UDC 372.881.1
IRSTI 14.35.09
https://doi.org/10.48371/PEDS.2026.81.2.027

ENHANCING STUDENTS' RESEARCH TRAINING THROUGH AN AI-SUPPORTED EDUCATIONAL PLATFORM

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Abstract. The increasing emphasis on the application of artificial intelligence (AI) in higher education highlights its potential in improving the quality of students' preparation for research activities. In the university environment, there is a significant gap between theoretical knowledge of research methods and practical skills in their application. The present study, conducted as part of the work with students of pedagogical and technical specialties, was aimed at bridging this gap by creating and implementing an AI-supported educational platform focused on the development of research literacy. Using a descriptive research design, the project aimed to develop and test a comprehensive digital platform capable of enhancing students' research planning, execution, and analysis competencies. Preliminary diagnostics revealed students' superficial knowledge of key stages of scientific research, as well as a limited understanding of the capabilities of modern AI tools, which emphasized the need for targeted digital training. The developed platform included modules based on AI algorithms: intelligent hints for formulating hypotheses, automated data analysis, generators of research plans, recommendations on the choice of methods and visualization tools. The training elements were accompanied by interactive tasks, case studies, simulators, and workshops on the use of AI in research. The results of the final assessment showed a significant improvement in students' research skills: from the basic level to confident and independent work with AI tools for data analysis and research design. The data obtained indicate the effectiveness of the implemented platform in the development of research literacy. In conclusion, the study recommends systematizing the processes of digital student training, expanding the functionality of the platform through advanced AI models, and using a variety of learning formats to sustainably improve the quality of training for future researchers.

Keywords: artificial intelligence, educational platform, student research training, digital learning tools, research literacy, automation of data analysis, development of research competencies, digitalization of education, pedagogical technologies

Introduction

The development of students' research training has become one of the key priorities of modern higher education, as universities are expected to prepare

graduates capable of conducting independent scientific inquiry and critically analyzing information. However, many students still experience difficulties in formulating research problems, selecting appropriate methods, analyzing data, and interpreting research findings. Previous studies indicate that insufficient digital readiness and limited experience with modern research technologies negatively affect students' research performance and academic confidence [1].

Recent advances in artificial intelligence (AI) have created new opportunities for improving educational processes and supporting research-oriented learning. AI-supported educational technologies can automate routine academic tasks, provide adaptive feedback, assist with data analysis, and support students in structuring scientific work [2]. Research also demonstrates that AI-based learning systems contribute to the development of analytical thinking, student engagement, and academic performance when integrated into structured educational environments [3]–[4].

At the same time, the effective use of AI in higher education requires not only technical access to digital tools but also the development of research literacy, critical evaluation skills, and responsible use of AI-generated outputs [5]–[7]. Researchers emphasize that students often possess general academic skills but remain insufficiently prepared to apply AI tools in practical research activities, particularly in research planning, interpretation of findings, and methodological decision-making [6]. In addition, the absence of integrated educational environments that combine methodological support, adaptive tasks, and AI-assisted feedback limits the effectiveness of many existing digital solutions [8].

In response to these challenges, the present study aims to develop and implement an AI-supported educational platform designed to enhance students' research training. The platform integrates tools for formulating research questions, processing and visualizing data, completing adaptive research tasks, and receiving personalized feedback. The study addresses the following research questions:

1) What is the current level of students' research literacy and digital readiness to use AI in research activities?

2) How does the AI-supported educational platform affect students' research skills and ability to apply AI tools before and after its implementation?

Materials and methods

This study used a mixed descriptive design aimed at a comprehensive assessment of the effectiveness of an AI-supported educational platform designed to develop student research literacy. The aim of the study was to eliminate specific deficits in students' research skills identified at the stage of preliminary diagnosis. Based on the results of the pre-tests, a digital platform was designed that contains tools for automated hypothesis formation, data mining, adaptive research tasks, and personalized feedback.

