ARTIFICIAL INTELLIGENCE (AI) LITERACY AMONG TEACHERS: THE CASE OF ITMO UNIVERSITY

LA ALFABETIZACIÓN EN INTELIGENCIA ARTIFICIAL (IA) EN LOS DOCENTES: EL CASO DE LA UNIVERSIDAD ITMO

Oksana Bleikher[1*]
E-mail: oxanableikher2017@gmail.com
ORCID: https://orcid.org/0009-0002-5536-7304
Victoria Snegurova[2]
E-mail: snegurova@bk.ru
ORCID: https://orcid.org/0000-0001-7349-6578
Alla Rvanova[1]
E-mail: alla_rv@mail.ru
ORCID: https://orcid.org/0000-0002-7235-1016
Irina Gotskaya[1,3]
E-mail: iringot@mail.ru
ORCID: https://orcid.org/0000-0003-3074-8936
Oksana Nakonechnaya[1]
E-mail: oksana-adonis@yandex.ru
ORCID: https://orcid.org/0009-0003-5538-2173
[1] ITMO University, San Petersburgo. Rusia.
[2] Institute for Content and Methods of Education named after V.S. Lednev, Russia.
[3] Herzen State Pedagogical University of Russia.
*Corresponding author

ABSTRACT

The rapid spread of AI-based technologies in higher education requires rethinking the educator's role and developing new digital competencies. This study investigates the forms and frequency of AI adoption in teaching, educators' trust in AI-generated outcomes, and their readiness to supervise AI-driven student learning. Conducted at ITMO University, the research surveyed 109 faculty members across engineering, humanities, natural sciences, and economics. Using correlation and cluster analysis, the study identified three educator profiles: "enthusiasts," "observers," and "skeptics." Results show that while most faculty use AI tools primarily for lesson planning and content generation, concerns about academic integrity and lack of regulatory frameworks remain significant barriers. At the same time, many educators expressed willingness to invest in professional development. Based on these findings, the AI-EduPro training program was developed, offering a scalable model for enhancing faculty digital skills. The study concludes that effective AI integration requires both technical literacy and ethical awareness.

Keywords:

Artificial intelligence in education, higher education transformation, educator readiness, digital competencies, professional development.

RESUMEN

La rápida expansión de las tecnologías basadas en IA en la educación superior exige replantear el rol del docente y desarrollar nuevas competencias digitales. Este estudio investiga las formas y la frecuencia de la adopción de IA en la docencia, la confianza de los docentes en los resultados generados por IA y su disposición para supervisar el aprendizaje estudiantil impulsado por IA. Realizada en la Universidad ITMO, la investigación encuestó a 109 docentes de ingeniería, humanidades, ciencias naturales y economía. Mediante análisis de correlación y de conglomerados, el estudio identificó tres perfiles de docentes: «entusiastas», «observadores» y «escépticos». Los resultados muestran que, si bien la mayoría del docente utiliza herramientas de IA principalmente para la planificación de clases y la generación de contenido, las preocupaciones sobre la integridad académica y la falta de

marcos regulatorios siguen siendo barreras importantes. Al mismo tiempo, muchos docentes expresaron su disposición a invertir en desarrollo profesional. Con base en estos hallazgos, se desarrolló el programa de capacitación AI-EduPro, que ofrece un modelo escalable para mejorar las habilidades digitales del docente. El estudio concluye que una integración eficaz de la IA requiere conocimientos técnicos y conciencia ética.

Palabras clave:

Inteligencia artificial en educación, transformación de la educación superior, preparación de educadores, competencias digitales, desarrollo profesional.

INTRODUCTION

The integration of AI-based tools into academia has emerged as a central trend in the ongoing digital transformation of the higher education environment. Increasingly sophisticated applications, including large language models (LLMs), generative AI systems, recommendation platforms, and automated data analytics, are reshaping not only the delivery of instruction but also the underlying pedagogical models themselves (Crompton & Burke, 2023). These technologies enable more personalized, adaptive, and data-driven learning experiences, which in turn challenge traditional notions of teaching and curriculum design.

