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Artificial Intelligence in Education: Benefits, Challenges, and Ethical Considerations According to Scientific Evidence

John Arturo Buelvas Parra, Álvaro Enrique Santamaría Escobar, Aylin Patricia Pertuz Martínez

1. PhD in Social Sciences, Associate Professor, University of Sucre. Colombia.
Email: John.buelvas@unisucre.edu.co

ABSTRACT

Artificial intelligence (AI) has positioned itself as a key tool to transform education, offering multiple benefits ranging from the personalization of learning to the optimization of academic management. AI's ability to analyze data and tailor teaching to each student's needs has led to more interactive and efficient learning. However, the integration of these technologies poses significant ethical and societal challenges. Reliance on large volumes of data exposes students to privacy risks, and the potential for algorithmic biases can intensify existing inequalities, affecting vulnerable groups by gender, ethnicity, and socioeconomic status.

The analysis of various research underlines that, although AI can democratize access to knowledge and improve the educational experience, its implementation must be carried out with an ethical and responsible approach. This involves developing policies that encourage equitable access to these technologies and training programs for both teachers and students, promoting informed and conscious use.

AI has the potential to be an engine of innovation that revolutionizes the education system, but for its benefits to be fully realized, its risks and limitations need to be addressed. The creation of solid regulatory and ethical frameworks is essential to ensure that AI acts as a complement that enhances the work of teachers, without replacing the human and collaborative aspects that are fundamental in learning. This study reinforces the need for a balance between technology and ethics to move towards an inclusive and sustainable education system.

KEYWORDS: Artificial intelligence in education, Personalization of learning, Ethical challenges in AI, Algorithmic bias, Data privacy.

1. Introduction

Artificial intelligence (AI) has burst into the educational field as one of the most promising technologies for profoundly transforming pedagogical practices and academic management. Its incorporation offers tools that allow learning to be personalized, educational administration to be more efficient, and access to knowledge to be expanded. Through intelligent tutoring systems, adaptive learning

platforms, and virtual assistants, AI facilitates interactive and dynamic teaching that adapts to the individual needs of each student (García Villarroel, 2021). However, along with these opportunities, there are also important questions and ethical challenges that must be addressed responsibly, since the integration of AI in education poses risks that affect both the privacy of students and the principles of equity and inclusion in access to these technologies.

Despite advances in AI applied to education, concerns persist about its impact in ethical, social and pedagogical terms. On the one hand, AI relies on large volumes of student data to operate optimally, which exposes students to privacy risks and sensitive data handling. On the other hand, there are fears about algorithmic bias that could perpetuate or even intensify pre-existing inequalities in aspects such as gender, ethnicity and socioeconomic status. In addition, unequal access to AI technologies can accentuate the digital divide, generating an educational environment where only some students and teachers have the possibility of benefiting from these tools. Against this backdrop, a fundamental question arises: does AI really democratize access to education or, on the contrary, does it risk widening inequalities? (UNESCO, 2019; 2022).

Thus, this research aims to address this dilemma from an analytical and critical perspective, formulating as a central problem how educational institutions can implement artificial intelligence ethically and effectively, considering both its potential benefits and the ethical challenges and risks it represents. To this end, several objectives are proposed. The first is to identify and classify the benefits of AI in the educational context, according to recent literature, to understand how this technology can support and improve teaching-learning processes. Next, the main challenges and limitations documented in the implementation of AI in education will be examined, as a basis for a broader reflection on the possible risks. Finally, it is proposed to develop an ethical framework that contemplates the protection of privacy, the reduction of algorithmic bias and the promotion of equity in access to these technologies, in order to guide future applications and research.

In this analysis process, the research is expected to provide practical recommendations that guide educational institutions in the responsible adoption of AI. These contributions include the development of a guide that promotes ethical and effective implementation, based on a balanced assessment of the associated benefits and risks. Likewise, inclusive education policies are suggested that promote equal access and training in AI for both students and teachers, regardless of their socioeconomic background. On the other hand, an ethical framework that regulates the use of AI in education, protecting the privacy of students and minimizing the risks of bias in algorithms, is considered essential.

In addition, an active promotion of AI literacy is proposed, aimed at both teachers and students, so that they can not only understand and use these tools, but also take a critical perspective on their ethical implications. Training in the responsible and thoughtful use of AI in education is essential for educators and students to reap its benefits without losing sight of the responsibilities that come with it.