To assess the effectiveness of the platform, quantitative and qualitative data were collected: user activity analytics, pre- and post-test results, teacher observations, as well as reflective reports from the students themselves. This approach ensured consistency between the research problem - the insufficient level of research readiness of students - and the results reflecting changes in the level of research literacy after the introduction of the platform.

Sampling criteria and characteristics of respondents

The study used a targeted sampling method, which made it possible to select the participants most relevant to the objectives of the study. The sample included 42 undergraduate students with pedagogical training, for whose academic programs research is a key component.

Students were invited to participate after confirming their willingness to improve their research skills and use the elements of the platform at all stages of the experiment.

Data collection procedure.

The researchers implemented a consistent multi-step procedure for evaluating the effectiveness of the platform. The key indicators of achievement included the following stages:

1) Conducting a diagnostic study aimed at identifying the initial level of research literacy, digital readiness, the ability to formulate problems, interpret data, and use AI tools. The success of the stage was determined by the identification of clear deficits.

2) Designing the functionality of an AI-supported platform based on diagnostic results. Success was measured by the degree to which the developed content corresponded to the identified needs of the students.

3) Platform validation with the participation of experts, prototype testing and pilot launch. The effectiveness was assessed by expert opinion, user feedback, and adjustments made.

4) Choosing a training course on research methodology as a platform for testing and integrating the platform into the educational process. Success was assessed by smooth implementation and active student participation.

5) Conducting a pre-test that determined the initial level of knowledge and skills of students. The success was in obtaining reliable basic data.

6) Implementation of the platform's training modules, including AI-guided assignments, automated feedback, virtual research cases, and collaborative projects. The effectiveness was assessed by the students' activity, the quality of their interaction and the completion of tasks.

7) Students carry out a mini-research project using the platform's tools. Success was measured by the ability to correctly apply the scientific research procedure and the elements of AI, according to the established evaluation category.

8) Conducting post-testing aimed at identifying the growth of research literacy and digital competencies. The significant improvement in performance compared to the pre-test served as proof of the effectiveness of the platform.

Criteria for selecting sources.

The literature sources for this study were selected based on their relevance to the theory of artificial intelligence in education, digital research literacy, and AI-supported learning models. The work included only high-quality sources: peer-reviewed articles from Scopus-indexed journals, materials from high-level international conferences and academic publications with a proven scientific reputation. Priority was given to research demonstrating proven results of using AI technologies to develop research skills and digital competencies.

Results and discussion

Digital platform Design.

The diagnosis of students' research literacy carried out at the initial stage revealed key deficits that need to be addressed as a matter of priority. The assessment included an analysis of competencies related to the formulation of research questions, conducting a literature review, data processing, and using AI tools. These results made it possible to adapt the architecture of the platform so that it was as relevant as possible to the needs of students.

The developed platform included four key modules:

- AI-an assistant for the formulation of research questions
- Intelligent data analysis system (automation of processing, visualization, interpretation)
- Adaptive research assignments
- Personalized feedback system

Table 1 shows the diagnostic results, reflecting the level of proficiency in key research skills. The average values and verbal interpretation show that the students had a predominantly entry level in most parameters.

This is consistent with studies indicating that students are poorly prepared in the field of scientific methods and digital analytics.

Table 1. The results of the diagnostic examination of students

Indicator		**Meaning (x)**	**Verbal interpretation**
Knowledge of research concepts		2.41	Elementary
The ability to apply research methods		3.05	Competent
Confidence in using AI tools		2.18	Elementary
Difficulties and a request for further education		2.39	Elementary
The average value		2.51	Elementary

The average value of 2.51 confirms that students have only a basic level of research readiness, which requires the introduction of a comprehensive digital solution to build sustainable academic and analytical skills. Similar conclusions are found in works devoted to the digital transformation of research training.

A preliminary survey (pre-assessment) of students' competence level in the use of AI and research tools was also conducted (Table 2). Students rated their ability to work in groups and analyze simple data most highly (mean: 4.12 and 4.05), however, the skills of integrating AI into research practice were noticeably lower (mean: 3.22).

