

## ON THE EDGE: THE GenAI REVOLUTION AND CHALLENGES FOR EDUCATION

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### *Abstract*

*This paper critically explores the integration of digital technology in education, highlighting its dual nature as both a transformative tool and a potential disruptor. Drawing on recent meta-analyses and systematic reviews, it examines the effectiveness of artificial intelligence (AI), particularly generative AI (GenAI), in higher education. Evidence shows significant positive effects on learning outcomes, including personalized learning, immediate feedback, increased engagement, and development of critical and creative skills. However, substantial risks are identified: algorithmic bias and discrimination, data privacy violations, over-reliance reducing critical thinking, academic dishonesty, and widened educational inequalities with diminished human emotional support. In light of evolving regulations—such as the EU AI Act and national strategies—the paper argues for cautious adoption to preserve epistemic validity, cognitive autonomy, and relational aspects of learning. It concludes with practical mitigation strategies, including ethical policies, reflective pedagogy, equitable access, and sustained training, advocating a balanced, human-centered approach that leverages GenAI's potential while upholding equity, integrity, and authentic intellectual growth in higher education.*

*Keywords: generative artificial intelligence, higher education, personalized learning, academic integrity, AI ethics, educational equity*

We are at a moment when the interaction between the educational environment and artificial intelligence, although having a history of only a few years, is on the verge of triggering a genuine revolution. The processes, phenomena, and challenges that have emerged raise serious questions regarding the very foundations of the entire educational system. It seems that nothing we knew about education will remain the same, and this in a very short time. Are we at such an advanced stage that it has become possible for qualifications obtained and professions for which we trained, by

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the time a full training module in an academic field is completed, to no longer be relevant on the labor market?

In this context, a critical analysis of the role of artificial intelligence in education becomes both necessary and urgent—one that goes beyond technological enthusiasm and evaluates its real impact on the cognitive and motivational processes of pupils and students. The present article aims to examine whether artificial intelligence (AI) in education represents an authentic revolution or rather a complex challenge that requires solid theoretical grounding and rigorous empirical validation, from the perspective of educational psychology.

### **Conceptual and Methodological Clarifications**

In recent years, artificial intelligence has become one of the most influential technologies, with immense disruptive potential and significant implications for educational processes. Recent developments in fields such as machine learning, natural language processing, and data analysis have led to the emergence of AI-based educational applications, including intelligent tutoring systems, adaptive learning platforms, and automated mechanisms for assessment and feedback (Luckin et al., 2016; Woolf, 2010). These advancements have intensified the interest of researchers in educational psychology but have also generated debates regarding the impact of AI on student learning and development.

For the conceptual clarity of this paper, we will refer to AI as the capacity of non-human entities—typically computer systems—to perceive their environment, solve tasks, communicate, interact, and act logically in a manner similar to humans, demonstrating performance in cognitive functions such as reasoning, learning, and autonomous decision-making (Zúñiga et al., 2024).

On the other hand, the considerations in this paper focus on generative artificial intelligence (GenAI), which represents a subcategory of artificial intelligence distinguished by the use of advanced statistical models, including deep learning neural networks, to produce original content through probabilistic inference rather than executing predefined rules. In education, these systems are used to generate explanations, learning tasks, feedback, and personalized support for pupils and students (Holmes et al., 2019; Selwyn, 2019). The most popular examples of generative AI include: ChatGPT, Grok (xAI), Claude (Anthropic), Gemini (Google), Midjourney, Flux, Ideogram (for images), Suno, Udio (for music), and others.

Unlike traditional forms of artificial intelligence used in education, GenAI introduces a qualitative shift through its ability to produce new educational content, raising essential questions about the epistemic validity

of the generated information, the role of the human author, and pedagogical responsibility in the learning process (Biesta, 2015).

From an optimistic perspective, AI is often presented as a catalyst for educational transformation, capable of personalizing learning experiences and supporting individual student progress. Research suggests that intelligent systems can adapt educational content to learners' competency levels, provide immediate feedback, and support early identification of learning difficulties (Holmes et al., 2019; Luckin et al., 2016). In this sense, AI is associated with the promise of a more efficient and student-centered education.

However, the literature increasingly highlights that integrating AI into education poses significant psychological and pedagogical challenges. These include the risk of reducing students' cognitive autonomy, over-dependence on algorithmic feedback, and limitation of metacognitive and self-regulation skills development (Azevedo et al., 2017; Selwyn, 2019). Moreover, the algorithmic opacity of many AI systems makes decision-making processes difficult to understand for both students and teachers, affecting transparency and trust in the educational act.

