasing of texts. These findings suggest that the absence of clear pedagogical guidelines and institutional policies regarding AI use may contribute to practices that undermine academic integrity. Importantly, these issues should not be interpreted solely as individual shortcomings of students but rather as indicators of systemic gaps in pedagogical training and institutional regulation.

Another significant problem identified by the study concerns the normative framework governing teacher education. Although the professional standard *Teacher of a General Secondary Education Institution* emphasises information and digital competence, it does not explicitly articulate requirements related to the pedagogical use of AI. As a result, AI remains implicitly included within digital competence without sufficient clarification of its specific didactic, ethical, and professional implications. This lack of explicit normative guidance complicates the systematic integration of AI into teacher education programmes.

Based on the findings of the study, several directions for the further development of the research topic can be proposed. First, there is a clear need to systematise the process of forming future teachers' readiness to use AI. This requires the integration of AI-related competencies into teacher education curricula through dedicated courses, such as *Artificial Intelligence in Education* or *Digital Technologies in Pedagogical Activity*, as well as through the incorporation of AI-related topics into subject-specific teaching methodologies.

Second, methodological support is worth strengthening by focusing not only on technical proficiency but also on developing critical and reflective skills. Educational activities should include the analysis of real cases of AI use in educational contexts, with particular attention to identifying errors, biases, and limitations of AI-generated content. Such an approach would contribute to the formation of students' ability to critically assess AI outputs and to use AI as a supportive tool rather than a substitute for independent intellectual activity.

Third, the findings of the study indicate the importance of revising and updating normative documents related to teacher education. It appears appropriate to introduce a separate provision within the professional standard for teachers that explicitly addresses the ability to use AI tools in pedagogical activity. Such a provision should define not only technical skills but also ethical principles, responsibility for learning outcomes, and adherence to academic integrity.

Finally, the study highlights the necessity of extending research efforts to include academic staff of higher pedagogical education institutions. Future research should aim to assess the readiness of university lecturers to use AI tools in teaching and to identify the main directions for developing AI-related competencies among teaching and research staff. Given that lecturers play a crucial role in modelling responsible and pedagogically sound practices, their readiness is a key factor in the successful integration of AI into teacher education.

In summary, the discussion of the research findings demonstrates that AI has already become an integral part of educational practice, but its pedagogical potential remains insufficiently realised. Addressing this challenge requires a systematic approach that combines curriculum development, methodological innovation, normative regulation, and further empirical research. The study contributes to this process by identifying key problem areas and outlining directions for the development of future teachers' readiness to use AI in an informed, critical, and ethically responsible manner.

Conclusion

Thus, the objective of the study has been fully achieved, and new, empirically grounded insights have been obtained into the state of readiness of future teachers to apply AI in learning activities.

The study purpose—namely, to identify and analyse the current state of readiness of future teachers to use AI tools in educational activities—has been realised through a combination of theoretical conceptualisation and empirical investigation. On the basis of the obtained data, the study has made it possible to characterise both the intensity of AI use by students and the qualitative features of their interaction with AI-generated content.

The first study objective, which consisted in determining the frequency of students' use of AI services in learning, has been successfully accomplished. The results demonstrate that all respondents use AI tools, with more than half doing so on a regular basis. This confirms that AI has already become an integral component of students' educational practices.

The second objective—establishing the pathways through which future teachers acquire skills related to the use of AI tools—has also been achieved. The findings show that the overwhelming majority of students master AI services independently, primarily through trial and error, while formal instruction and guidance from lecturers play a minimal role. This result highlights the absence of systematic and targeted preparation for pedagogically appropriate AI use within teacher education programmes.

The third objective—identifying which AI tools are most frequently used and for which types of educational tasks—has been addressed through both survey data and the analysis of students' learning outputs. The study has demonstrated that students predominantly rely on a limited range of AI services, primarily ChatGPT and Gemini, and use them mainly for basic academic tasks such as information search, text drafting, and preparation for assessments. Other AI tools are used significantly less frequently, indicating a narrow and functionally limited pattern of AI utilisation.

The fourth objective—analysing students' practices of verifying and critically evaluating AI-generated information—has been fulfilled by combining self-reported data with an examination of activity products. While many students claim to verify AI-generated content, the analysis revealed that a considerable proportion of assignments contain uncorrected errors and evident AI “*hallucinations*”. This confirms the presence of a gap between declared critical awareness and actual verification practices.