This corresponds to the conclusions that the majority of students have general academic skills, but are not sufficiently prepared to use next-generation technologies.

Table 2. Preliminary assessment of the level of students' research competencies

Indicator	**Meaning (x)**	**Verbal interpretation**
Basic level data analysis	4.05	Very good
Teamwork in research	4.12	Excellent
The use of AI in research	3.22	Good
Conducting mini-studies	3.47	Very good
Using digital sources	4.19	Excellent
The average value	**3.81**	**Very good**

Despite the overall high level of self-esteem, low AI scores confirm the need to develop a platform that provides access to intelligent tools, training in working with algorithms and analytics.

Platform implementation

Figure 1 shows data comparing the results of the pre-test and the post-test. All indicators showed significant improvement after completing the platform:

• Data analysis skills increased from 2.84 to 4.28
• ability to formulate research questions — from 2.63 to 4.10
• ability to interpret results — from 2.55 to 4.02
• skills in using AI tools — from 2.21 to 4.15

The overall average score increased from 2.81 to 4.14, which indicates the high efficiency of the platform.

These data are consistent with meta-analyses showing that learning based on the use of AI tools leads to significant improvements in critical thinking and analytical skills.

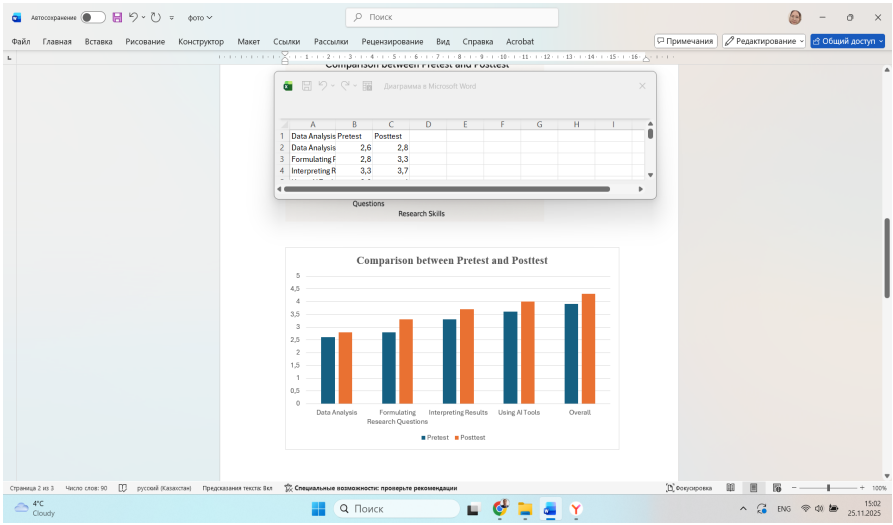

Figure 1 – Comparison between pretest and posttest

Examples of research projects created

Figures 2 and 3 show the key interface screens of the developed AI-supported platform, demonstrating how students created, structured and developed their own research projects. Unlike the traditional approach, in which students prepare notes and curricula manually, this platform provides a digital space that combines project creation, downloading source materials, automatic text processing and formatting of research sections in a single logic of scientific writing.