As a result, faculty members are required to evolve from the conventional role of information transmitters to that of mentors and facilitators, guiding students in navigating complex digital learning ecosystems (Walter, 2024). This shift necessitates not only a deep understanding of AI tools and their capabilities but also the development of new competencies in digital pedagogy, ethical considerations, and critical evaluation of AI-generated content. Furthermore, professional development programs tailored to AI literacy are becoming crucial for equipping educators with the skills needed to leverage these technologies effectively, ensuring both enhanced student engagement and the maintenance of academic integrity.

Despite the global presence of AI-based tools, educators demonstrate diverse types of perception towards them. There can be noticed significant differences in the degree of trust towards AI and thus, the number of routine tasks which can be delegated to AI-based tools also vary. Along with that we observe growing distrust to AI's technologies associated with biased algorithms, risks of reduced assessment transparency and violation of ethical standards (Bond et al., 2024).

The way the subjects of the educational process are exposed to new technologies is the core element of vast and effective use of AI. It encompasses professional development courses, support of administration, clear policies, access to professional communities and further educational activities.

ITMO university suggests that all parties of the educational process should be involved into adaptation towards fast-evolving AI-driven technologies. Special attention is granted to shaping AI competences of future engineers which became an integral part of the all-university bachelor's and master's programs.

Concurrently, faculty members initiate further educational and methodological activities fostering integration of AI in academia (Dawson et al., 2024). @edulabai telegram channel run by ITMO teacher and one of the authors of this article, Oksana Nakonechnaya, could be a good example of that. It represents a local academic community where faculty members are sharing case studies of successful AI integration into classroom routine, practical solutions and complex issues related to academic integrity and digital inequality.

University policy includes advanced training professional courses on strengthening digital, pedagogical and ethical competencies needed for effective workflow in the era of AI-driven education (Bond et al., 2024).

This research aims at identifying AI-associated practices, affirmations and barriers of faculty members. Other focal points of the investigation are teachers' readiness to manage AI-based learning of students, degree of trust in AI solutions and perception of risks and obstacles.

As a result of the preliminary research stage there were framed core hypotheses which comprise peculiarities of AI-related perceptions experienced by faculty members. It was assumed that educators use AI-based tools in different aspects of teaching and learning activities: from material design to facilitating feedback from students. In addition, we supposed that differences in the assessment of AI - technologies stem from individual ethical attitudes and level of digital literacy. Another assumption was that teachers' readiness to manage and guide AI learning performed by students presents a variable value which depends on multiple contextual factors.

Questionnaire data received from educators of bachelor's and master's degree programs served as an empirical basis of this study. Correlation analysis allowed us to identify stable relations between AI-related educational practices, attitudes and barriers. Furthermore, there were specified latent profiles of educators: "enthusiasts",

"observers" and "sceptics" , distinguished by degree of involvements and trust and risk estimation. Obtained findings may contribute to a more profound understanding of special means to support academic community in the current context shaped by AI-driven ethical and practical issues. Research findings provided the basis for the AI-EduPro professional training program, which was further developed to cater specifically to the needs of fostering AI-associated competencies.

Intensive integration of AI solutions into academia provoked rapid growth in the number of interdisciplinary research covering pedagogical, technological and institutional aspects. This section introduces systematic overview of up-to-date scientific articles categorised according to four research fields: (1) systematic overview of AI use in higher education, (2) AI-driven engineering educational programs, (3) advanced training courses and teachers' attitude to AI, (4) questionnaire- and poll-based research.

Complex systematic overviews deliver overall understanding on the dynamic role of AI in higher education. Thus, Crompton & Burke (2023) conducted analysis of 138 scientific articles and identified five core trends of AI integration: automatized assessment and testing, predictive analytics, intellectual learning systems, virtual assistants and student mentoring. The authors have also emphasised leadership shift in research from the USA to China, which reflects global technological and geopolitical changes.

