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ARTIFICIAL INTELLIGENCE IN EDUCATION: OPPORTUNITIES, CHALLENGES, AND ETHICAL CONCERNS

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Abstract: Artificial Intelligence (AI) is rapidly transforming education, offering innovative solutions that enhance learning, modernise administrative tasks, and provide personalised and engaging educational experiences. The present paper explores the integration of AI in education, analysing both its advantages and disadvantages. It also highlights AI-driven tools, such as intelligent tutoring systems, automated grading software, and virtual assistants, which are revolutionising teaching methodologies and making education more accessible and efficient. Beyond traditional classrooms, AI plays a crucial role in language learning, entrepreneurship, business education, research studies, and various other disciplines. However, its adoption presents significant challenges, including concerns over data privacy and the potential reduction of human interaction in learning environments. Besides, this paper reviews teachers' and students' perspectives on the role of AI in education, assessing its impact on engagement, critical thinking, and academic performance. Furthermore, ethical issues such as plagiarism, data security, and the need for regulatory policies are discussed to ensure effective and reliable AI implementation. Finally, as AI continues to evolve, its future in education depends on a balanced approach that maximises its potential while guaranteeing academic integrity and human involvement in learning.

***Keywords**:* Artificial Intelligence (AI), AI applications, education, ethics

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1. Introduction

Artificial Intelligence (AI), the buzzword of our time, has become an increasingly prevalent topic, shaping discussions across industries and revolutionising the way we approach technology and innovation. At its core, AI stimulates human intelligence in machines, enabling problem-solving, decision-making, and data-driven learning. AI-powered systems process large datasets, recognise patterns, and develop solutions that closely mimic human reasoning (Sehlaoui, 2024). In education, AI is transforming teaching and learning by introducing innovative tools that enhance instruction and students engagement. Its global integration into education provides instructors with the opportunity to adopt these technologies and evolve alongside ongoing advancements (Orlando et al., 2024).

AI in education has evolved from basic computer-based systems to web-based platforms and advanced embedded technologies. Robots, chatbots, and AI-driven tools have improved teaching efficiency and instructional quality. Additionally, AI personalises learning experiences by tailoring educational content to students' needs, optimising engagement and comprehension. It has also significantly influenced administration, instruction, and learning within educational institutions (Chen et al., 2020). Beyond classrooms, contributes to automation, efficiency, and cost reduction in various fields, including natural language processing and intelligent robotics. In education, AI-powered digital resources and adaptive systems analyse student progress, adjust content accordingly, and provide real-time feedback, improving accessibility and effectiveness through computers and mobile technology (Anggraini & Faisal, 2024).

The objective of this research paper is to explore the role of AI in education by addressing key questions related to its applications, benefits, challenges, and ethical considerations. It specifically aims to answer the following questions:

1) How is AI transforming education, and what are its key applications in teaching and learning?
2) What are the advantages and disadvantages of integrating AI into education?
3) How do AI-powered tools enhance learning experiences across different educational fields?
4) What ethical concerns arise from using AI in education?
5) What is the future of AI in education, and how can it be implemented responsibly?

2. AI in Education: Pros and Cons

The integration of AI in education has transformed traditional teaching and learning methods, offering both benefits and challenges. As AI-powered tools become more common in classrooms and educational institutions, it is essential to examine their advantages and disadvantages to ensure a balanced and effective implementation.

2.1 Advantages of AI in Education

AI is transforming education by enhancing efficiency, engagement, and personalisation. Intelligent tutoring systems, chatbots, and automated grading tools save teachers time while ensuring accurate and immediate feedback. AI-driven learning adapts to individual student needs, increasing engagement and improving outcomes. Additionally, by automating repetitive tasks, AI allows educators to focus on meaningful interactions and instructional quality (Harry, 2023).

In addition to traditional classroom settings, AI is also reshaping course planning, content creation, and educational delivery. It provides personalised and flexible learning experiences, using data insights that help educators tailor instruction based on student performance. Besides, AI automates administrative routine tasks freeing teachers and students to concentrate on more critical aspects of education (Tahir et al., 2024).

Moreover, AI enhances accessibility by supporting students with disabilities through speech-to-text, text-to-speech, and real-time translation tools. It also fosters lifelong learning by providing adaptive courses and intelligent recommendations, enabling learners to acquire new skills at their own pace. These advancements contribute to a more inclusive, efficient, and student-centred educational system.

2.2 Disadvantages of AI in Education

The integration of AI in education presents challenges such as privacy and security risks, lack of trust, high costs, and potential bias. Protecting student data is crucial to prevent breaches, while transparency in AI-generated feedback is essential to build trust in AI-powered systems. Financial constraints also pose a barrier, as implementing and maintaining AI systems can be costly for institutions. Additionally, AI models may inherit biases from their training data, leading to unfair outcomes, making it essential to develop unbiased and inclusive algorithms. Ethical concerns, including the absence of human interaction and fairness in AI-based education, further highlight the need for responsible implementation (Harry, 2023; Tahir et al., 2024). AI systems can also be rigid, struggling to adapt to diverse learning styles or unpredictable classroom dynamics. Additionally, the constant updates and training required for AI-driven tools can be resource-intensive for educators and institutions, making sustainable implementation a significant challenge.