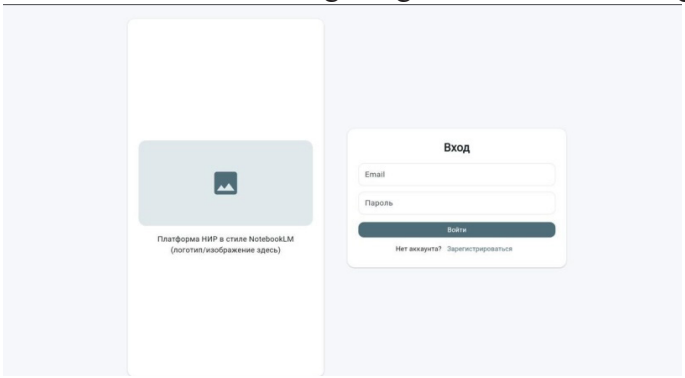

Figure 2 - Interface of the AI-supported research platform login page

After passing through the authorization screen (Figure 2), users went to the main page of the platform, where they were offered the recommended templates. These templates provided pre-structured layouts of research papers, including section headings, hints, embedded checklists, and text supports. Thanks to this, students could start their work not with an empty document, but with a clearly organized outline, which lowered the starting barrier and made it easier to immerse themselves in the research process. On the same page there is a mini-guide explaining the key steps of the work: creating a new project, uploading a PDF or DOCX for automatic annotation or retelling, as well as editing the resulting material using the Markdown editor.

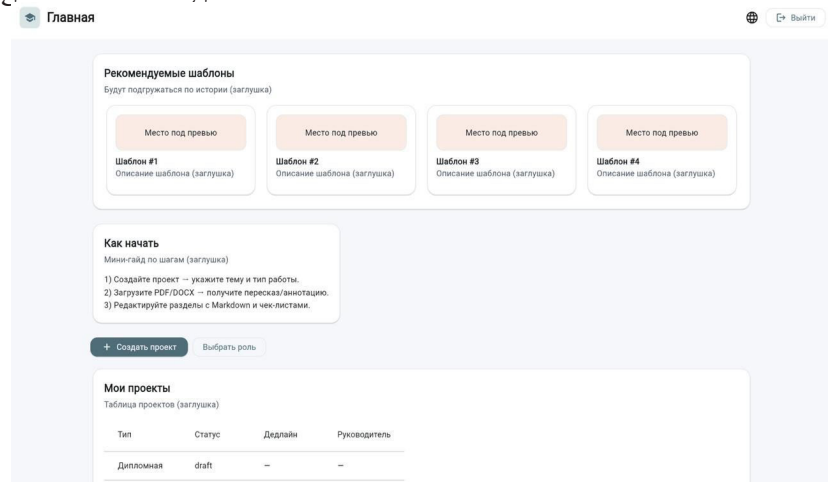

Figure 3 - The main page of the platform with recommended templates and instructions for getting started

The working part of the platform, shown in Figure 3, includes a project table that displays the status of the work, its type, estimated completion date, and the appointed supervisor. Students created a new project and uploaded the text of a scientific article, report, or teaching materials into the system. The platform automatically generated a short abstract, extracted key concepts, formed an initial research plan, and suggested possible areas of analysis.

During the development of the research document, students actively used the Markdown editor built into the platform. It made it possible to edit each section of the study in a flexible format, supplementing the text with new data and visualizations. At the same time, the AI assistant offered clarifying questions, helped to reformulate hypotheses, suggested analysis methods and pointed out logical gaps. This form of support served as a digital scientific mentor who comments on the work at each step and helps the student avoid typical methodological errors.

The completed mini-studies included the formulation of the problem, the choice of method, the analysis of sources and interpretation of data, as well as the formulation of final conclusions. For example, in one project, students analyzed the impact of AI-associated tools on motivation for independent learning, and in another, they documented the results of comparing various data visualization methods. An analysis of the created works showed that using the platform contributed to a deeper understanding of research logic, improved text structure, and improved the quality of analytical conclusions.

Additional features of the platform, such as automatic text verification, the ability to compare different versions of a document, and the generation of questions for further analysis, enhanced critical thinking skills and ensured the systematic development of research skills. As a result of the creation of the projects, the students demonstrated a more confident mastery of methodology and an improved ability to formulate scientific arguments, which is consistent with research confirming the effectiveness of integrating AI into the academic writing process.

In general, the analysis of the created research projects showed that the platform has become not only a technical tool for students, but also a full-fledged learning environment. Intellectual functions have significantly expanded their capabilities in the design, analysis and design of scientific papers, ensuring the transition from formal assignments to meaningful research activities.

