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TRANSFORMATIONAL TRENDS IN HIGHER EDUCATION IN THE CONTEXT OF DIGITALIZATION: THE CASE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES

TENDÊNCIAS DE TRANSFORMAÇÃO DO ENSINO SUPERIOR NO CONTEXTO DA DIGITALIZAÇÃO: O CASO DAS TECNOLOGIAS DE INTELIGÊNCIA ARTIFICIAL

TENDENCIAS TRANSFORMADORAS EN LA ENSEÑANZA SUPERIOR EN EL CONTEXTO DE LA DIGITALIZACIÓN: EL CASO DE LAS TECNOLOGÍAS DE INTELIGENCIA ARTIFICIAL

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ABSTRACT: The purpose of this study is to substantiate the transformational trends in higher education in the context of digitalization using artificial intelligence (AI) technologies as an example. Through expert surveys, the article identifies educational models emerging from the use of AI in higher education and outlines key challenges accompanying AI integration into academic environments. The most pressing issues include upholding academic integrity, data privacy and security, ethical concerns related to intellectual property, and the unintentional spread of misinformation. The authors propose strategies to address these challenges. They conclude that the integration of AI in higher education will serve as a catalyst for significant transformations — acting both as an innovative educational tool and an increasingly important academic discipline — shaping the future of higher education where the harmonious coexistence of human and machine intelligence will open new horizons for knowledge acquisition and dissemination.

KEYWORDS: Higher education. Digitization. Artificial intelligence (AI). ChatGPT. Generative AI.

RESUMO: O objetivo deste estudo é fundamentar as tendências de transformação do ensino superior no contexto da digitalização, utilizando como exemplo as tecnologias de inteligência artificial (IA). Através de inquéritos a especialistas, o artigo identifica modelos educativos que emergem da utilização da IA no ensino superior e descreve os principais desafios que acompanham a integração da IA nos ambientes académicos. As questões mais prementes incluem a defesa da integridade académica, a privacidade e a segurança dos dados, preocupações éticas relacionadas com a propriedade intelectual e a disseminação não intencional de desinformação. Os autores propõem estratégias para enfrentar estes desafios. Concluem que a integração da IA no ensino superior servirá de catalisador para transformações significativas — actuando simultaneamente como uma ferramenta educativa inovadora e como uma disciplina académica cada vez mais importante — moldando o futuro do ensino superior, onde a coexistência harmoniosa da inteligência humana e da inteligência das máquinas abrirá novos horizontes para a aquisição e divulgação de conhecimentos.

PALAVRAS-CHAVE: Ensino superior. Digitalização. Inteligência artificial (IA). ChatGPT. IA generativa.

RESUMEN: El propósito de este estudio es corroborar las tendencias transformadoras de la enseñanza superior en el contexto de la digitalización utilizando como ejemplo las tecnologías de inteligencia artificial (IA). Mediante encuestas a expertos, el artículo identifica los modelos educativos que surgen del uso de la IA en la enseñanza superior y esboza los retos clave que acompañan a la integración de la IA en los entornos académicos. Entre los problemas más acuciantes figuran la defensa de la integridad académica, la privacidad y seguridad de los datos, las preocupaciones éticas relacionadas con la propiedad intelectual y la difusión involuntaria de información errónea. Los autores proponen estrategias para afrontar estos retos. Llegan a la conclusión de que la integración de la IA en la enseñanza superior servirá de catalizador para transformaciones significativas, actuando a la vez como una herramienta educativa innovadora y una disciplina académica cada vez más importante, configurando el futuro de la enseñanza superior, donde la coexistencia armoniosa de la inteligencia humana y la inteligencia artificial abrirá nuevos horizontes para la adquisición y difusión de conocimientos.

PALABRAS CLAVE: Enseñanza superior. Digitalización. Inteligencia artificial (IA). ChatGPT. IA Generativa.