Additionally, extensive use of AI can influence the teacher–student relationship, transferring part of the pedagogical responsibility to automated systems that cannot reproduce the relational and socio-emotional dimension of human learning (Biesta, 2015; Selwyn, 2019). From an educational psychology perspective, these aspects are essential, as learning processes are deeply rooted in social interaction, motivation, and personal meaning.

Such a task is not easy, however, given the rapid growth of academic research in AI. According to estimates based on credible reports and data from sources such as the Stanford AI Index Report 2025 and bibliometric analyses from the Scopus database, the number of AI publications has increased significantly: from approximately 102,000 in 2013 to over 242,000 in 2023, with a 19.7% growth compared to 2022. Recent annual growth is around 20%. The total estimate for 2020–2025 is approximately 1.54 million academic studies. This number includes publications in computer science, machine learning, computer vision, etc., representing over 40% of all computer science publications in 2023 (Maslej et al., 2025). According to the Emerging Technology Observatory (2024), AI research grew 121% overall between 2017 and 2022.

The field of GenAI exploded after 2022, following technologies such as ChatGPT. A bibliometric analysis from Scopus (based on 2,162 articles) shows a dramatic increase in publications containing the term "generative artificial intelligence" (Alshahrani, 2025).

Thus, by clearly delimiting the concepts of general artificial intelligence and generative artificial intelligence, as well as highlighting the qualitative differences that GenAI introduces into the educational process—from the potential for personalization and innovation to the epistemic,

cognitive, and relational risks—this paper aims to provide a balanced and rigorous analytical framework necessary for a correct understanding of the transformations induced by these technologies in contemporary education.

The urgent initiation of serious debates on the subject regarding the foreseeable and already documented implications of educational transformations, within as comprehensive a framework as possible, is not only necessary but obligatory.

### **GenAI Opportunities for Enhancing Learning Processes and Student Outcomes**

Numerous research studies, including meta-analyses, have provided solid empirical evidence highlighting the advantageous ways in which GenAI is transforming education, concluding that AI has a positive and robust impact, supporting its integration to improve learning outcomes (Li et al., 2025; Zhang et al., 2025;). Below, we present some opportunities and advantages of implementing GenAI in education.

Personalized learning represents one of the most powerful benefits of GenAI and AI in university education, allowing the adaptation of content, pace, and feedback to the individual needs of students.

A meta-analysis based on 34 experimental studies showed that GenAI improves learning outcomes through personalization, with a medium-large effect (*Hedges' g* = 0.68,  $p < 0.001$ ). The effects are more pronounced in the cognitive dimension ( $g = 0.795$ ), due to adaptive learning paths and immediate feedback (Ma & Zhong, 2025).

AI-assisted personalized learning has a significant positive effect on student outcomes (medium-large effect, calculated based on 36 experimental/quasi-experimental comparisons). Adaptive systems provide tailored content, increasing retention and performance (Hu, 2024).

GenAI makes learning interactive (e.g., chatbots for discussions, generation of creative examples), increasing cognitive, emotional, and behavioral engagement. Thus, a systematic review of 25 articles (2019–2024) concludes that AI (including ML, NLP, and ITS) improves engagement, motivation, and performance through adaptive paths and real-time feedback in higher education, especially in small groups or individually (Abdelrahman et al., 2025).

The implementation of GenAI and AI in university education can stimulate critical abilities (critical thinking: analysis, evaluation, inference) and creative ones (creativity: generation of innovative ideas, creative problem-solving), especially when pedagogically guided (e.g., structured prompts, critical evaluation of AI outputs). Below is some evidence from recent meta-analyses and systematic reviews (2024–2025), with statistical effects and focus on higher education. These studies show positive effects ranging from moderate to large but emphasize the importance of active and

supervised use to avoid dependence. Empirical evidence shows that effects are positive in the majority of cases (up to 94% of studies), but they strongly depend on the mode of use: guided and active (with structured prompts, critical evaluation of AI outputs, and integration into pedagogical tasks), GenAI acts as cognitive "scaffolding," stimulating higher-order thinking processes. Without guidance, there are risks of dependence and reduced cognitive effort (Daniel, 2025).