Conclusion

The results of the study confirm that the developed AI-supported educational platform significantly increases the level of research literacy of students. The integration of artificial intelligence into key stages of research activities has allowed students to create a digital environment in which they feel confident at all stages of their work, from choosing a topic and analyzing literature to structuring the text and preparing the final report. The platform eliminated many of the difficulties that were identified at the stage of input diagnostics: uncertainty in the choice of methods, difficulties in problem formulation, lack of data analysis skills and difficulties in designing a scientific text.

The intelligent functionality - automatic processing of uploaded texts, annotation generation, AI assistant prompts, built-in templates and an interface for editing in Markdown format - allowed students to master research procedures faster and reduced the cognitive load when working on projects. The platform's interface, which includes the main dashboard, recommended templates, a project table and a personalized support system, has created a clear, logical and convenient structure for independent research activities.

Improving the quality of student papers and improving their research skills is confirmed by the results of the post-test: students began to formulate research goals more precisely, choose analysis methods more consciously, and demonstrate a high degree of independence when preparing a text. As a result, the platform has acted not only as a technical tool, but also as a virtual digital scientific mentor who accompanies the user at every step and helps to avoid methodological errors.

The platform has shown high efficiency in working with students with different levels of education, which indicates its flexibility and adaptability. It promotes the growth of research autonomy, the development of critical thinking, the formation of the ability to work with data and the understanding of the principles of scientific logic. All this increases motivation for research activities and makes the learning process deeper and more productive.

A promising area of further research may be to assess the long-term impact of using the platform on students' academic performance, analyze the possibilities of its scaling in other educational programs, as well as integrate additional modules related to data analysis automation or real-time collaborative research.

In general, the conducted research demonstrates the potential of AI-supported digital solutions in the transformation of modern education and confirms that such platforms can significantly improve the quality of training of future specialists in the field of scientific work.

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ЖАСАНДЫ ИНТЕЛЛЕКТ НЕГІЗІНДЕГІ БІЛІМ БЕРУ ПЛАТФОРМАСЫ АРҚЫЛЫ СТУДЕНТТЕРДІҢ ЗЕРТТЕУШІЛІК ДАЯРЛЫҒЫН АРТТЫРУ

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Аңдатпа. Жоғары білім беруде жасанды интеллектті (ЖИ) қолдануға деген қызығушылықтың артуы студенттердің ғылыми-зерттеу даярлығын жетілдірудегі оның әлеуетін айқындайды. Университеттік ортада ғылыми зерттеу әдістері бойынша теориялық білім мен оларды практикада қолдану дағдылары арасында елеулі алшақтық байқалады. Педагогикалық және

техникалық мамандықтарда білім алатын студенттермен жүргізілген бұл зерттеу аталған алшақтықты жою мақсатында зерттеу сауаттылығын дамытуға бағытталған, жасанды интеллектке негізделген білім беру платформасын әзірлеу және енгізуге арналды. Сипаттамалық зерттеу әдіснамасы негізінде жоба студенттердің зерттеуді жоспарлау, жүзеге асыру және талдау құзыреттерін дамытуға мүмкіндік беретін кешенді цифрлық платформаны әзірлеу және сынақтан өткізуді мақсат етті. Алдын ала жүргізілген диагностика студенттердің ғылыми зерттеудің негізгі кезеңдері бойынша үстірт білімге ие екенін, сондай-ақ заманауи жасанды интеллект құралдарының мүмкіндіктерін шектеулі деңгейде түсінетінін көрсетті. Бұл өз кезегінде мақсатты цифрлық даярлықтың қажеттілігін айқындады. Әзірленген платформа жасанды интеллект алгоритмдеріне негізделген модульдерді қамтыды: гипотезаларды тұжырымдауға арналған интеллектуалды кеңестер, деректерді автоматтандырылған талдау құралдары, зерттеу жоспарларын генерациялау жүйелері, әдістер мен визуализация құралдарын таңдауға қатысты ұсынымдар. Оқыту үдерісі интерактивті тапсырмалармен, кейстік тапсырмалармен, тренажерлармен және ғылыми зерттеуде ЖИ қолдану бойынша шеберлік сабақтарымен толықтырылды. Қорытынды бағалау нәтижелері студенттердің зерттеу дағдыларының айтарлықтай артқанын көрсетті: бастапқы деңгейден деректерді талдау мен зерттеу жобалауда жасанды интеллект құралдарын сенімді әрі дербес қолдану деңгейіне дейін өскені байқалды. Алынған нәтижелер енгізілген платформаның зерттеу сауаттылығын дамытудағы тиімділігін дәлелдейді. Қорытындылай келе, зерттеу студенттердің цифрлық даярлығын жүйелеуді, платформаның функционалдық мүмкіндіктерін озық жасанды интеллект модельдері арқылы кеңейтуді, сондай-ақ болашақ зерттеушілерді даярлау сапасын тұрақты арттыру үшін оқытудың әртүрлі форматтарын қолдануды ұсынады.