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INTRODUCTION

Traditional higher education is undergoing a profound transformation in the digital era (Denning & Denning, 2020). One of the most innovative methods being implemented today is the use of artificial intelligence (AI). AI has quickly been adopted as a revolutionary force in the field of education, with early applications involving simple tools such as automated grading systems. However, the past decade has seen a rapid evolution of AI, with advanced learning platforms offering personalized learning approaches (Baker, 2016). Using deep learning and natural language processing, these platforms closely monitor student progress and deliver content tailored to each learner's pace and level of knowledge. A notable example is the Carnegie Learning system, which reportedly improved student performance through adaptive problem-solving exercises that personalize the learning process in real time (Chen et al., 2022).

Beyond asynchronous learning, AI is increasingly enhancing real-time instruction. A striking example is "Jill Watson" at the Georgia Institute of Technology—an AI-powered teaching assistant. Jill can respond to student inquiries, organize discussions, and even assist with grading assignments, thereby relieving instructors of some administrative duties and expanding students' access to educational support (Castrillón et al., 2020).

AI enables institutions to better predict student outcomes, allowing early intervention for those facing academic challenges. By analyzing student engagement, activity, and performance, predictive models can identify potential dropouts or those in need of academic assistance. This not only improves student retention rates but also contributes to a more responsive and supportive learning environment (Makridakis, 2017).

As industries began to recognize the potential of AI, the demand for specialists in this field surged, prompting a sudden shift in academia. Universities worldwide have experienced significant growth in enrollment for courses directly or indirectly related to AI. What began with foundational modules in programming and machine learning has now expanded to cover complex topics such as neural networks, robotics, and AI ethics (Natale & Ballatore, 2020). The diversification of AI curricula caters to students with a wide range of interests and career goals.

Recent advancements in generative AI technologies, particularly large language models (LLMs), have garnered unprecedented attention with the release of ChatGPT 3.5—a chatbot that became publicly available in November 2022. The app became the fastest-growing online application in history, reaching around 100 million active users per month within just two months of launch (Kooli, 2023). Consequently, the higher education sector faces urgent challenges, requiring institutions to respond and adapt to the changes brought by this technology. By early 2023, several reports highlighted attempts to limit the use of generative AI in educational settings and warned of risks to academic integrity (Hussin, 2018). While generative

AI and LLMs in particular do present challenges for universities and the education sector, it is crucial to recognize the substantial opportunities they offer to reshape education.

Despite the rapid adoption of AI in higher education, there remains a significant gap in understanding how students and faculty perceive its influence on their daily academic routines. Their subjective experiences including increased reliance, concerns over surveillance, and the redefinition of intellectual effort deserve closer examination. Including user perspectives helps to frame AI not only as a technical tool but as a phenomenon that reshapes power dynamics, responsibility, and academic culture.

LITERATURE REVIEW

Research findings indicate a significant use of large language models such as ChatGPT in academic learning today (Lund et al., 2023). The capabilities of ChatGPT have been tested across various academic disciplines, revealing a wide range of advantages and limitations. The model has shown a notable ability to handle complex queries in fields such as law, operations management, and computer science, though it has faced difficulties in areas requiring deep conceptual understanding and complex problem-solving (Nze, 2024). ChatGPT's performance on standardized tests, such as economics exams and medical licensing assessments, has been particularly impressive—often surpassing the results of average students (Pesonen, 2021). Study (Przegalinska et al., 2019) demonstrated that this tool can be further optimized through prompt engineering, improving its effectiveness and helping overcome some limitations.

Researchers have noted that students use ChatGPT to prepare for exams and classes (Crompton et al., 2024), to search for ideas and inspiration when working on projects and homework—highlighting the tool's role in supporting creativity and assisting with academic tasks (Floridi & Chiriatti, 2020). This underscores the need to incorporate digital literacy and AI education into higher education curricula.