3. Different Applications of AI in Education

AI is changing education across various disciplines, enhancing teaching and learning through intelligent tools and adaptive technologies. While AI is widely applied in numerous fields, this section focuses on three areas that have recently gained prominence in the Algerian context: language learning, business and entrepreneurship, and research writing. English proficiency is crucial across disciplines, serving as a language for instruction in many fields, professional communication, and research. Entrepreneurship, on the other hand, becomes increasingly popular among graduates from diverse fields such as biotechnology, economics, and engineering. AI supports learners in both language proficiency and business development by helping them design business models, analyse market trends, and refine startup strategies. Furthermore, research writing is essential for students completing dissertations and academic projects, requiring clarity and adherence to scholarly standards. AI aids these areas by improving language learning, facilitating business innovation, and enhancing research writing. This section, hence, explores AI's role in these domains and its potential for further integration.

3.1 AI in language teaching and learning

AI-driven digital platforms and adaptive systems have made learning English more accessible and personalised, enabling learners to study at their own pace catering to individual needs and schedules (Fitria, 2021). Research highlights AI's role in improving linguistic proficiency, motivation, and learner autonomy through various tools and applications (Sehlaoui, 2024). One such tool is ABLE, an AI-driven platform designed as an exam-focused learning environment. By analysing formative and summative assessments, it helps learners improve their grammar skills and overall language proficiency. Similarly, AI- powered speech and pronunciation tools such as Orai enhances public speaking skills by analysing speech

patterns, tracking word usage, and detecting filler words. This enables learners to practice and improve their speaking abilities independently (Anggraini & Faisal, 2024).

Another notable application is ELSA Speak (English Learning Speech Assistant**)**, which uses AI-powered voice recognition to provide real-time pronunciation feedback. It analyses and corrects speech while distinguishing non-native accents, and offers well structured lessons in multiple languages, including English, Spanish, French, and German (Anggraini & Faisal, 2024; Sehlaoui, 2024).

AI-driven chatbots such as ChatGPT and Gemini serve as virtual conversation partners, allowing learners to practice both spoken and written English. These chatbots offer grammar correction, user logs, and real-time feedback, simulating human interactions through natural language processing (NLP). Research indicates that chatbots play a crucial role in enhancing English for Specific Purposes (ESP) vocabulary acquisition, improving retention and engagement. However, responsible use is necessary to ensure that learners maintain creativity and critical thinking rather than relying solely on AI-generated responses (Savitri et al., 2025; Silitonga et al., 2024).

Game-based and interactive platforms like Duolingo and Hello English have also gained popularity in AI-powered language learning. For example, Duolingo adapts learning materials to users' proficiency levels based on an initial assessment (Anggraini & Faisal, 2024). Hello English offers lessons, interactive games, and spoken English dialogues, though minor errors in meaning or sentence structure may occasionally appear (Anggraini & Faisal, 2024). Another engaging platform, EWA, integrates lessons, games, films, TV shows, bilingual translations, and audiobooks to enhance language comprehension and memorisation (Sehlaoui, 2024). Another innovative AI-driven learning system, Neo, developed by Nexgen English Online Co., utilises AI and voice recognition to adapt to users' progress. With an intuitive interface and internationally recognised certification, Neo provides an adaptive approach to English acquisition suitable for learners with active lifestyles (Fitria, 2021).

AI has significantly advanced writing and grammar assistance. Grammarly, a widely used AI-powered tool, detects grammar, punctuation, spelling, and style errors while providing detailed feedback to improve writing quality. Its sophisticated language analysis supports academic and professional communication (Sehlaoui, 2024). Particularly beneficial for non-native English speakers and academic writers, Grammarly exemplifies AI's broader impact on language learning and professional development.

Beyond individual learning, AI fosters collaborative and social learning through platforms like Busuu and HelloTalk. Busuu combines interactive lessons, exercises, and assessments with a strong emphasis on social learning, allowing users to connect with a global community of language learners. HelloTalk similarly facilitates direct communication between users and native speakers, promoting authentic conversations and cultural immersion in real-time (Sehlaoui, 2024). Effective communication is essential for language mastery, yet in the past, learners had limited opportunities to practice with native speakers. With the rise of the internet, technology, and AI-driven platforms, language learning has become more accessible, interactive, and immersive than ever before.

AI has also contributed to virtual learning environments by integrating technologies such as virtual reality (VR), augmented reality (AR), and three-dimensional (3D) simulations. These tools offer interactive learning experiences in which users can explore, experiment, and receive instant feedback in a controlled setting. Meanwhile, major online learning platforms like Coursera, edX, and Udacity have integrated AI to enhance their educational offerings, providing adaptive content tailored to individual progress and learning goals (Sehlaoui, 2024). By making learning more immersive and responsive, these innovations bridge the gap

between theory and practice, offering students hands-on experiences that were once limited to physical classrooms or specialised training centres.

Integrating AI into language learning is beneficial on multiple levels, enhancing communication skills and academic performance, but its impact extends beyond general language acquisition. Mastering technical and professional language is crucial across various fields, especially as innovation and entrepreneurship are becoming increasingly popular among Algerian graduates. In addition to language proficiency, learners now rely on AI-driven tools for business planning, market analysis, and entrepreneurial decision-making.