Numerous quantitative studies in university education indicate positive effects for higher levels of Bloom's taxonomy (analyzing, evaluating, creating), with improvements in critical thinking and creativity when GenAI use is instructed and active. Here is an example in this regard: *The impact of generative artificial intelligence on students' higher order thinking: Evidence from a three-level meta-analysis* (Qu et al., 2025). The meta-analysis examines the cognitive impact of Generative AI tools (GenAI) (such as ChatGPT or other LLMs) on university students (college students), using the revised Bloom's taxonomy as the main framework. It focuses on differences between lower-order cognitive levels (remember, understand, apply) and higher-order ones (analyze, evaluate, create), including critical thinking, problem-solving, and creativity. Among the main results, clear benefits are highlighted for lower-order tasks: GenAI significantly helps with basic tasks (e.g., debugging code for novices, improving syntax knowledge, rapid feedback), reducing cognitive load and supporting early learning. The study concludes that GenAI is a powerful tool for simple tasks and personalization but does not sufficiently support the independent development of critical thinking and creativity without pedagogical intervention (Qu et al., 2025). The study offers a balanced and nuanced perspective, emphasizing that GenAI is not a "panacea" for cognition—the benefits are conditioned by context and guidance. It is particularly relevant for discussions about the risks of over-reliance in higher education.

Other aspects of GenAI integration in academic education involve improving the efficiency of teachers' and institutions' activities by automating repetitive tasks, freeing time for deep human interactions, mentoring, and research. The main advantages include reducing administrative workload, rapid generation of teaching materials and automated assessments, allowing focus on creative teaching and personalized support. The primary advantages lie in automating administrative and assessment tasks (GenAI helps with automatic grading, plagiarism detection, quiz generation, or preliminary feedback, reducing time spent on routine and increasing efficiency), generating teaching content (creates lesson plans, examples, exercises, or adaptive materials quickly, saving hours of preparation and enabling large-scale personalization), institutional support (automates processes such as enrollment, scheduling, or student data analysis, improving resource management and sustainability),

and timely and scalable feedback (provides instant feedback to students, reducing pressure on teachers) (Tariq et al., 2025).

Other advantages relate to accessibility and inclusion; in university contexts, AI reduces barriers for students from disadvantaged or non-native backgrounds, offering support for students with special needs and promoting accessibility and inclusion in university education through personalized support for students with special needs (visual, auditory, cognitive, or linguistic disabilities), reducing digital barriers, and promoting equity. These benefits include real-time translations, automatic captioning, text simplification, adaptive feedback, and resources for non-native students or those from disadvantaged backgrounds, making learning more equitable and inclusive. Additionally, AI significantly improves accessibility and personalization of learning, offering adaptive support (e.g., real-time feedback, multisensory content, educational robots for social interaction). Although AI transforms support for students with disabilities, success depends on ethical integration, educator training, and institutional collaboration (Deng & Joshi, 2025; Dumitru et al., 2025;).

GenAI tools are beginning to play a considerable role in preparing for the professional future. The implementation of GenAI, such as tools based on models like ChatGPT or Gemini, plays an essential role in preparing university students for a professional future dominated by digital technologies and automation. In a world where over 85% of jobs in 2030 will require advanced digital skills (according to World Economic Forum reports), GenAI not only improves academic learning but also develops transferable skills such as AI literacy (understanding and ethical use of AI), complex problem-solving, adaptability, and human-machine collaboration. This transforms university education from a passive process into an active, career-oriented one, preparing students for fields such as IT, data science, business analytics, digital education, or even AI-augmented creative arts (Ma & Zhong, 2025). Numerous recent meta-analyses and systematic reviews demonstrate the positive impact of GenAI on professional preparation, with moderate to large effects on transferable competencies (Daniel, 2025; Dumitru et al., 2025;). Government reports confirm that integrating GenAI in postsecondary education prepares students for an AI-driven workforce, through the development of skills such as data analysis and ethical AI use (U.S. Department of Education, Office of Educational Technology, 2025).

This evidence shows that GenAI/AI not only personalizes learning but also increases educational efficiency in numerous university contexts, with large effects. However, implementing GenAI in university education offers substantial advantages only if guided by ethical and pedagogical policies (e.g., supervised use to avoid dependence). The benefits often

outweigh the risks when integrated strategically, transforming the university into a more dynamic and equitable environment.