Despite ChatGPT's wide adoption, findings from (Sorokin, 2023) show that only 48.2% of students believe it significantly reduces the time needed to prepare for exams and classes. Consequently, researchers conclude that although AI tools are widely used, they cannot always be regarded as shortcuts to academic success (Ali et al., 2023). Instead, their role is to supplement—not replace—traditional learning methods (Ivakhnenko & Nikolsky, 2023), and combining AI tools with hands-on learning experiences can enhance the overall educational process (Perrotta & Selwyn, 2020). This highlights the need to develop a balanced approach to educational methodologies that blends technological tools with traditional pedagogical practices.

At the same time, researchers point out the potential risks and ethical implications of using ChatGPT in academic settings, emphasizing the importance of responsible AI use in education (Bialik et al., 2022). This finding demonstrates the need to integrate moral considerations into academic curricula while promoting the responsible use of AI tools in academic and research environments.

When analyzing the necessity of regulating AI use in education, scholars advocate for the establishment of clear guidelines on using ChatGPT to maintain academic integrity (Garkusha & Gorodova, 2023), stress the importance of adaptive policies in the context of technological progress (Rincon-Flores et al., 2020), and highlight the need for educational institutions to develop and implement clear frameworks and policies governing the use of AI tools in academic contexts (Pearlman, 2020). In their view, such measures would not only ensure ethical AI usage but also help uphold academic standards and integrity in the rapidly evolving digital higher education landscape (Lund et al., 2023).

Study (Chang et al., 2022) revealed students' strong interest in developing their AI-related skills and improving their proficiency in using AI tools such as ChatGPT—highlighting the need to equip students with relevant digital skills that are in demand in today's job market.

The results of (Humble & Mozelius, 2022) indicate growing interest in AI among students and show that universities can play a key role by integrating AI education into their curricula, providing students with the necessary tools and knowledge to navigate the digital world. Strengthening the focus on AI education in university programs will ensure that graduates are well-prepared for labor market demands in an increasingly AI-integrated environment.

Many studies argue that AI tools like ChatGPT can improve learning outcomes however few explore the realistic tensions and ambivalence that students and instructors may experience during AI tool use. No one has published empirical studies exploring user agency. No one explored trust, cognitive overload, or emotion within AI tools in empirical studies that were published. Completing these gaps offers a fuller view of the technology's effect and makes possible ethical and teaching methods.

The aim of this study is to substantiate the transformational trends in higher education in the context of digitalization, using artificial intelligence technologies as an example. To achieve this goal, the following objectives are outlined:

- To identify educational models emerging from the use of AI in higher education;
- To explore the challenges arising from AI integration into academic environments and propose solutions to address them.

RESEARCH METHODS

In accordance with the stated objectives, a qualitative-quantitative approach was chosen for the study.

At the first stage of the research, relevant information sources necessary for achieving the research goal were selected. The data for this study were drawn from articles and reviews published in scientific journals indexed in Scopus and Web of Science. The search was conducted using keywords and phrases such as “University 4.0,” “higher education,” “digitalization,” “artificial intelligence,” “ChatGPT”, and “generative AI,” in both English and Russian.

At the second stage, an expert survey was conducted to identify educational models emerging from the use of AI in higher education, as well as the challenges associated with the integration of AI into academic environments and possible solutions. Subsequent ranking allowed for the determination of the significance (weight) of the educational models and potential challenges. To ensure a more objective analysis of the data obtained from the expert survey, the degree of agreement among expert opinions was measured using Kendall’s coefficient of concordance.

This yielded a final sample size of 40 experts. The experts were then invited to take part in the survey via email. An invitation to participate in the survey was sent to academics with at least three publications on the research topic in peer-reviewed journals and 38 agreed.

However, this study focused on experts, and did not include students or university staff, so the results do not reflect the experiences and attitudes of those who use AI tools in their daily teaching and learning contexts. Future research could remedy this limitation by adding a qualitative component, such as interviews with students and educators, classroom observation, or the use of focus groups, to further investigate the subjectivity and social dimensions of AI implementation in higher education.