Тірек сөздер: жасанды интеллект, білім беру платформасы, студенттерді зерттеу дайындығы, цифрлық оқыту құралдары, зерттеу сауаттылығы, деректерді талдауды автоматтандыру, зерттеу құзыреттілігін дамыту, білім беруді цифрландыру, педагогикалық технологиялар

ПОВЫШЕНИЕ ИССЛЕДОВАТЕЛЬСКОЙ ПОДГОТОВКИ СТУДЕНТОВ С ПОМОЩЬЮ ОБРАЗОВАТЕЛЬНОЙ ПЛАТФОРМЫ НА ОСНОВЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА

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Аннотация. Возрастающий акцент на применении искусственного интеллекта (ИИ) в высшем образовании подчёркивает его потенциал в повышении качества подготовки студентов к научно-исследовательской деятельности. В университетской среде наблюдается существенный разрыв

между теоретическим знанием методов исследований и практическими навыками их применения. Настоящее исследование, проведённое в рамках работы со студентами педагогических и технических специальностей, было направлено на устранение этого разрыва путём создания и внедрения AI-поддерживаемой образовательной платформы, ориентированной на развитие научно-исследовательской грамотности. Используя дескриптивный дизайн исследования, проект ставил целью разработать и апробировать комплексную цифровую платформу, способную повышать у студентов компетенции в области планирования, выполнения и анализа исследований. Предварительная диагностика выявила поверхностное владение студентами ключевыми этапами научного исследования, а также ограниченное понимание возможностей современных ИИ-инструментов, что подчеркнуло необходимость целенаправленной цифровой подготовки. Разработанная платформа включала модули, основанные на алгоритмах ИИ: интеллектуальные подсказки для формулирования гипотез, автоматизированный анализ данных, генераторы исследовательских планов, рекомендации по выбору методов и инструменты визуализации. Обучающие элементы сопровождались интерактивными заданиями, кейсами, тренажёрами и мастер-классами по использованию ИИ в исследованиях. Результаты итоговой оценки показали существенное улучшение исследовательских навыков студентов: от базового уровня к уверенной и самостоятельной работе с ИИ-инструментами для анализа данных и проектирования исследований. Полученные данные свидетельствуют об эффективности внедрённой платформы в развитии научно-исследовательской грамотности. В заключение исследование рекомендует систематизировать процессы цифровой подготовки студентов, расширить функционал платформы за счёт продвинутых ИИ-моделей, а также использовать разнообразные форматы обучения для устойчивого повышения качества подготовки будущих исследователей.

Ключевые слова: искусственный интеллект, образовательная платформа, исследовательская подготовка студентов, цифровые инструменты обучения, исследовательская грамотность, автоматизация анализа данных, развитие исследовательских компетенций, цифровизация образования, педагогические технологии

Received / Мақала түсті / Статья поступила: 27.11.2025
Accepted / Жариялауға қабылданды / Принята к публикации: 26.06.2026

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