### **Potential Risks of GenAI: Threats to Academic Integrity and Student Outcomes**

Although GenAI offers significant opportunities, its implementation in educational contexts raises major ethical and psychological challenges, particularly regarding academic integrity and long-term student outcomes. Numerous recent studies indicate that easy access to AI-generated content increases the risk of dishonest academic behaviors, including undetectable plagiarism, excessive dependence, and reduced personal cognitive effort (Bearman et al., 2023).

Unethical use of GenAI can negatively affect deep learning processes, critical thinking, and the development of intrinsic motivation, leading to declines in authentic performance and erosion of trust in academic assessments (Chan & Tsi, 2023). Moreover, associated inequalities—such as differential access to AI tools, algorithmic biases, and limitations in automatic detection—can exacerbate existing disparities among students and generate additional academic anxiety (Farrokhnia et al., 2023).

These risks underscore the need for proactive approaches based on educational psychology evidence to protect academic integrity and ensure sustainable positive outcomes for students (Sullivan et al., 2023). I will explain several major issues by drawing on concrete examples to highlight why they are concerning. I note, however, that these aspects do not negate AI's benefits (such as personalized learning) but emphasize the need for strict regulations to avoid undesirable consequences. The following considerations detail these challenges and their implications, based on recent empirical literature, with a special focus on explicating the negative and concerning aspects of AI integration in education. The discussed aspects are based on recent systematic analyses and meta-analyses that highlight ethical, social, and educational risks. Next, we will examine five of the most concerning aspects of AI implementation in the absence of a comprehensive strategy and precise regulations:

#### ***1. Excessive Dependence and Decline in Critical Thinking***

Overuse of GenAI can create excessive dependence that reduces independent problem-solving abilities and critical thinking. Students become accustomed to receiving immediate responses from AI (e.g., chatbots), which diminishes personal exploration, deep analysis, and cognitive effort - essential for cognitive development and creativity (Gerlich, 2025). Students habituated to immediate AI feedback avoid personal reflection, resulting in long-term cognitive deficiencies (Stadler et al., 2024). A 2024 study showed that excessive dependence on AI in

problem-solving can diminish independent resolution abilities, leading to lower performance in scenarios without AI (Qu et al., 2025). These examples demonstrate how dependence can transform education into a mechanical process, reducing the development of essential skills for the real world. The "cognitive offloading" phenomenon explains this risk: mental effort is transferred to AI, leading to "metacognitive laziness" and a decline in higher-order thinking (critical thinking, creativity) (Gerlich, 2025; Zhai et al., 2024)

Beyond these individual effects, the risk extends to a systemic level: generations of graduates may enter the job market with apparently solid skills (demonstrated through AI-assisted tasks) but fragile in real contexts requiring cognitive resilience, authentic innovation, or adaptation to unforeseen situations. The frequently proposed solution is guided and reflective use of GenAI—for example, through tasks that require students to critique, refine, and justify AI outputs—to transform the tool from a substitute into an augments of human thinking.

Let us consider one example: preparation for exams or theses. Suppose students rely on GenAI for quick summaries and explanations instead of reading primary texts or their own notes. In a traditional written exam or thesis defense, they may reproduce information correctly but cannot connect concepts originally or respond to unexpected questions, highlighting a reduction in cognitive depth. Thus, the danger arises that dependence on GenAI, if not counterbalanced by intentional pedagogical design (e.g., temporary tool bans, metacognitive reflection tasks, or process-based evaluation rather than just the final product), can undermine precisely the competencies that university education should cultivate most intensively.

## ***2. Academic Dishonesty and Plagiarism***

GenAI facilitates academic dishonesty and plagiarism by allowing students to generate apparently original content (essays, code, exam responses) without personal intellectual effort. This undermines academic integrity, devalues authentic assessments, and creates graduates with apparently solid but unvalidated skills, affecting the credibility of diplomas and trust in the educational system (Cotton et al., 2024).

The risk is amplified by the fact that GenAI outputs are often unique and difficult to detect with traditional plagiarism verification methods (e.g., classic Turnitin), creating a gray area where students can justify use as "assistance" rather than fraud. In the long term, this practice erodes not only individual academic value but also the institutional culture of honest effort, promoting a "quick results" mentality at the expense of deep learning and authentic skill development. Using AI for entire essays, forcing universities

to ban tools or implement checks (Cotton et al., 2024). Let us consider a few examples in this regard.