RESEARCH FINDINGS

According to the results of the expert survey, the integration of AI into universities can give rise to numerous new educational models that leverage the capabilities and advantages of this technology (Table 1).

Table 1

Educational models emerging from the use of AI in higher education

Educational Model	Description	Rank	Weight
Personalized Learning Pathways	AI can enable the creation of individualized learning programs tailored to students' preferences, skills, and goals. Through data analysis, AI can identify optimal combinations of subjects, courses, and career paths for each student, offering a more personalized educational experience.	1	0,21
Recommendation Systems	Using AI, universities can implement advanced recommendation systems. Based on analysis of students' preferences, academic performance, and career progress, AI can suggest suitable courses, study materials, seminars, or internship programs that align with students' interests and support their development.	2	0,17
Chatbots and Student Support	AI-powered chatbots can provide instant answers to students' questions about class schedules, exams, university policies, and more. They can also offer academic guidance by directing students to resources or connecting them with appropriate campus staff.	3	0,15
Data Analytics and Forecasting	AI helps universities analyze student and labor market data, allowing them to forecast trends in student preferences, labor market shifts, demand for specific skills, and to design curricula that meet current and future job market needs.	4	0,13
Virtual and Augmented Reality Tools	AI can be used to develop cutting-edge VR and AR learning tools. These include simulations, gamified learning, and interactive environments that help students acquire hands-on skills in a safe and controlled setting.	5	0,10
Personalized Career Counseling	AI can support the creation of data-driven career guidance systems. Universities can assess students' skills and preferences to suggest relevant career paths, internships, mentors, and professional development opportunities.	6	0,08
Predictive Analytics for Student Performance	Using AI and data analytics, universities can build predictive models to identify students at risk of underperformance or dropout early, allowing for timely intervention and support.	7	0,07
Administrative Process Automation	AI can automate university administrative tasks such as recruitment, application processing, database management, and financial operations—saving time, reducing errors, and improving efficiency.	8	0,06
Development of Digital Learning Platforms	AI can help build modern learning platforms that provide access to materials, content, learning tools, and online collaboration. These platforms can offer personalized experiences, adaptive content, interactive tests, and performance analytics.	9	0,03

Note. Expert survey results. Kendall's coefficient of concordance $W = 0.69$ ($p < 0.01$), indicating strong agreement among experts.

At the same time, the integration of AI into the academic environment is not without challenges. Experts identified the following major issues (Table 2):

Table 2

Challenges arising from AI integration into the academic environment

Challenge	Description	Rank	Weight
Academic Integrity	The latest version of ChatGPT 4.0 is multimodal, supports web browsing, advanced data analysis, and has access to expanded knowledge resources. There are currently no reliable tools to detect its use. Existing tools—despite claims of high accuracy—are prone to both false positives and false negatives, significantly limiting their practical usefulness.	1	0,32
Data Privacy and Security	AI systems require large volumes of data to operate effectively, raising concerns over misuse and data breaches. Institutions and tech providers must prioritize enhanced data security measures to protect students' sensitive information.	2	0,27
Ethical Issues Related to Intellectual Property	Training data may be protected by copyright, raising legal and ethical questions about using such content to train AI models. This issue is intensified by the current AI development paradigm that favors large datasets for better results.	3	0,20
Unintentional Spread of Misinformation / AI Bias	AI technology can be used to mass-produce or amplify questionable content and misinformation, leading to biased or flawed outputs. This creates serious ethical and operational concerns, especially given AI's inability to make ethical judgments and its dependence on biased or fake training data.	4	0,12
Human-AI Interaction	The psychological and pedagogical effects of reduced interpersonal interaction in education require further study. Balancing the benefits of AI-driven personalization with the need for human guidance remains a serious challenge.	5	0,09

Note. Expert survey results. Kendall's coefficient of concordance $W = 0.70$ ($p < 0.01$), indicating strong agreement among experts.