Therefore, in a context in which AI is increasingly integrated into the different areas of daily life, it is essential that its incorporation into education is carried out with a

clear understanding of its benefits, but also of its risks. This research aims to contribute to the development of a more inclusive and responsible education, in which technology not only serves as a tool for efficiency, but also becomes a facilitator of learning and human development. With an ethical and equitable approach, AI can play a crucial role in shaping the next generations, equipping them not only with digital skills, but also with a deep awareness of the implications and responsibilities that these technologies entail.

1. Artificial Intelligence in Education

Artificial intelligence (AI) has established itself as a key resource to drive innovation in education, providing tools that transform the way we teach and learn. This progress has been driven by technological development and the need to adapt education systems to an increasingly digitalised environment. AI in education ranges from intelligent tutoring systems to adaptive learning platforms and automated assessment, which expands access and personalizes the educational experience for students (García Villarroel, 2021).

AI has enormous potential in educational settings, particularly in higher education and virtual classrooms. García Villarroel (2021) points out that AI enables more interactive and dynamic learning, thanks to the real-time analysis of student progress. These tools allow you to identify learning patterns, suggest areas for personalized improvement, and optimize teaching resources. For his part, Moreno Padilla (2019) highlights that AI not only enriches teaching, but also allows teachers to adopt a more facilitating role, where autonomous and personalized learning is at the center of the academic experience.

However, the incorporation of AI in education also presents significant ethical and societal challenges. UNESCO (2019) warns that the implementation of AI must contemplate aspects of equity, privacy, and ethics. The "Beijing Consensus on Artificial Intelligence and Education" emphasizes the importance of regulating the use of data and protecting student privacy, stressing that it is essential to avoid biases in algorithms that can negatively impact certain groups of students. UNESCO (2022) promotes a "new social contract for education", which aims to balance the benefits of AI with social justice and inclusion.

The impact of AI on education not only redefines traditional structures, but also orients the system towards a model more adapted to individual needs, promoting continuous learning (UNESCO, 2022). This approach values both technical competencies and emotional and social skills, recognizing the complexity of human learning. Rouhiainen (2018) mentions that AI not only revolutionizes the way knowledge is imparted, but also transforms the roles of teachers and students, generating new dynamics of collaboration and learning.

The integration of AI in education is one of the most prominent developments in recent years, affecting both teaching methodology and administrative and planning processes. AI has begun to transform education by allowing teachers and students to take advantage of tools that optimize time and personalize learning. According to a survey by Slidesgo (2024), 70.7% of teachers perceive AI positively in the educational field, highlighting its ability to improve the planning of activities and

reduce the time spent on routine tasks, which facilitates a deeper focus on the educational process.

A relevant point addressed by the survey is the adoption of generative AI tools by teachers. More than 61% of respondents said they had used these technologies in the last three months, which is evidence of rapid familiarization and adoption. Generative AI has helped teachers overcome creative blocks, such as "blank page syndrome," by providing inspiration and support in content creation. According to Slidesgo (2024), this technology contributes significantly to enriching teaching methods and facilitates the personalization of educational content, allowing materials to be adapted to the needs of different groups of students.

The use of AI in education also offers benefits in terms of efficiency and time optimization. According to Slidesgo (2024), teachers perceive that AI improves the quality of educational material and promotes more inclusive teaching. The ability to personalize teaching is especially valued, as AI makes it possible to identify and respond to the particular needs of each student, a key aspect to promote a more equitable and effective education. In addition, AI automates certain administrative and assessment tasks, freeing up time for teachers to focus on more complex pedagogical and academic development aspects.

The ability of educational institutions to implement AI appropriately is another aspect highlighted by the Slidesgo survey. While the potential of this technology to optimize processes is recognized, concerns remain about potential reliance on these systems. Therefore, it is essential that institutions not only adopt AI technologies, but also invest in the training and continuous education of teachers, so that they can use these tools critically and effectively (Slidesgo, 2024). A successful implementation of AI in education requires a balanced approach that combines technological use with a deep understanding of its ethical and pedagogical implications.