In the UK, during 2023–2024, approximately 7,000 cases of AI cheating were confirmed in universities, representing 5.1 cases per 1,000 students, leading to sanctions and policy revisions (QAA, 2024). At Yeshiva College in 2023, several students were caught using ChatGPT for take-home exams, resulting in updates to academic integrity policies (Susnjak, 2024). The consequences do not delay and go beyond individual sanctions: employers begin to question the value of recent diplomas, and institutions are forced to invest massively in advanced detection tools and redesign assessments (e.g., oral exams, in-class projects, process-based evaluation). Proposed solutions include clear AI use policies, process-based assessments (not just final product), advanced detection tools, and education on digital ethics (Cotton et al., 2024; QAA, 2024). In the absence of these proactive measures, GenAI-facilitated dishonesty risks becoming a tacitly accepted norm, undermining the foundation of higher education as a space for authentic intellectual development.

### **3. Algorithmic Bias and Discrimination**

One of the most concerning aspects of integrating artificial intelligence (AI) in education is algorithmic bias, which occurs when algorithms are trained on biased data, perpetuating racial, gender, or socio-economic inequities. This can lead to unfair assessments, discriminatory recommendations, and amplification of social divisions in education. For instance, in 2020 in the United Kingdom, an AI algorithm used for exam grading during the COVID-19 pandemic lowered grades for students from disadvantaged schools based on historical institutional performance, amplifying socio-economic inequities and leading to national protests that forced the system's cancellation (Sullivan, 2023). A 2025 study showed that AI assistants for teachers generate more punitive recommendations (e.g., disciplinary sanctions) for students with names sounding "Black" compared to those with "White" names, perpetuating racial stereotypes in behavior management (Boateng, 2025). These examples demonstrate how bias can create a vicious cycle where marginalized students receive inferior feedback, reducing their chances of academic success and perpetuating long-term inequities. In addition to these cases, recent research emphasizes the need for ethical audits and diversification of training data to mitigate these risks, promoting a more equitable education.

### **4. Data Privacy Risks**

AI in education collects large volumes of personal data about students (learning behaviors, performance, emotions through facial recognition or predictive analyses), raising serious privacy concerns. Lack of transparency in storage, use, or sharing of these data can lead to excessive

surveillance, security breaches, sale to third parties, or abuses, eroding autonomy and student trust (U.S. Department of Education, Office of Educational Technology, 2025).

In 2024, a report highlighted that AI used in universities for analyzing confidential data (e.g., research with student medical data) can lead to privacy risks if strict protocols are not implemented, affecting student trust (Dumitru et al., 2025). Using AI in school chatbots can involve constant surveillance, raising privacy concerns, especially in contexts where student data is exploited for commercial purposes without explicit consent (García-López & Trujillo-Liñán, 2025). In 2025, research indicated that overloaded students see AI as a time-saving tool, but this reduces deep learning and creativity, especially in humanities disciplines (Jose et al., 2025). These cases underscore how lack of transparency can lead to loss of trust and potential abuses, affecting students' emotional well-being and the integrity of educational systems. Recent research confirms that AI-related privacy incidents have increased significantly in recent years, and in education, the main risks include using data for model training without explicit consent and breaches exposing personally identifiable information (PII) (Stanford HAI, 2025; U.S. Department of Education, Office of Educational Technology, 2025).

### **5. *Educational Inequality and Lack of Emotional Support***

GenAI could contribute to amplifying educational inequalities through the digital divide, as access to quality technology and AI tools is not universal, primarily benefiting students from privileged backgrounds or well-funded institutions. At the same time, AI does not provide authentic human emotional support (empathy, contextual understanding, interpersonal relationships), leading to social isolation and lack of motivation in online or hybrid learning, particularly affecting students' socio-emotional development (García-López & Trujillo-Liñán, 2025; Dumitru et al., 2025).

In developing countries, lack of digital infrastructure means AI favors elites, creating a "digital divide" that perpetuates the cycle of poverty (García-López & Trujillo-Liñán, 2025). Students from Black and Hispanic communities in the U.S., already affected by the digital divide, face greater inequities if AI is implemented without equity, perpetuating cycles of poverty (Stanford HAI, 2025). A 2024 report highlighted that AI can undermine teacher-student relationships, leading to lack of emotional support and social isolation in online learning (U.S. Department of Education, Office of Educational Technology, 2025). In 2024, AI trained on biased data can predict low performance for certain groups, leading to inequitable resource allocation in education (García-López & Trujillo-Liñán, 2025).