In addition to the existence of a technological infrastructure, human factors of implementation were seen as a success factor for implementing AI in higher education. While faculty were concerned about the assessment's credibility and pedagogical sovereignty, students expressed the positive aspects and challenges of an AI-supported educational settings, such as motivation and anxiety, respectively. Some view generative systems like ChatGPT as democratizing technology, but others are concerned that they blur the distinction between authorship with academic support. This ambivalence suggests a need for empirical studies. The academic community must perceive, trust, and understand the ethical implications of generative systems through these studies.

Experts also insisted universities provide institutional and pedagogical frameworks for introducing AI tools. These frameworks include internal codes for AI use, clear data handling rules, and compulsory digital ethics training courses for staff and students. To address these issues universities could promote interdisciplinary ethics committees. These committees could reflect on new technologies. These committees could ensure data efficiency does not cost students their privacy, autonomy and intellectual property. This would help leaders act responsibly. It would guide them as they ethically adopt AI in higher education and govern in anticipation of binding state or international regulations.

DISCUSSION

As shown by the results of the expert survey, the most significant problems arising from the integration of AI into the academic environment are academic integrity, data privacy and security, ethical issues related to intellectual property, and the unintentional spread of misinformation.

Although research on the subject suggests that the threat to academic integrity is real (Floridi & Chiriatti, 2020), the existence of a common trend is not yet perceptible. Nevertheless, dialogic analysis of social media shows no critical reflection in discussions about harm done by generative AI in education. This suggests that students may not use systems like ChatGPT reflectively. To reduce the risk of plagiarism in the academic environment, experts proposed several approaches. Firstly, universities should revise their academic integrity policies to include the use of generative AI. Secondly, the criteria for assessing students' academic work should be modified: innovative assessments should be developed that prioritize creative and critical thinking and analysis, rather than simple memorization; particular attention should be paid to authentic assessments in which students complete tasks that reflect real-world problems.

Regarding the privacy and security of ChatGPT users' data, experts noted that the enormous volume of data processed by ChatGPT algorithms is vulnerable to cyberattacks, creating the risk of unauthorized access or misuse of confidential information. Concerns were also expressed about how ChatGPT processes information obtained through interactions, as there are many uncertainties about how it stores and uses data. This issue, according to (Perrotta & Selwyn, 2020), is especially important for students and faculty members who may lack sufficient knowledge about the technology and its privacy policy. In addition, there is a risk that young students may unintentionally share personal data with platforms, which highlights the need to protect the privacy of vulnerable groups who are especially susceptible to the consequences of inadequate education (Rincon-Flores et al., 2020). Experts have proposed several strategies that can be used to address privacy issues.

Firstly, informing staff and students: universities must ensure that both staff and students are well informed about privacy issues related to AI. Secondly, it is necessary to create a secure learning environment using AI. The resolution of intellectual property rights issues related to generative AI in higher education, according to experts, should involve the following steps.

Firstly, raising awareness among students and faculty members about potential copyright violations when using generative AI tools is crucial for addressing this issue. Understanding the legal implications of using AI-generated content is especially important for its responsible use. Secondly, universities should strive to cooperate with AI providers who can verify the legality of their training data. This helps ensure that AI tools used in educational institutions comply with intellectual property regulations. Also, according to the results of the expert survey, there are serious concerns that AI like ChatGPT may unintentionally/intentionally spread misinformation. In extreme cases, fake content created using generative AI may damage the reputation of individuals or institutions. This risk is exacerbated by the possibility that even well-intentioned users unknowingly spread fake news. Studies (Kooli, 2023; Lund et al., 2023) indicate that the problem is further aggravated by the fact that many users fall victim to misinformation due to cognitive biases; in addition, generative AI can be used to create false datasets to support scientific hypotheses.

Taking these risks into account, universities, according to experts, should take the following measures.