Another important challenge is the ethics in the use of AI in education. The automation and personalization of educational processes raise questions about data privacy and equity in access to technology. In addition, teachers must be trained not only in the technical handling of these tools, but also in an ethical understanding of their implications. Excessive reliance on AI could affect teacher autonomy and, in some cases, generate technological inequality gaps between different institutions (Slidesgo, 2024).

2. Fundamentals of Artificial Intelligence in Education

The fundamentals of artificial intelligence (AI) are based on technologies such as machine learning, which allows patterns to be identified in large volumes of data to make predictions; deep learning, which uses artificial neural networks with multiple hierarchical levels of learning; and natural language processing, which facilitates interaction between machines and people. This latest technology allows the processing, automation, and organization of large amounts of data to execute specific actions and obtain specific results (García Villarroel, 2022).

In recent years, the implementation of AI-based technologies has transformed teaching and learning processes in universities and educational centers around the world. The most widely used tools include intelligent tutors, learning management

systems and educational video games, which have experienced a notable increase in demand (Vila Sánchez & Penín Lama, 2007). These tools reflect a shift in the educational approach, geared towards leveraging technology to enrich the student experience.

AI is revolutionizing education by making it easier to personalize learning and automate processes, such as virtual tutoring and automated assessment. This ability to adapt and optimize teaching has redefined how knowledge is accessed and learning is developed (Aparicio Gómez, 2023).

However, the automation and personalization of teaching bring with them significant ethical challenges. Among these is the controversy over the impact of automation on teaching and the need for continuous training for both teachers and students (Marcillo Pin, Cevallos Ponce, & Gutiérrez Cevallos, 2023). It is crucial to address these challenges to maximize the benefits of AI in education, without compromising the quality and equity of the training process.

The use of AI in education also poses challenges related to access and equity. Although AI has the potential to strengthen educational objectives and promote inclusion, there is a risk of exclusion and data manipulation, aspects that must be carefully evaluated (Barrios Tao, Díaz, & Guerra, 2020). AI's ability to personalize learning and automate administrative tasks allows for more accurate feedback, adjusted to the needs of each student, which optimizes educational processes (Torres Cruz et al., 2023).

The use of AI-based virtual tutors can significantly improve student learning and skills. However, it is important to consider the pros and cons of this technology, as its application entails risks and opportunities that must be carefully balanced (Norman Acevedo, 2023). Looking ahead, AI is expected to be able to perform basic tasks, such as solving mathematical problems and providing feedback, although its ability to replace human elements, such as values and interactions necessary for a complete training, will be limited (Navarrete Cazales & Manzanilla Granados, 2023).

The adoption of AI in the educational system supports the connectivist paradigm, which maintains that learning is a process of networking and constant adaptation, a fundamental characteristic in the digital age (García Peña, Mora Marcillo, & Ávila Ramírez, 2020). The integration of AI not only transforms pedagogical practices, but also impacts the way we understand knowledge, cognition, and culture, fostering a profound change in the way we approach learning (Castañeda Urquilla, 2022).

It is essential that the implementation of AI in education is carried out under an ethical framework that guarantees respect for privacy and equitable access. AI should not replace the teacher, but rather complement him, favoring a comprehensive and humanistic training that develops competencies in students in a balanced way (Gonzáles Sánchez et al., 2023).

2. Methodological Framework

This research adopts a qualitative approach, based on the systematic review of available scientific literature (Booth, Sutton, & Papaioannou, 2016), in Scopus on

the impact of artificial intelligence (AI) on education. In this sense, the choice of a qualitative approach allows for an in-depth exploration of the benefits, challenges, and ethical considerations of AI in the educational field, analyzing and interpreting information from previous studies to obtain a comprehensive understanding of the topic.

In a complementary way, the type of research is exploratory-descriptive (Hernández Sampieri, Fernández Collado, & Baptista Lucio, 2014), since it seeks to identify and describe the main implications of the implementation of AI in education without formulating previous hypotheses. Thus, this research focuses on describing the findings obtained from relevant studies and, based on this, proposing reflections and recommendations on the ethical and effective implementation of AI in educational environments.

On the other hand, the research design is documentary (Arias, 2012), based on the analysis of scientific articles and secondary sources. This approach allows for a comprehensive examination of existing findings, analysing trends, patterns and approaches to the use of AI in education and gaining a critical view of the ethical implications, benefits and limitations documented in the literature.