These examples show how GenAI, without deliberate inclusion interventions (e.g., free tool access, universal design for learning, teacher training), risks aggravating existing gaps between privileged and marginalized students. On the emotional level, AI interactions remain transactional and lacking human nuances, which can increase feelings of loneliness, reduce intrinsic motivation, and affect mental health, especially in university contexts with predominantly online or distance learning. The solution involves balancing technology with human interactions, equitable access policies, and conscious integration of socio-emotional support in course design (Dumitru et al., 2025; Stanford HAI, 2025).

Although GenAI offers substantial benefits—personalization, rapid feedback, increased engagement, cognitive development, and professional preparation—its implementation in university education comes with significant and multifaceted risks that cannot be ignored. The five categories analyzed (algorithmic bias and discrimination, data privacy risks, excessive dependence and decline in critical thinking, academic dishonesty and plagiarism, educational inequality and lack of human emotional support) highlight a common pattern: GenAI amplifies existing problems in traditional educational systems, turning them into systemic threats if not managed proactively.

On one hand, bias and inequalities can perpetuate or even worsen social and economic divisions, excluding already marginalized groups and reducing educational equity. On the other hand, excessive dependence and academic dishonesty threaten the very essence of higher education—the development of authentic critical thinking, intellectual integrity, and real competencies. Data privacy risks and lack of human emotional support complete the picture, affecting students' psychological well-being and trust in institutions.

The essential conclusion is that GenAI is neither a panacea nor an inevitable danger, but a powerful tool whose value depends entirely on the mode of implementation. After presenting the major risks associated with GenAI integration in university education, it becomes evident that these challenges are not insurmountable but can be managed effectively through proactive and responsible strategies. To transform GenAI's disruptive potential into a sustainable and equitable advantage, it is essential to now explore practical, evidence-based recommendations that guide institutions, teachers, and students toward an ethical, inclusive, and pedagogically solid implementation. These recommendations will balance the benefits demonstrated in recent literature with mitigation of identified risks, ensuring that GenAI becomes an ally of higher education rather than a factor of division or degradation.

### **Current Status of AI-Related Regulations in Schools and Universities)**

As the integration of artificial intelligence (AI), including generative AI (GenAI), becomes increasingly prevalent in education, governments and international institutions have begun developing regulations to address associated risks, such as algorithmic bias, data privacy, and academic integrity. However, as of late 2026, the global framework remains fragmented, with slow adoption of formal guidelines: only approximately 10–15% of schools and universities have comprehensive official policies regarding AI use (UNESCO, 2025; Holmes et al., 2025). This section examines the current situation at global and Romanian levels, highlighting recent developments and persistent gaps.

At the international level, 2026 marks a major turning point with the full enforcement of the EU AI Act (Regulation (EU) 2024/1689), adopted in 2024 and fully applicable from August 2026 (European Commission, 2025). This act classifies AI systems by risk level, imposing strict requirements on educational applications (e.g., mandatory transparency, bias audits, prohibition of high-risk practices such as biometric surveillance in schools without justified exceptions) (European Parliament, 2024).

In the United States, the U.S. Department of Education issued non-binding guidelines in 2023, updated in 2025 (*Artificial Intelligence and the Future of Teaching and Learning*), emphasizing ethics, equity, and academic integrity, while leaving decisions to state or institutional levels (U.S. Department of Education, Office of Educational Technology, 2025). Some states (e.g., California, New York) have introduced local laws on AI transparency in educational assessments.

Other notable initiatives include: UNESCO published global recommendations for AI in education in 2025, promoting AI literacy and equity (UNESCO, 2025). However, a Stanford HAI report (2025) shows that most developing countries still lack specific legal frameworks, exacerbating the digital divide (Stanford HAI, 2025).

Predictions for 2026 indicate an acceleration of regulations, with a focus on mandatory AI literacy and student data protection, yet fragmentation persists across regions (Holmes et al., 2025; Stanford HAI, 2025).

Romania, as an EU member state, is required to transpose and fully apply the EU AI Act starting August 2026, which involves adapting the education system to requirements of transparency, risk assessment, and AI ethics.

At the national level the Romanian Government approved the National Strategy for Artificial Intelligence 2024–2027 in 2024 (Government Decision no. 832/2024), which includes a chapter dedicated to education: promoting AI literacy in curricula, mandatory teacher training,

and ethical integration of AI in schools and universities (Government of Romania, 2024).