3.2 AI in Entrepreneurship and Business Studies

The growing significance of AI in entrepreneurship is reshaping how businesses are created, managed, and scaled. AI empowers entrepreneurs by automating routine tasks, enhancing decision-making processes, and improving business performance. It also provides valuable tools for research and education, bridging the gap between theory and practice. In Algeria, higher education institutions are increasingly focusing on fostering an entrepreneurial spirit among students across various fields. Therefore, by integrating AI into entrepreneurship education, students are not only equipped with the latest technological tools but also encouraged to embrace innovative thinking and enhance their entrepreneurial skills, preparing them for the evolving business landscape.

AI-driven education strengthens entrepreneurial skills and nurtures creativity, offering valuable and significant advantages for businesses (Nuseir et al., 2020). Economics students, in particular, primarily use AI for task automation and time management to address their inexperience with complex tasks. While self-directed learning is a key motivation, gaining a competitive edge is less emphasised. Additionally, students often utilise multiple AI tools, as no single tool fully meets their needs (Balytska et al., 2024). Entrepreneurs today are increasingly turning to AI to support the development and growth of new businesses (Roundy, 2022). These trends highlight AI's growing role in not only enhancing efficiency but also shaping entrepreneurial mindsets. In today's digital era, AI serves as both a learning aid and a strategic tool, equipping students and future entrepreneurs with the skills needed to adapt to market demands and drive innovation.

According to Giuggioli and Pellegrini (2021), AI impacts entrepreneurship in four key areas: opportunity creation, decision-making, performance improvement, and education and research. In the 'opportunity' phase, AI assists entrepreneurs in identifying and developing new business prospects. During 'decision-making,' it enhances predictions and enables more informed choices. In terms of 'performance,' AI boosts operational efficiency by optimising business processes. Finally, in 'education and research,' AI bridges the gap between academic studies and practical entrepreneurship, accelerating innovation. By augmenting human capabilities, AI allows entrepreneurs to delegate routine tasks to AI systems and focus on creativity, empathy, and strategic vision, areas where AI cannot compete. Consequently, AI should be seen as a tool that empowers entrepreneurs rather than as a threat.

AI is optimising economic activities across various sectors, including finance, insurance, biotechnology, marketing and customer service. Its integration into business operations enables companies to innovate and remain competitive. AI plays a key role in customer interaction, data analysis, and strategic planning. By handling routine operations and boosting productivity, it also improves inter-company relations in areas such as accounting and financial management. Businesses are increasingly incorporating AI into their decision-making processes, with AI becoming a member of some boards of directors. As AI continues to shape Industry 4.0, it is expected to take over high-level tasks, influencing labour and legal frameworks (Ruiz-Real et al., 2021).

AI has become a vital asset in entrepreneurship and business, enhancing efficiency, innovation, and strategic decision-making. Just as mastering English and developing an entrepreneurial mindset are essential for students in today's academic and professional settings, strong research writing skills are equally crucial. High-quality dissertations and research projects are not only academic requirements but also indicators of a student's ability to think critically, communicate effectively, and contribute meaningfully to their field. Whether drafting business proposals, startup plans, or academic dissertations, the ability to produce well-structured and coherent work reflects a student's preparedness, expertise, and capacity for data analysis and effective communication. As research writing becomes an integral part of higher education, AI is increasingly supporting students in this domain, shaping the way they approach academic work.

3.3 AI and Scientific Writing

AI is reshaping scientific research by reforming information processing and enhancing academic writing. Tools like ChatGPT assist researchers in identifying relevant information, summarising complex studies, and organising literature reviews. In addition, AI enhances writing quality by detecting grammatical errors, ensuring academic compliance, and improving clarity in research manuscripts. These tools have become increasingly integrated into academic workflows, supporting researchers across various disciplines (Amara et al., 2024).

However, while AI tools like ChatGPT, Grammarly, and SciSpace Copilot improve research efficiency by automating tasks like text editing and data synthesis, their role in academic writing must be critically examined. Some scholars argue that over-reliance on AI-generated content may undermine originality and the depth of critical analysis (Biondi-Zoccai et al., 2025). The challenge lies in ensuring that AI serves as a complementary tool rather than a substitute for human intellectual effort. Without careful oversight, AI-generated text could dilute scholarly rigour and lead to ethical concerns regarding authorship and academic integrity. Furthermore, AI fosters inclusivity by aiding non-native English speakers in scientific communication, enabling interdisciplinary collaboration, and facilitating knowledge dissemination. However, transparency in AI-assisted research is crucial. Researchers must clearly disclose the extent of AI involvement in their writing, as failure to do so may raise concerns about credibility and intellectual contribution (Biondi-Zoccai et al., 2025). Institutions and academic journals should develop clear ethical guidelines to regulate AI's role in research writing, ensuring that AI enhances, rather than compromises, the quality and originality of scholarly work.

As AI becomes more embedded in research writing, it is essential to strike a balance between deploying its benefits and maintaining academic integrity. The ongoing debate about AI's influence on originality and critical thinking highlights the need for clear ethical guidelines and responsible use. Moreover, universities and academic journals should play an active role in educating researchers about AI's potential and limitations, ensuring that technological advancements support, rather than compromise, the quality of scholarly work.

4. Teachers' Perspectives and Students' Readiness for AI

4.1 Teachers' Attitudes Towards AI in Education

Understanding educators' perspectives on AI is essential to evaluate its role in enhancing or hindering teaching practices. This section highlights teachers' attitudes toward AI tools, focusing on both their benefits and challenges in the classroom.