It should be noted that the information used in this research comes from scientific articles and systematic reviews (Hart, 1998), obtained from the Scopus database. To ensure the quality and relevance of the data, only those studies that addressed the use of AI in the educational context were selected, focusing on its applications, benefits, challenges, and ethical considerations. This selection process allowed for a detailed analysis of highly rigorous academic literature.

Regarding the information collection procedure, specific keywords and terms related to AI in education were defined, such as "artificial intelligence in education," "ethics of AI in education," "benefits of AI in learning," and "challenges of AI in educational environments." This process was carried out in Scopus, applying filters to obtain recent academic articles and systematic reviews in English and Spanish.

In addition, the inclusion and exclusion criteria were considered in this research (Petticrew & Roberts, 2006), to select relevant studies. Specifically, the inclusion criteria included publications from the last five years, studies that addressed applications, benefits, challenges, or ethical implications of AI in education, and peer-reviewed articles to ensure their quality. Studies that did not meet these criteria were discarded.

To facilitate the analysis, the information obtained was organized into thematic categories that responded to the specific objectives: benefits of AI in education, implementation challenges and ethical considerations. This categorization allowed for a detailed discussion aligned with the proposed objectives, using a qualitative content analysis technique to identify key patterns, themes, and categories in the reviewed literature. Likewise, an analysis matrix was used to organize the studies (Miles, Huberman, & Saldaña, 2014), and facilitate the comparison between the approaches and findings of each article, establishing a critical view of the implications of AI in education.

Since this research is based on literature review, the quality criteria focused on the

rigorous selection of reliable and academic sources. Likewise, copyright was respected and an adequate citation and reference of all the studies analyzed was made, ensuring ethics in the use and presentation of secondary information.

However, as it depends exclusively on secondary sources, this research is limited to the perspective and conclusions of the studies reviewed (Bowling, 2014). The lack of primary data precludes direct or experimental observations on the impact of AI on education. In addition, limited access to some articles could influence the completeness of the review.

3. Study Results

The research by Haron et al. (2025) focuses on the development of an artificial intelligence (AI) model to monitor and predict the academic performance of students at the Faculty of Computing and Multimedia at Kolej Poly-Tech Mara University (UPTM), in Malaysia. To achieve this, the methodology used combines data mining techniques and machine learning algorithms, specifically using the decision tree (RepTree), k-NN and Naïve Bayes algorithms to predict the probability of unsatisfactory results. In fact, the study shows that the RepTree algorithm outperforms k-NN and Naïve Bayes in accuracy, with a rate of 95.5%, suggesting that it is the most effective model for the early identification of at-risk students. This predictive capacity allows preventive measures, such as advice and personalized plans, to be implemented to improve student performance.

On the other hand, research conducted by Sachdeva et al. (2024) explores the acceptance of an AI-assisted diagnostic tool for cervical cancer screening in women from Dschang, Cameroon. Here, the study identifies factors that influence the perception of AI in low-resource contexts, highlighting privacy and trust in diagnostic accuracy as key aspects. Despite its perceived usefulness, some participants expressed concerns about privacy and the use of mobile devices to capture sensitive images, highlighting the importance of patient-centered communication.

Likewise, Bogar et al. (2024) evaluated the effectiveness of a virtual reality (VR) simulator and an AI-assisted evaluation system for pin transfer in laparoscopy. In this context, the results indicated that, although there were no significant differences in performance between VR and traditional simulators, the AI system improved efficiency in the evaluation of surgical skills, with an accuracy of 95%. However, some students expressed a preference for the haptic feel of traditional simulators.

In other relevant research, Parveen et al. (2024) analyzed the factors influencing the adoption of ChatGPT among university students in Pakistan using a technology acceptance model. The study concluded that the intention to use is mainly influenced by the perception of fun and perceived value, highlighting that educational and personal benefits drive the adoption of this technology.

In addition, research by Bhatt et al. (2024) compares data-centric and model-centric approaches to improving the performance of deep learning models. According to the findings, the data quality-focused approach outperforms the model-centric approach,

improving accuracy by 3%, thus underscoring the importance of high-quality data.