AI use in education remains an evolving topic in Romania, with institutional initiatives but no fully implemented national official framework at the pre-university level. Romania lags behind many European countries regarding central regulations, according to the European Schoolnet report from December 2025, which places the country outside the 23 European education systems with clear official strategies or guidelines for AI (European Schoolnet, 2025).

Given that Romanian students frequently use GenAI (Romania ranks 1st in the EU for AI use in studies, according to Eurobarometer), the delay in adopting regulations in this area is incomprehensible.

At the pre-university level (schools), there is no mandatory national official framework issued by the Ministry of Education. AI is used informally by teachers (Romania is among the European leaders in adoption, with 46% of teachers using AI, according to OECD TALIS 2024 data) (OECD, 2025a), but without clear rules regarding data protection, ethics, or assessment.

In October 2025, Minister of Education Daniel David announced the preparation of a guideline for AI use by teachers, aimed at promoting responsible use (focus on the steps of solving, not just the result) (Digi24, 2025). However, as of early 2026, this guideline has not been officially published, according to available sources. There are also pilot projects, such as collaboration with Microsoft for introducing AI in schools, and emphasis on teacher training.

At the university level, regulations are limited to the adoption by a few institutions of their own regulations. The Politehnica University of Bucharest (UPB) developed a dedicated regulation in 2025, governing AI use by students, teachers, and staff, with emphasis on ethics, copyright, data protection, and security. It includes good practice guidelines and codes of conduct (Politehnica University of Bucharest, 2025).

Babeş-Bolyai University in Cluj-Napoca does not have a single central mandatory regulation at the institutional level regarding AI use in education and research, but there are approved recommendations at the university level and specific guidelines developed by faculties. These promote responsible use of generative AI tools (such as ChatGPT), with emphasis on academic integrity, transparency, and human responsibility. The university has issued a Position of the Scientific Council of Babeş-Bolyai University (Scientific Council of UBB, 2024). According to this document, AI use must be responsible, with constant human supervision, as tools can generate inaccurate, incomplete, or biased content. Students and teachers bear final responsibility for the content of their work. The document also states UBB's commitment to promoting originality and academic integrity: AI does not replace critical thinking or scientific

analysis, but serves as an auxiliary tool for improving efficiency. AI use is permitted for preliminary research, source finding, brainstorming, grammatical corrections, stylistic reformulations, or critical feedback, but is prohibited in assessments that test basic skills such as memorization, understanding, critical thinking, or personal creativity (e.g., exams, tests, critical essays, complete theses) (Department of Sociology, FSAS-UBB, 2024; Scientific Council of UBB, 2024). AI use must be explicitly declared in papers, usually in the methodology section or appendices, including the tool name, version, publisher, and context of use. Example: mentioning the tool (e.g., ChatGPT) and describing the manner of use (Faculty of European Studies, 2024; Department of Sociology, FSAS-UBB, 2024; Scientific Council of UBB, 2024).

The National University of Political Studies and Public Administration (SNSPA) has also developed a Guide for the Use of AI Tools in Academic Processes (2024), which promotes transparency and ethical use in teaching and research. It includes prompt examples and recommendations for responsible integration (National University of Political Studies and Public Administration, 2024).

The “Carol Davila” University of Medicine and Pharmacy Bucharest (UMFCD) has a specific Regulation from 2025 regarding AI use in academic activities, with recommendations for faculty and students, emphasizing avoidance of biases and hallucinations (Carol Davila University of Medicine and Pharmacy Bucharest, 2025).

Politehnica University of Timișoara (UPT): One of the first with recommendations (since 2023), it allows use with proper citation and adherence to ethics; it does not prohibit but regulates (Politehnica University of Timișoara, 2023).

A distinct approach is taken by Transilvania University of Brașov, which has adopted a strict position completely banning AI use (e.g., ChatGPT) in the drafting of academic papers (bachelor’s, master’s, doctoral theses), considering it fraud. Severe sanctions, including expulsion; teachers may determine plagiarism based on their own judgment (Transilvania University of Brașov, 2025).

In Romanian universities, regulations regarding AI use in academic activities are in full development and vary significantly from one institution to another. In the absence of a unitary national framework, most universities adopt balanced approaches: they permit AI use as an auxiliary tool (brainstorming, corrections, preliminary research), but require mandatory declaration of use and prohibit undeclared automatic content generation in assessments of originality, treating it as academic fraud.