Firstly, it is extremely important to teach students how to assess the quality of information, distinguish reliable information sources from questionable ones, and understand the limitations of generative AI models. Secondly, it is necessary to increase students' awareness of the potential of AI in spreading misinformation. In general, encouraging and supporting critical thinking among students is crucial for their preparation for a world of information abundance and the challenges posed by generative AI. These strategies emphasize the need to balance risks and benefits, and to ensure that universities stay up to date and actively address emerging issues, while preparing their students for a future in which generative AI may penetrate and influence many aspects of life. In the future, the way students interact with AI will evolve beyond its current role as a simple collaboration tool. Students will be able to work together with artificial intelligence systems, promoting synergy between the creative potential of humans and computational capabilities. Such collaboration may enhance the processes of problem solving, research, and creativity, opening up new and exciting prospects in education.

Beyond the student-facing risks, the role of teachers is being transformed by AI in ways that require a deeper ethical analysis. For example, teachers may have less say over instructional decision-making or may feel that the profession is weakened when AI is utilized to help with or automate routine academic tasks such as grading, feedback, or instruction. Otherwise,

teaching runs the risk of being reduced to mere management and control and will be deprived of the human dimensions of mentoring, discussion and care. Universities therefore need to train teachers in digital technologies and AI as well as in how to rethink their roles in hybrid human-machine pedagogies. Professional development should consist of reflection on AI ethics, power, and pedagogical intention in teaching.

For practical implementations of contextualized AI in education, Georgia Institute of Technology's "Jill Watson" virtual teaching assistant represents AI improving learning without replacing education professionals. In Singapore, AI is used to provide learners with predictive learning analytics that identify which students are most in need of extra academic support, while preserving students' private data in controlled data environments. Scandinavian countries also give artificial intelligence literacy courses in high school, for students to better comprehend how to responsibly use and create the technology when they arrive at university. AI may assist education if used safely in the correct setting. They could adopt internal charters or ethics boards, develop data use policies that are more open by default, and create units that evaluate new tools before they are deployed in order to ensure that AI supports rather than weakens their academic priorities.

FINAL CONSIDERATIONS

According to the study results, the landscape of AI in higher education is complex, marked by promising innovations alongside inherent challenges. As academia continues to seek the optimal balance between human and artificial intelligence, one thing remains clear: the educational landscape is undergoing a transformation, with AI at its core. Harnessing the full potential of AI, achieving its successful integration, and overcoming related difficulties will shape the future of higher education—one in which the harmonious coexistence of human and machine intelligence will unlock new horizons for knowledge acquisition and dissemination.

At present, the use of generative AI is considered the most promising within the higher education space, making it essential for universities to develop effective strategies for implementing generative AI technologies. Staying informed about technological and regulatory developments, as well as monitoring the impact of generative AI on education and society at large, is crucial for its continued advancement. Therefore, the adoption of strategies that effectively address challenges and support the successful integration of AI into the educational environment is necessary, especially considering the significant transformative potential and benefits this technology offers to higher education.

The complexity of implementing generative AI technologies requires universities to allocate sufficient resources to manage the process effectively. This includes ensuring staff readiness to work with AI and establishing academic or administrative roles dedicated to overseeing its potential implementation. These efforts must be supervised, coordinated, and evaluated—incorporating open dialogue with relevant stakeholders to help collectively shape the process.

The use of artificial intelligence in higher education has been demonstrated in practice as a new form of instructional technology in higher education and a new academic discipline, from static automatic grading programs to modern learning platforms that can address the characteristics of students and improve their learning experience.

Universities around the world have expanded their curricula to include in-depth AI topics, reflecting both the increasing complexity of the field and its interconnectedness with various sectors. Moreover, the growing importance of AI has led to the inclusion of ethical considerations in academic programs, addressing the social and moral implications of AI technologies. University guidelines on AI use are extremely important from an ethical standpoint. Their purpose is to ensure that these tools are used in accordance with best practices and to define clear boundaries for their application.

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