In educational terms, Zheng et al. (2024) evaluated the impact of an AI-assisted teaching model on cardiovascular disease learning, using a quasi-experimental design. This study demonstrated that the experimental group scored significantly higher in operational and theoretical skills, highlighting the effectiveness of AI in improving student satisfaction and motivation.

For its part, Kuzior's (2024) research explores the impact of AI on the evolution of the smart city towards a sustainable model. This research shows that AI not only optimizes urban services, but also contributes to citizen well-being in a smart and sustainable city model.

In a complementary manner, Palomino Vidal et al. (2024) analyzed the implementation of AI and ML in Latin America, highlighting sectors with significant adoption, such as education and health, but also identifying limitations in agriculture and administration.

On the other hand, the research by Mah and Groß (2024) addresses teachers' perceptions of the integration of AI in higher education institutions. Through an analysis of latent classes, they identified four perception profiles, and concluded that self-efficacy in AI is related to greater acceptance among teachers.

Also relevant is the study by Baucon and Neto de Carvalho (2024), who evaluated GeologyOracle, an AI designed to answer geoscience questions. The system, with 79.6% of satisfactory answers, demonstrates skill in complex tasks, although its accuracy varies with the difficulty of the questions.

Next, Lee, Yoon, and Hwang (2024) evaluated a global health course for nursing students, finding that collaborative project-based learning significantly improved key competencies in global health.

Regarding energy efficiency, Tariq et al. (2024) analyzed the use of AI to optimize consumption in educational buildings, concluding that models such as gradient boosting and LSTM improve the management of energy resources.

On the other hand, Al Murshidi et al. (2024) explored students' perception of ChatGPT in the United Arab Emirates, finding that a greater understanding of its risks and benefits can encourage its responsible adoption.

In terms of health, Setegn and Dejene (2024) used explainable AI to predict pregnancy termination in East Africa, identifying key risk factors using the Random Forest model, with an accuracy of 85.6%.

In addition, Tolentino et al. (2024) evaluated the experience of virtual interviews in medical residency programs, observing a favorable disposition towards technologies such as AI and VR in medical education.

On the other hand, research by Al-Zahrani and Alasmari (2024) in Saudi Arabia shows that students and teachers have a positive attitude towards AI in education, albeit with ethical concerns about privacy and security.

Likewise, Nemt-allah et al. (2024) developed a scale to measure the use of ChatGPT

among graduate students, highlighting its usefulness for academic writing and homework support.

Finally, Usher and Barak (2024) analyzed an ethics module in AI for science students, observing improvements in knowledge and ethical awareness. This study emphasizes the need to integrate ethics in AI into academic programs.

In closing, Del Moral-Pérez et al. (2024) implemented an AR and AI project to transform children's films into educational games, facilitating digital and transmedia skills in students. Together, this research highlights the diverse applications and challenges of AI, highlighting its transformative role in sectors such as education, health, and sustainability.

4. Discussion

Board 1. Comparative Analysis of Studies on the Use of AI in Education and Medicine: Objectives, Benefits, Limitations, and Ethical Considerations

Study	Study Objective	Technology and Methodology Used	Identified Benefits	Challenges and Limitations	Ethical and Social Considerations	Impact on Education and Society
Haron et al. (2025)	Develop a predictive model of academic performance	Data mining, machine learning algorithms: RepTree, k-NN, Naïve Bayes	95.5% accuracy in early prediction of low performance, enabling early interventions such as personalized tutoring and improvement plans.	Limitations in technological infrastructure and availability of quality data for training the models.	Accuracy depends on the responsible and secure use of student data. Privacy issues and ethical management of information.	Contributes to the optimization of the educational process by early identification of at-risk students, thus improving overall performance.
Sachdeva et al. (2024)	Acceptance of an AI tool for medical diagnosis	AI tool for assisted diagnosis of cervical cancer	Accuracy in diagnosis and patient acceptance in a low-resource context. Facilitates diagnosis in rural areas, reducing inequalities in access to healthcare.	Distrust in handling personal data and fear of privacy loss. Concerns about the accuracy of AI diagnosis compared to medical professionals.	The need for a robust ethical framework that protects privacy and provides transparency in the use of AI in healthcare. Importance of clear communication between patient and medical professional.	Improves equity in access to medical diagnosis, especially in low-resource communities.
Bogar et al. (2024)	Evaluation of the effectiveness of a VR simulator with AI in medicine	Virtual reality (VR) simulator with AI for automated evaluation in laparoscopic procedures	Significant reduction in evaluation time compared to manual assessments, and 95% accuracy compared to human evaluators. Students value the VR experience.	Preference for the physical feel of traditional simulators, suggesting possible improvements in VR to achieve complete haptic simulation.	Automated evaluation must ensure impartiality and accuracy, without fully relying on AI to maintain human judgment.	Facilitates medical training, enhancing precision and speed in the assessment of surgical skills.