A study by Kehal (2024) on AI integration in creative research at Algerian universities found that faculty members generally view AI positively, recognising its potential to enhance creativity, research methodologies, and interdisciplinary collaboration. However, challenges such as limited institutional support, ethical concerns, and insufficient training hinder its full adoption, highlighting the need for structured training programmes, ethical guidelines, and institutional backing. Similarly, Benaicha and Semmoud (2024) found that while Algerian EFL teachers appreciate AI's role in lesson planning, delivery, and assessment, they caution against over-reliance and its potential impact on academic integrity. In the same vein, Achili and Zerrouki (2024) note a growing interest in AI among Algerian educators but emphasise persistent barriers, including ethical concerns, poor infrastructure, and inadequate training. To bridge this gap, they advocate for comprehensive training, improved resources, and clear ethical guidelines to support effective AI integration and digital literacy development.

From educators' standpoint, AI has remarkably advanced educational experiences. However, ensuring proper AI use remains critical to preserving academic honesty and fostering critical thinking. Informal discussions with colleagues across disciplines reveal diverse attitudes toward AI adoption as well. While some educators eagerly integrate AI for several uses such as grading, research, and interactive learning, others remain cautious due to concerns about reliability and ethics. Some admit AI's role in reducing administrative workload, allowing for greater student engagement, yet uncertainties persist regarding its impact on originality and creativity in student work. Besides, disparities in AI-related training highlight the need for clearer institutional guidelines and professional development opportunities in Algerian higher education. Notably, some Algerian universities have established well-equipped AI hubs and corners, reflecting a growing institutional commitment to AI integration, but more work is still needed for effective AI implementation.

4.2 Students' Attitudes Towards AI in Education

Students generally perceive AI tools such as ChatGPT as a valuable supplement rather than a replacement for their own work. Many students believe that combining their writing with AI-generated content enhances the quality of their work rather than overshadowing it. ChatGPT is particularly valued for drafting research papers, although students are aware of its limitations. Hence, there is a need for additional support and training to help students understand AI's advantages and best practices for of these technologies (Amara et al., 2024).

Conversely, Hiouani and Khiari (2024) argue that some students perceive AI as a replacement for effort rather than an enhancement to learning. AI use is often contrasted with plagiarism, and many students do not equate it with traditional academic dishonesty. AI chatbots, particularly for literature reviews, are generally not seen as violating academic integrity, reflecting a lack of clear ethical understanding. This highlights a gap in students' ethical awareness surrounding AI use in academic work.

It is quite noticeable that students' attitudes towards AI vary widely, with some expressing openness to its use, while others remain hesitant due to limited awareness of potential risks. To foster an accurate AI adoption, institutions should provide guidance on ethical AI use and its role in supporting, not replacing, critical thinking and academic integrity.

5. Ethical Considerations

5.1 AI and Plagiarism

AI's growing applications in education raise concerns about plagiarism. As previously stated, AI tools enhance learning, but their misuse can threaten academic integrity. Teachers, administrators, and policymakers acknowledge both the benefits and risks of AI tools and stress the need for ethical use to prevent violations (Hoa, 2023). To avoid such risks,

institutions should establish clear policies regulating AI-assisted writing and plagiarism detection. Educating students and faculty on AI's ethical implications is essential, alongside training on its adequate use. Ultimately, AI should aid learning and intellectual development, not replace original work or facilitate plagiarism (Hiouani & Khiari, 2024). A similar perspective is shared by Huston (2024), who highlights how the rise of AI technologies like ChatGPT has disrupted academic writing, rendering traditional plagiarism detection methods insufficient. AI's ability to mimic human writing complicates distinguishing between original work and AI-assisted content. Educational institutions must develop new frameworks that balance AI's role with academic integrity, integrating ethical guidelines and targeted training for students and educators. The goal is to empower AI to enhance education without compromising critical thinking and creativity, ensuring it supports rather than undermines the academic process.

Although regulating AI-assisted writing and preventing plagiarism is crucial, a policy-driven approach alone may not suffice. The effectiveness of such regulations depends on how well students and faculty grasp the ethical boundaries of AI use. Simply implementing detection tools and policies does not address the deeper issue: fostering academic integrity as a mindset rather than a set of enforced rules. Moreover, defining 'plagiarism' in AI-generated content remains challenging, as AI produces text based on existing knowledge rather than direct copying. Instead of viewing AI solely as a threat to integrity, institutions should explore its potential to reinforce ethical academic practices. Encouraging responsible AI use through critical thinking exercises and reflective discussions may be more impactful than relying solely on detection and punitive measures.

5.2 AI and Data Security

According to Pendy (2021), AI is becoming integral to education, resulting in critical data privacy and security concerns. AI systems collect vast amounts of student data, raising the risk of misuse or unauthorised access. Therefore, transparency in data processing, strong protective measures, and clear communication with educators and students are essential to maintaining trust. Nevertheless, ensuring data security requires more than just protective measures. Many institutions lack clear policies on AI-driven data collection, leaving gaps in accountability. Additionally, AI systems must not only protect data but also be used ethically to avoid biased profiling or misuse. As AI's role in education expands, regular updates are essential to maintaining both security and fairness.

5.3 AI Policy Regulations in Education

AI technologies hold immense potential for humanity, but require careful regulation. They are not a perfect solution or a guarantee of positive outcomes. Policymakers must assess AI' legal, ethical, pedagogical, psychological, and sociological impacts, positive or negative, to ensure that these technologies are developed and implemented within a legal framework to protect individuals and society from potential risks (Gocen & Aydemir, 2020).