Zawacki-Richter et al. (2019) have also obtained significant findings based on the overview of 146 scientific papers. They accentuate the prevalence of technical approaches, specifically in informatics and engineering. Researchers claim the lack of pedagogical surveys and necessity to focus on the ethical component of research devoted to integration of AI-based tools in academia.

Russian researchers place emphasis on methodological solutions of AI-driven education, institutional limitations preventing from effective integration and introduce initiatives on developing national strategies related to AI-driven transformation of education.

Despite growing number of research focusing on empirical data and methodology development, faculty members are regularly facing certain range of obstacles while implementing AI-based technologies into their daily routine (Chan, 2023).

Engineering degree programs are turning into active experimental sites for AI integration. Schleiss & Johri (2024) proposed competency-based role-centric model which implies differentiated training of students as users, developers and critics of AI technologies. This model takes into account diverse tracks and fosters formation of professional competencies.

The works of (Acosta-Servín et al., 2025; Casimiro-Urcos et al., 2025), provide significant contributions to understanding and developing digital competencies in higher education. Acosta-Servín et al. (2025), focus on innovating teaching practice, emphasizing the need for future professionals to acquire digital skills that enable the effective integration of technological tools into teaching and learning processes, fostering more active and participatory pedagogical strategies.

Meanwhile, Casimiro-Urcos et al. (2025), assess the level of digital competencies among university faculty, offering empirical evidence on strengths and areas for improvement, which can guide continuous professional development programs and institutional policies to optimize the use of educational technologies. Together, both studies highlight that digital literacy is not merely a technical resource but a strategic component for educational quality, pedagogical innovation, and preparing educators capable of meeting the challenges of contemporary higher education.

The outcome of AI integration in academia to a great extent depends on teachers' readiness and involvement. Mah & Groß (2024) identified several faculty members' profiles related to the level of digital confidence and their background of AI implementation. On the basis of these data there were recommended special means of personalised professional development. Extended version of this study explores institutional and cultural barriers which restrain effective AI integration in education. Chan & Tsi (2023) analyse the possibility of educator's replacement with AI-systems and conclude that most valuable are those models which supplement but not replace faculty members.

The authors, (Garaev & Novik, 2023; Sysoev, 2023; Sysoev & Filatov, 2023), are in line with these issues, pointing out scarce regulation, lack of advanced training courses and digital inequality among regions and institutions.

Literature review defined certain questionnaire-based studies which analysed attitude of students and teachers to AI (Delcker et al., 2024; Ma et al., 2024) performed cross-cultural investigation which showed significant differences in the degree of trust, expectations and readiness of students when asked about AI integration in academia. Their results place emphasis on the necessity of cultural adaptation of AI-based tools.

The authors, Micheni et al. (2024) explored AI's influence on different segments of educational context accentuating the gap between technical capacity and pedagogical practices.

Likewise, Nguyen (2023) put in focus AI's potential in providing educational equality and more affordable access to education.

According to data introduced by Digital Education Council (Kelly, 2024), 86% of students have been using AI for educational purposes which demands from universities revision of regulatory standards, ethical norms and digital literacy programs.

In this context, the case of ITMO University illustrates how structured initiatives in professional development can support faculty in adopting AI-enhanced teaching strategies, fostering innovation, and sustaining educational quality amidst rapid technological change. By examining institutional approaches, training models, and faculty experiences, this study sheds light on the challenges and opportunities associated with cultivating AI literacy in higher education.

The reviewed studies demonstrate that AI is transforming higher education: from automatization to personalization and intellectual learning support (Bond et al., 2024). The core parameters of successful integration are defined by pedagogical and ethical awareness, professional teachers' training and facilitating special teaching and learning environment (Chan & Hu, 2023).

MATERIALS AND METHODS

Faculty members performing educational practices across four core training disciplines participated in this study: engineering, natural sciences, social sciences and humanities, and economics. The questionnaire was filled out by 109 respondents. All respondents are involved in bachelor's and master's training programs.