Source: Own elaboration

The review of studies shows specific benefits derived from the implementation of artificial intelligence (AI) in educational and health contexts. In the analysis by Haron et al. (2025), it is highlighted how an AI predictive model allows the early identification of at-risk students, with an accuracy of 95.5%. This predictive capacity facilitates timely interventions to improve academic performance, thus transforming educational processes by enabling personalized support strategies that help prevent school failure.

Similarly, the study by Sachdeva et al. (2024) highlights the positive impact of AI in the field of health, specifically in rural and low-resource areas. Technology allows for more equitable access to medical diagnostics, reducing inequalities in healthcare. In addition to expanding access, AI increases diagnostic accuracy, a crucial factor in environments with limited medical infrastructure.

On the other hand, research by Bogar et al. (2024) highlights the benefits of using AI-powered virtual reality (VR) simulators for the assessment of surgical skills. This method, compared to manual assessments, provides a faster and more accurate assessment, improving the learning experience and reducing training time. Students especially value the immersion offered by VR simulation, considering it an enriching resource.

Despite the benefits, the studies analyzed show significant challenges and limitations. Haron et al. (2025) underline that the implementation of AI in education requires advanced technological infrastructure and access to quality data, which can be a considerable barrier for institutions with limited resources. For their part, Sachdeva et al. (2024) identify concerns related to privacy and trust in the accuracy of AI-assisted diagnosis. The reluctance to share personal data, especially in under-resourced communities, and the comparison with the reliability of human diagnosis reflect the need to strengthen user acceptance and trust in these technologies.

In addition, the study by Bogar et al. (2024) reveals that although VR simulation improves the educational experience, some students show a preference for traditional simulators that offer haptic feedback. This finding points to the importance of incorporating such feedback into future versions of VR simulators to improve the perception of realism and learning effectiveness.

The analysis also underscores the need for a robust ethical framework for the adoption of AI in health and education contexts. The protection of data privacy and the ethical use of information are aspects highlighted by both Haron et al. (2025) and Sachdeva et al. (2024). It is essential to ensure that data collection and analysis are carried out responsibly, protecting the privacy of students and patients. Bogar et al. (2024) also emphasize the importance of maintaining human judgment in the assessment of medical competencies, complementing automated assessment with expert supervision to ensure fair and accurate judgment.

The impact of AI on education and society is evident in the research reviewed. Haron et al. (2025) show how AI optimizes educational processes through early interventions, which contributes to reducing school dropout and improving academic performance. On the other hand, Sachdeva et al. (2024) highlight how AI democratizes access to health services by improving diagnostic equity in areas with limited resources. In the field of medical education, Bogar et al. (2024) argue that VR simulators with AI offer an immersive and efficient learning environment, accelerating the process of acquiring skills in an area as demanding as medicine.

Board 2. Assessing the Adoption and Impact of AI on Education and Society: Objectives, Benefits, Challenges, and Ethical Considerations