Understanding teachers' attitudes can help policymakers prioritise clarity, transparency, and ethics in AI integration, supporting educators and building trust. Successful AI implementation in higher education requires ongoing collaboration among students, teachers, policymakers, and stakeholders (Dobrovská et al., 2024).

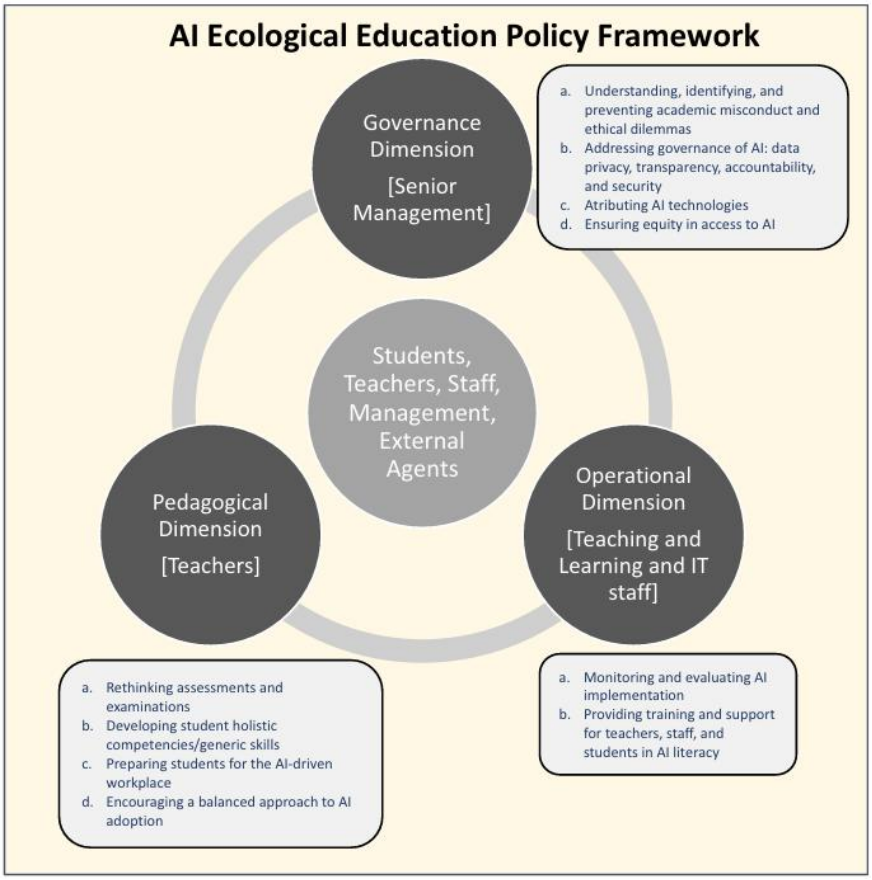
Policymakers must regulate AI development to align with societal values, while researchers and developers must minimise associated risks. Proactive dialogue among stakeholders is crucial to ensure AI benefits society as a whole. This includes setting standards, researching social and ethical impacts, and fostering open discussions about AI integration. Additionally, AI systems should be designed for long-term sustainability,

considering both immediate benefits and long-term consequences to ensure a just and equitable future for all (Akinnagbe, 2024).

This study proposes an AI Ecological Education Policy Framework, consisting of three dimensions: Pedagogical, Governance, and Operational, to guide AI integration in universities. It ensures a comprehensive understanding of AI's impact, clarifies stakeholder responsibilities, and supports ethical and responsible AI use to optimise its benefits in education as displayed in Figure1 (Chan, 2023).

Figure 1:

AI Ecological Education Policy Framework (Chan, 2023, p. 20).



In brief, regulatory efforts are essential to ensuring AI aligns with ethical and societal values, but the challenge lies in balancing innovation with oversight. Excessive regulation could stifle AI's potential benefits, whereas a lack of governance may lead to ethical misuse. Moreover, AI policies must remain flexible to keep pace with technological advancements, preventing outdated regulations from hindering progress. Given AI's expanding role in education, collaboration between educators, policymakers, and developers is not just necessary but urgent. Establishing clear responsibilities and transparent guidelines is a key to fostering trust and ensuring AI serves as a tool for improvement rather than disruption.

6. Future Prospects of AI

The future of AI in education holds great promise, offering opportunities for innovation and growth. AI has the potential to change teaching and learning by making education more adapted and effective (Harry, 2023). As AI systems evolve, they are expected to better understand human emotions, provide nuanced feedback, and create more customised lesson

plans. Pendy (2021) simply puts that current trends, such as intelligent tutoring systems, chatbots, and the integration of NLP and machine learning, are paving the way for more interactive and tailored learning environments. Additionally, AI is playing a growing role in teacher professional development and the creation of immersive learning experiences through virtual and augmented reality. However, as AI continues to transform education, it its challenges must be addressed to ensure teachers remain central in fostering creativity, imagination, and problem-solving skills, areas beyond machine capabilities (Kaswan, 2022; Tahir et al., 2024). In this regard, Akinnagbe (2024) advocates future AI integration in education should prioritise responsible innovation, ethics, transparency, and accountability (Akinnagbe, 2024).