Overall, the trend is toward promoting transparency, responsibility, and academic integrity, in accordance with the principles of the EU AI Act,

paving the way for an ethical and responsible integration of artificial intelligence in Romanian higher education.

### **The Need for Developing a Risk Mitigation Strategy in the Use of GenAI in University Education**

To transform GenAI into a safe and equitable tool, universities can rapidly implement the following essential strategies, aligned with current regulations (e.g., EU AI Act, 2026).

To mitigate Algorithmic Bias and Discrimination, annual audits of AI tools can be conducted, and only platforms with certified transparency regarding training data should be used (European Commission, 2025). Policy example: Stanford University requires AI providers to publish fairness metrics and allow independent verifications (Stanford HAI, 2025).

Data Privacy and explicit consent can be regulated through data processing and preference for local/on-premise models (U.S. Department of Education, Office of Educational Technology, 2025). Policy example: Universities in the UK impose “data minimization”—collecting only strictly necessary data and automatic deletion after use (QAA, 2024).

Excessive Dependence and Decline in Critical Thinking can be attenuated and eliminated by setting mandatory tasks for critical reflection on GenAI outputs and process-based evaluation (Holmes et al., 2025). Policy example: The University of Melbourne requires students to attach an “AI usage log” to papers, detailing their own contribution vs. AI (Perkins et al., 2024).

Academic Dishonesty and Plagiarism can be managed by updating integrity codes to clearly define permitted GenAI use and integrating detection tools (Cotton et al., 2024). Policy example: Harvard University introduced in 2025 the 'transparent AI use' rule - students must declare and cite any GenAI contribution, similar to bibliographic citations (Perkins et al., 2024).

Educational Inequality and Emotional Support can be addressed through institutional free licenses for GenAI and maintaining regular human interactions (UNESCO, 2025). Policy example: The University of Toronto provides free access to premium GenAI for all students and requires a minimum of 30% synchronous human interactions in online courses (Holmes et al., 2025).

Rapid Implementation: Creating an institutional AI committee for monitoring and mandatory annual training for faculty and students (U.S. Department of Education, Office of Educational Technology, 2025).

These concise measures enable responsible adoption of GenAI, balancing innovation with student protection and academic integrity. By adopting such strategies, universities can transform GenAI from a risk factor into a powerful tool for equitable and responsible pedagogical innovation, aligned with current and future legal require

## **Conclusions**

1. GenAI offers substantial benefits in university education, with a large overall positive effect on learning outcomes (Hedges'  $g = 0.86$ ), particularly through chatbots and generative tools ( $g = 1.02$ ), adaptive personalization, immediate feedback, and increased student engagement (Zhang et al., 2025; Ma & Zhong, 2025). These empirical results support the strategic integration of GenAI as a tool for augmenting the educational process.
2. The associated risks are real and multifaceted, including algorithmic bias and discrimination, data privacy concerns, excessive dependence leading to diminished critical thinking, academic dishonesty, and amplification of educational inequalities, alongside the lack of human emotional support (García-López & Trujillo-Liñán, 2025; Holmes et al., 2025). These threats can undermine equity, integrity, and authentic cognitive development if not addressed proactively.
3. The global and national regulatory framework is evolving rapidly, with the EU AI Act becoming fully applicable in 2026 and Romania's National Strategy for Artificial Intelligence (2024–2027) providing clear directions; however, practical adoption in universities remains fragmented and slow (European Commission, 2025; Government of Romania, 2024). This gap underscores the urgent need for local institutional policies.
4. Risk mitigation is possible and effective through concrete strategies, such as bias audits, transparency and consent policies for data, reflective pedagogical design, process-based assessments, equitable access to tools, and maintenance of essential human interactions (UNESCO, 2025; U.S. Department of Education, Office of Educational Technology, 2025). Successful examples from international universities demonstrate that a responsible approach transforms GenAI into a sustainable ally.
5. The future of university education depends on a responsible balance between innovation and ethics: GenAI has the potential to revolutionize higher education, making it more personalized, efficient, and preparatory for the job market, but only if institutions adopt ethical governance, continuous training, and a focus on integral human development. An ill-considered implementation risks aggravating inequalities and eroding fundamental educational values, while a guided one can generate a more inclusive and resilient education for future generation

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