The developed questionnaire consisted of closed questions. Most items were adapted using previous studies, whereas some were redeveloped.

Data analysis comprised descriptive and interpretation statistical methods:

For the primary data analysis there were used descriptive statistics methods, including calculation of percentage distribution to identify prevailing trends in the respondents' answers.

We applied Pearson's correlation coefficient to test the hypotheses with suggested correlations among the variables. This allowed us to identify statistically significant correlations among AI-based tools selection preferences, frequency of use and educational purposes.

Using factor analysis, we performed testing of the thematic units' structure. It allowed us to reduce data dimensionality, confirm internal consistency and identify stable factors.

There were determined educators' profiles on the basis of factor scores. The resulting profiles served as the basis for designing the AI-EduPro advanced training program.

RESULTS AND DISCUSSION

109 faculty members took part in the survey. They belong to four major academic programs: engineering, scientific, humanities, and economic disciplines. Over 90% of respondents reported that they had utilised AI-based tools pursuing professional goals. The most frequently used AI-related applications were material design, creating worksheets, assessment and analysis of students' answers.

Unit A: AI integration in teaching and learning

RQ1. Analysis of the responses reveals that most educators apply AI-based tools mainly at the lesson planning stage (74%). Nevertheless, regular AI's adoption was demonstrated only by some part of the respondents (59%). Meanwhile, there were identified differences related to specific program tracks which suggests the influence of the study field on the intensity of AI's integration.

RQ2: Typical integration scenarios. Structure of the questionnaire allows us to analyze 8191 combinations of work aspects and AI-based tools. Results pointed out three standard scenarios for applying AI technologies: instructional design + content generation, assignment checking + AI-based assessment, students mentoring + chatbots.

RQ3: Students supervision. Most faculty members believe that monitoring of AI-based learning performed by students is necessary, though their awareness level on the supervision mechanisms proves to be low. Correlation between the frequency of AI use and their willingness to monitor students academic activities demonstrated moderate dependence (0.76).

Unit B: Attitudes and values

RQ4: Advantages and risks. Analysis showed that those responses dominate which point out potential benefits from using AI-based tools while simultaneously reducing routine workload and fostering personalised learning. Though, risks and concerns, including loss of control, quality decrease and mistrust are also highly prevalent. These aspects are reliably correlated with difficulties in implementing AI ($\rho = 0.72$).

RQ5: Trust in AI-generated output. Faculty members, even those who demonstrate high trust level tend to double check AI-generated information. This signals high level of responsibility among educators using AI-based tools.

RQ6: Readiness to integrate AI-based tools. Most respondents feel positive about more extensine AI implementation but still it may vary depending on the degree of anxiety

and trust. Trust score reveals high positive correlation with the willingness to expand AI use ($\rho = 0.71$).

Unit C: Control, support and limitations

RQ7: Awareness of monitoring technologies

Research results show low level of educators' awareness on the monitoring technologies which constitutes a significant barrier. Only 3 out of 109 respondents answered affirmatively. This places limits on the overall readiness to monitor students' interaction with AI-based tools.

RQ8: University and national support. Faculty members feel more significant support on the part of higher education institutions rather than the government. This may indicate the importance of university policy and local initiatives (such as @edulabai telegram channel) while enhancing AI-related competences.

Unit D: Profiles of AI perception

RQ9: Educators' profiles. Factor and cluster analysis allowed us to identify three distinct profiles which possess the following characteristics:

- high frequency of implementation, high degree of trust, critical risk assessment, inclination to expand AI-driven academic activities;

- moderate AI implementation, interest to monitoring, reserved attitude;

- infrequent use, risk-related anxiety, low implementation readiness.

These three groups demonstrate different training needs and expect different types of institutional support which should be taken into consideration when developing AI-EduPro course tracks.