In addition, the study has identified a number of problematic aspects in students' use of AI, including an uncritical attitude towards AI-generated information, insufficient preparation for working with AI tools, a limited range of services employed, and the use of AI for activities classified as academic misconduct. These findings substantiate the need for pedagogically guided, ethically grounded, and methodologically structured approaches to AI integration in teacher education.

On the basis of the obtained results, the study proposes concrete measures for the formation of future teachers' readiness to use AI. These include the introduction of dedicated courses focused on AI in education, the integration of AI-related topics into subject-specific teaching methodologies, and the systematic analysis of real cases of AI use with an emphasis on identifying and correcting errors. The implementation of these measures is expected to contribute not only to the optimisation of the educational process in higher education institutions but also to the improvement of future teachers' professional performance.

Finally, the findings confirm that AI has already moved beyond a peripheral technological tool and has become a multifunctional element of contemporary learning environments. However, its pedagogical potential can be fully realised only if the formation of future teachers'

readiness to use AI is addressed as a systematic and integral component of professional training. The study contributes to this task by providing a coherent conceptual framework, empirical evidence, and practical recommendations for the development of informed, critical, and ethically responsible use of AI in education.

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Conflict of Interest

The author declares that there is no conflict of interest.

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Appendix

Table 1. Composition of the future teachers participating in the study

Respondents	N	Age	Average Age	Gender (women, %)
Bachelors	90	19–28	20.9	82%
Masters	58	22–43	28.1	68%
Total	148			

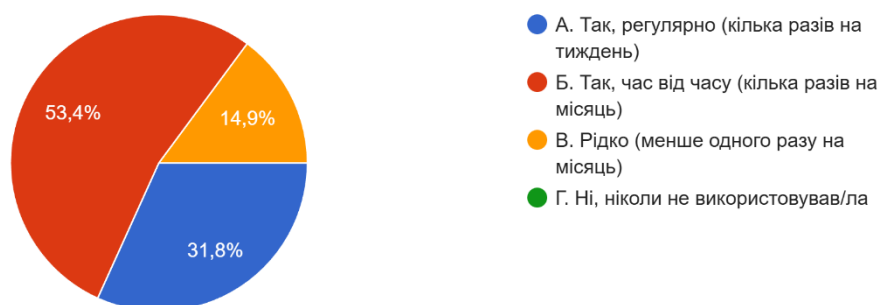


Figure 1. Frequency of AI Use by Future Teachers (In Ukr.)

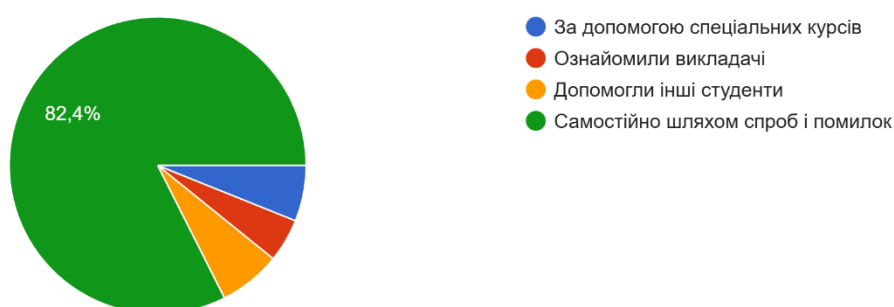


Figure 2. Pathways through which future teachers acquire the ability to use AI (In Ukr.)

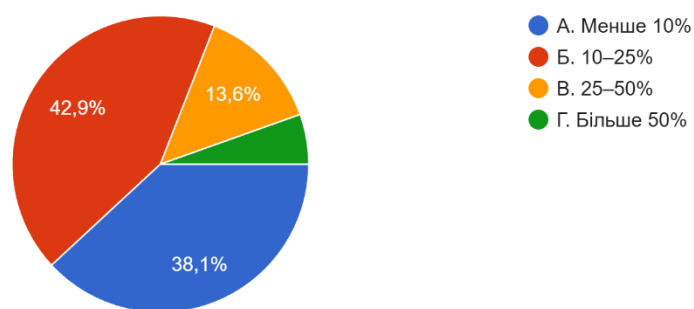


Figure 3. Percentage of learning tasks completed by future teachers using AI (In Ukr.)



Figure 4. Percentage of students who critically evaluate materials generated by AI (In Ukr.)