AI continues to expand its role in education worldwide. Thus, it is important to assess its development in different contexts. Understanding the current state of AI in Algerian education provides valuable insight into existing opportunities and challenges. By examining these aspects, we can explore potential strategies for responsible and effective AI implementation. With a thoughtful approach, Algeria can advance AI integration in a way that supports both educators and students. To contribute to this discussion, this study proposes a roadmap that outlines key steps for fostering AI adoption while ensuring alignment with the country's educational goals and infrastructure.

6.1 Current State of AI in Algeria

Algeria is actively positioning itself as a leader in AI adoption in Africa through strategic initiatives aimed at fostering innovation and technological development. The country introduced its first National AI Strategy during the 3rd African Start-up Conference in Algiers, reflecting its commitment to AI-driven digital transformation. This strategy prioritises scientific research, talent development, AI-friendly infrastructure, and start-up support to enhance business-oriented solutions (Ecofin Agency, 2024). A key landmark in this effort is the establishment of the Scientific Council for AI, which serves as a consultative body shaping a multi-sectoral AI strategy while advocating for ethical AI use and intellectual property protection (Saada, 2024).

The Algerian government has also emphasised AI's role in economic growth, digital transformation, and national sovereignty, with key priorities including strengthening AI research, improving digital infrastructure, and promoting AI-driven solutions across governance and industry. Also, Algeria has been actively engaging in international collaborations and policy discussions to align its AI strategy with global advancements (Algerian Ministry of Post and Telecommunications, 2025). However, despite these efforts, Algeria ranks low in AI readiness due to weaknesses in digital infrastructure and implementation capacity. Addressing these gaps requires investments in talent development, cloud computing, and reliable internet access to ensure effective AI integration (Ecofin Agency, 2024).

To support AI education and research, Algeria has established specialised institutions such as the National School of Artificial Intelligence (ENSIA) and AI hubs in various Algerian universities. ENSIA, for instance, plays a pivotal role in training engineers to apply AI across sectors including health, energy, agriculture, and transport. Through national and international partnerships, it fosters interdisciplinary research and digital innovation, contributing to Algeria's technological future (ENSIA, n.d.). Similarly, the Algeria Research Hub, launched in collaboration with local and North American universities, focuses on translating research into practical innovations in AI, applied mathematics, clean energy, and agriculture, reinforcing the link between academia and economic development (Algeria Research Hub, n.d.).

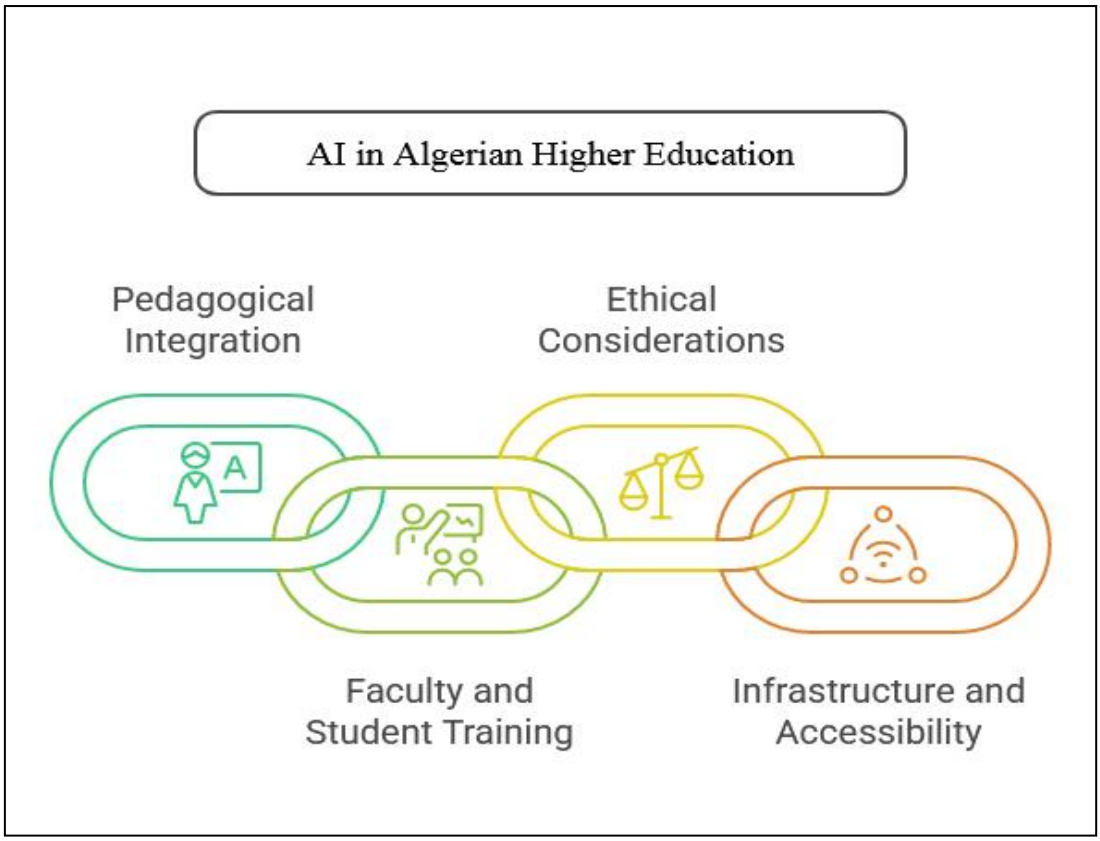
Progress is evident, yet challenges remain. AI literacy and teacher training continue to be obstacles, as many educators lack structured training on AI's effective and ethical use. Additionally, infrastructure limitations, such as unreliable internet and insufficient AI-integrated learning management systems, hinder AI's full potential in higher education. Moreover, Algeria's multilingual education system presents another challenge, requiring AI tools to be adapted for Arabic, French, and English instruction.