The data which were obtained throughout this study mainly proved the core hypothesis related to the implementation of AI-based tools by faculty members. Thus, we received empirical confirmation to the hypotheses which state the connection between AI implementation frequency and the diversity of AI-based tools: over 90% of respondents turn to AI, mainly at the lesson planning stage. By means of correlation analysis there were identified relations between the frequency of AI utilisation and educators' readiness to expand its use and between the frequency of implementation and willingness to monitor the students.

Analysis of multidimensional combinations of faculty members' academic tracks and AI-based tools together with clustering revealed three consistent profiles of pedagogical scenarios. This result supports our assumption that educational practices and the tools selected are logically interconnected.

While systematizing aspects fostering AI implementation we have obtained the following factors: high practical value of the tools (automatization, tasks generation, information search) availability and accessibility of chatbots, AI-based text generators and translators, high AI' efficiency in completing routine, repetitive tasks.

Simultaneously, we have identified the following factors preventing from active AI adoption: lack of time to master new tools, absence of clear ethical and methodological guidelines, anxiety related to academic integrity and uncontrolled AI implementation by students.

Degree of educators' trust to AI-generated output proved to be moderate: most respondents answered "partially trust" which was accompanied by regular information crosschecks.

Those faculty members who apply AI-based tools regularly, more often express their readiness to monitor AI-based learning performed by students.

Hypothesised skeptical attitude and anxiety of faculty members to AI implementation have been confirmed: more than one-third of the educators' experience concerns related to AI. However, significant part of respondents could not answer or provided negative answer to the question about the presence of a clear national policy.

Low correlation score between the degree of trust to AI and its actual everyday use proved to be one of the most unexpected results. In addition, there was not detected strong dependence between educational tracks and types of AI-based tools applied.

Obtained results are in line with conclusions made by Zawacki-Richter et al. (2019) who state that AI implementation in pedagogy demands more profound ethical considerations. Furthermore, our research results are compliant with Mah & Groß (2024) in terms of pointing out different educators' profiles: from enthusiasts to those who express critical attitude. However, unlike in other research papers (e.g., Ma et al., 2024), our findings showed low level of educators' knowledge related to AI policy.

CONCLUSIONS

This study has some limitations which should be taken into account. It is composed of only 109 faculty members. Thus, the size of the sample is quite moderate which stipulates explorative character of the study and demands special accuracy while performing generalising research results outside the current sample. Consequently, these findings may be considered as preliminary as such, demanding further research with a bigger sample in order to get initial findings confirmed.

The study provided data confirming relevance of the need to rethink the role of educator in the context of rapid AI integration into academia. Questionnaire details collected from the faculty members allowed us not only to describe the frequency and types of AI use but also identify consistent cognitive and behavioral profiles of the respondents.

By utilising factor analysis and clustering, we have revealed three types of educators' attitude to AI implementation, which reflect differences not only in AI adoption but in the degree of trust, their willingness to monitor this activity and their perception of support provided by higher education institutions.

Furthermore, clustering of AI implementation scenarios recognized four practice profiles: automatization, assessment, educators' training and personalized learning and teaching. Each of the profiles may serve as a basis of a program of professional development.

Limited number of sample respondents makes our findings less representative. Possible cultural and institutional peculiarities among different higher education institutions may have influence on the perception of AI-driven teaching and learning, the degree of willingness to put it into practice and preferences of AI tools' selection. Moreover, it should be emphasized that the questionnaire revealed declarative statements of the respondents which may not coincide with the behavioral practices.

Future research may encompass wider range of AI-based tools and expanded research sample, i.e.: conducting advanced interviewing with the representatives of different profiles in order to better understand their motivation and barriers, facilitating special surveys to track the change in the attitudes' dynamics and practices of AI implementation, including faculty members of other universities into the research sample (pedagogical, regional and international higher education institutions), performing analysis of the influence of certain integrated programs (i.e.; AI-EduPro) on the educators' attitude and educational activities.

Therefore, this study has the potential to develop adaptive strategies of educators' support in the era of AI-driven teaching and learning and may become the foundation for advanced training courses for faculty members to propagate effective and responsible AI use in academia.

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