6.2 A Roadmap for AI in Algerian Higher Education

Given Algeria's growing interest in AI, a structured approach is essential to ensure its effective and ethical integration in higher education. There is no one-size-fits-all model; however, the following roadmap aims to address existing challenges while fostering innovation and aligning AI use with educational needs. This framework is built on four key pillars: pedagogical integration, faculty and student training, ethical considerations, and infrastructure and accessibility as shown in Figure 2.

Figure 2:

A Suggested Roadmap for AI Integration in Algerian Higher Education



Pedagogical Integration: Developing AI literacy programmes for educators and students is essential to ensure the right usage of AI tools. AI should be incorporated into blended learning models, where it enhances rather than substitutes traditional teaching, maintaining human interaction. Besides, interactive and adaptive AI-powered systems, such as tutoring platforms and automated assessments, can personalise education by responding to individual student needs. For instance, AI-driven quizzes and real-time feedback tools can

improve engagement and learning outcomes in various fields such as mathematics, economics, and languages.

Faculty and Student Training. Similarly to ICTs and English, AI training should be mandatory for educators, equipping them with best practices for AI-enhanced instruction. Workshops on AI ethics, bias, and academic integrity can help prevent misuse in research and assignments. Students should also receive practical training on AI tools relevant to their fields, such as AI-based financial modeling for economics students and AI-assisted language learning for linguistics students. As several Algerian universities have established AI hubs, faculty access remains limited. Expanding these initiatives through structured AI certification programmes can strengthen educators' confidence in AI adoption. These hubs can also welcome educators from other universities with limited infrastructure.

Ethical Considerations. To ensure responsible AI integration, national policies must define acceptable AI use in education and deliver it to all institutions. Universities should implement institutional guidelines on AI-assisted writing and research to uphold academic integrity. AI-driven grading systems must be transparent and unbiased, preventing algorithmic disparities in student evaluations. Standardising AI detection tools across universities can help prevent plagiarism while allowing ethical AI-assisted research, ensuring a balance between innovation and academic honesty.

Infrastructure and Accessibility. Strengthening digital infrastructure in universities is critical for AI-powered learning. Additionally, investing in multilingual AI tools that support Arabic, French, and English will enhance accessibility for diverse student populations. Collaborating with AI companies through public-private partnerships can help make AI solutions more affordable and widely available, enabling sustainable AI integration in Algerian higher education.

This roadmap outlines essential steps for ethical and effective AI integration in Algerian higher education. Strengthening pedagogy, training, ethics, and infrastructure can foster a sustainable AI ecosystem. Collaboration among educators, policymakers, and developers is also important to ensuring AI enhances learning rather than disrupts it.

7. Conclusion

The integration of AI in Algerian higher education presents both opportunities and challenges that require deeper investigation. Empirical studies are needed to assess its current state, effectiveness, and impact on student learning, faculty adaptation, and institutional policies. Future research should also explore alternative roadmaps that complement or refine existing frameworks, ensuring AI adoption remains flexible and context-specific. Addressing challenges such as multilingual AI development, digital infrastructure, and ethical concerns will be crucial in shaping a sustainable AI ecosystem. By fostering interdisciplinary research and continuous policy evaluation, Algeria can develop an adaptive, inclusive, and ethically grounded approach to AI in education.

References

Achili, N., & Zerrouki, N. (2024). Using Artificial Intelligence in Algerian Higher Education: Opportunities and Challenges from Teachers' Perspectives. *Atras Journal , 5*, 541-556.

Akinnagbe, O. B. (2024). The Future of Artificial Intelligence: Trends and Predictions. *Mikailalsys Journal of Advanced Engineering International , 1* (3), 249-261.

Algeria Research Hub. (n.d.). Retrieved March 28, 2025, from Improving Research Capability in Algeria: https://www.algeria-research-hub.org/

Algerian Ministry of Post and Telecommunications. (2025, March 3). Retrieved March 28, 2025, from Algeria at the forefront of AI adoption in Africa: A strategic vision at ministerial summit: https://www.mpt.gov.dz/algeria-at-the-forefront-of-ai-adoption-in-africa-a-strategic-vision-at-ministerial-summit/

Amara, N., Elbchir, Y., & Hanifi, A. (2024). Chatgpt as an Essential Tool: Student' Perceptions in Academic Writing at Chlef University. *Journal of Studies in Language, Culture, and Society (JSLCS) , 7* (2), 98-114.

Anggraini, A., & Faisal, F. (2024). The Use of Artificial Intelligence Based Technology in English Language Teaching. *Golden Ratio of Data in Summary , 4* (2), 950 -957.

Balytska, M., Rašticová, M., Versal, N., Honchar, I., Prykaziuk, N., & Tkalenko, N. (2024). What drives economics students to use generative artificial intelligence?". *Knowledge and Performance Management , 8* (2), 51-64.

Benaicha, B., & Semmoud, A. (2024). Investigating Algerian EFL Teachers' Attitudes Towards AI Utilization in Language Learning. *ATRAS , 5*, 130-150.

Biondi-Zoccai, G., Cazzaro, A., Cobalchin, E., D'Auria, D., Ardizzone(, G., Giordano, S., et al. (2025). Artificial Intelligence Tools for Scientific Writing: The Good, The Bad and The Ugly. *Top Italian Scientists Journal , 2* (1).

Chan, C. K. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education , 20* (38).

Chen, L., Chen, P., & Lin, Z. (2020). Artificial Intelligence in Education: A Review. *IEEE Access , 8*, 75264- 75278.

Dobrovská, D., Vaněček, D., & Yorulmaz, Y. I. (2024). Students' Attitudes towards AI in Teaching and Learning. *International Journal of Engineering Pedagogy (iJEP) , 14* (8), 88–106.

Ecofin Agency. (2024, December 10). Retrieved March 29, 2025, from Algeria Unveils AI Strategy to Boost Digital Transformation: https://www.ecofinagency.com/public-management/1012-46241-algeria-unveils-ai-strategy-to-boost-digital-transformation

ENSIA. (n.d.). Retrieved March 29, 2025, from ENSIA: https://www.ensia.edu.dz/school/

Fitria, T. N. (2021). The Use Technology Based on Artificial Intelligence in English Teaching and Learning. *ELT Echo The Journal of English Language Teaching in Foreign Language Context , 6* (2), 213_223.

Giuggioli, G., & Pellegrini, M. M. (2021). Artificial intelligence as an enabler for entrepreneurs: a systematic literature review and an agenda for future research. *International Journal of Entrepreneurial Behavior & Research* .

Gocen, A., & Aydemir, F. (2020). Artificial Intelligence in Education and Schools. *Research on Education and Media , 12* (1), 13-21.

Harry, A. (2023). Role of AI in Education. *Injuruty: Interdiciplinary Journal and Humanity , 2* (3), 260-268.

Hiouani, A. S., & Khiari, N. E. (2024). The AI degree: Exploring the drivers of AI tool use in master's dissertation writing of EFL graduates. *Journal of Studies in Language, Culture, and Society (JSLCS) , 7* (2), 26-47.

Hoa, N. Q. (2023). AI and Plagiarism: Opinion from Teachers, Administrators and Policymakers. *Proceedings of the AsiaCALL International Conference , 4*, 75-85.

Hutson, J. (2024). Rethinking Plagiarism in the Era of Generative AI. *Journal of Intelligent Communication , 3* (2), 20-31.

Kaswan, S. (2022). Application of Artificial Intelligence in Educational Contexts for Teaching and Learning. *International Journal of Innovative Research in Computer Science & Technology (IJIRCST) , 10* (2), 139-143.

Kehal, M. (2024). AI and Creative Research in Algerian Universities: Faculty Perspectives on Integration. *Journal of Studies in Language, Culture, and Society (JSLCS) , 7* (2), 85-97.

Nuseir, M. T., Basheer, M. F., & Aljumah, A. (2020). Antecedents of entrepreneurial intentions in smart city of Neom Saudi Arabia: Does the entrepreneurial education on artificial intelligence matter? *Cogent Business & Management , 7* (1).

Orlando, V., Lazaros, E. J., Davison, ,. C., Truell, A. D., & Allam, H. (2024). Artificial intelligence (AI) applications in education: implications for information systems instructors. *Issues in Information Systems , 25* (1), 469--473.

Pendy, B. (2021). Artificial Intelligence: The Future of Education. *Journal of Indonesian Social Sciences , 2* (11), 2003-2012.

Roundy, P. T. (2022). Artificial intelligence and entrepreneurial ecosystems: understanding the implications of algorithmic decision-making for startup communities. *Journal of Ethics in Entrepreneurship and Technology , 2* (1), 23-38.

Ruiz-real, J. L., Uribe-toril, J., Torres, J. A., & De pablo, J. (2021). Artificial Intelligence in Business and Economics Research: Trends and Future. *Journal of Business Economics and Management , 22* (1), 98-117.

Saada, H. (2024, July 4). *Algeria's Commitment to Integrating Artificial Intelligence Across Various Sectors*. Retrieved March 29, 2025, from Dzair Tube: https://www.dzair-tube.dz/en/algerias-commitment-to-integrating-artificial-intelligence-across-various-sectors/

Savitri, W. E., Nugroho, H. A., Munir, A., Pusparini, R., Kurniasih, E., & Arinda, D. (2025). Perspectives of Pre-Service English Teachers on AI Chatbots in Esp Worksheet Development. *JOLLT Journal of Languages and Language Teaching , 13* (1), 425-435.

Sehlaoui, F. z. (2024). The Artificial Intelligence Revolution in University Language Teaching:Applications and Futures. *Journal of Studies in Language, Culture, and Society (JSLCS) , 7* (2), 13-25.

Silitonga, L. M., Wiyaka, & Prastikawati, E. F. (2024). Boosting Students' ESP Vocabulary by Utilizing AI Chatbot. *Eternal: English Teaching Journal , 15* (2), 275-283.

Tahir, M., Hassan, F. D., & Shagoo, M. R. (2024). Role of artificial intelligence in education: A conceptual review. *World Journal of Advanced Research and Reviews , 22* (1), 1469–1475.