Study	Study Objective	Technology and Methodology Used	Identified Benefits	Challenges and Limitations	Ethical and Social Considerations	Impact on Education and Society
Parveen et al. (2024)	Analyze the adoption of ChatGPT among university students	Technology Acceptance Model UTAUT, Flow Theory, and SEM Analysis	Fun and educational value are strong predictors of usage intention. Students are motivated to use the tool due to perceived academic support benefits.	Social influence and ease of use have a minor effect, indicating adoption depends more on individual perception of utility.	It is crucial to ensure students use ChatGPT ethically and responsibly, avoiding over-dependence on the tool and fostering critical thinking.	Promotes autonomy in learning and the acquisition of new digital skills.
Bhatt et al. (2024)	Improve performance of AI models through a data-centered approach	Focus on data quality, duplicate elimination, correction of noisy labels	At least 3% improvement in model accuracy when prioritizing data quality over model configuration.	Obtaining clean and precise data is costly and complex, especially in educational contexts where large amounts of student performance data must be managed.	Data handling must be done transparently, ensuring students and end users understand the use of their personal data.	Improves the precision and effectiveness of predictive models in educational environments by focusing on data quality.
Zheng et al. (2024)	Evaluate AI in teaching cardiovascular diseases	Simulation model with AI for teaching cardiovascular diseases; quasi-experimental design	Significant improvement in knowledge, operational skills, and critical thinking. Students also reported higher satisfaction and motivation in learning.	Access to advanced technology is limited in some institutions. Both teachers and students need training to fully utilize AI-assisted simulation.	Simulators must be ethically managed, ensuring that data used and generated in evaluation processes are protected and confidential.	Fosters active learning and the development of critical skills in the medical field.
Kuzior (2024)	Analyze the impact of AI in smart cities and sustainability	Integration of AI in urban management systems; focus on sustainable cities (Smart City 4.0)	Optimization of urban services, increased sustainability, and active citizen participation. Promotes higher quality of life and environmental awareness.	Need for advanced infrastructure and digital education for citizens to achieve proper adoption and management of technology.	Ensure equitable and secure access to urban technology to avoid social and economic gaps. Promote data privacy policies at the urban level.	Facilitates sustainable development and greater citizen participation in the management of urban resources and services.

Source: Authors.

The implementation of artificial intelligence (AI) in different areas, such as education, health, and urban management, has shown significant benefits. Parveen et al. (2024) describe how the adoption of ChatGPT in university settings allows students to develop autonomy in their learning and acquire new digital skills. This use is primarily driven by the educational appeal and value that students perceive, which is essential to fostering a positive relationship with technology.

In another context, Bhatt et al. (2024) underline that a data quality-focused approach improves the accuracy of AI models by 3% compared to a model-configuration-oriented approach. This finding is of particular relevance in education, as the accuracy of predictive models facilitates better monitoring of student performance and supports informed decision-making.

In the field of health, Zheng et al. (2024) show that AI simulators, used for the teaching of cardiovascular diseases, significantly improve students' theoretical knowledge, operational skills, and critical thinking. Participants report greater satisfaction and motivation when using these tools, which reinforces their educational effectiveness.

For his part, Kuzior (2024) highlights that the integration of AI into urban management systems contributes to the optimization of services, sustainability, and the active participation of citizens in smart cities, improving quality of life and promoting greater environmental awareness.

Despite the observed benefits, studies also reveal significant challenges. Parveen et al. (2024) mention that social influence and ease of use have a smaller effect on the adoption of ChatGPT, implying that the motivation to use this technology depends to a greater extent on the individual perception of its usefulness. This represents a

challenge in the promotion of technological tools in contexts where the educational value is not evident.

Bhatt et al. (2024) point out that the collection of high-quality data is an expensive and complicated process, especially in education, where large volumes of information on student performance are managed. This limitation affects the viability of AI models that require accurate and well-structured data.

Zheng et al. (2024) indicate that access to advanced technologies is limited in many educational institutions, making it difficult to implement AI simulators. The training of both teachers and students is an essential requirement for the effective use of these tools, which represents a challenge in terms of training.

Kuzior (2024) warns that the implementation of AI in smart cities requires robust infrastructure and adequate digital education for citizens. Overcoming this challenge is particularly tricky in communities with restricted access to technology resources.

Ethical considerations are fundamental in the implementation of AI, as underlined by Parveen et al. (2024), who emphasize the need for responsible use of ChatGPT to encourage critical thinking and avoid excessive reliance on the tool. The ethical utilization of AI is crucial to ensure that it complements learning rather than replaces essential cognitive skills.

Bhatt et al. (2024) highlight the importance of transparency in data manipulation, emphasizing that students and users must understand how their personal data is used. A lack of transparency can erode trust and limit acceptance of technology.

In the context of medical education, Zheng et al. (2024) point out that data confidentiality in AI simulators is essential to protect privacy in assessment processes, underlining the need for responsible information management.

Kuzior (2024) recommends ensuring equitable and safe access to technology in smart cities to avoid social and economic gaps, as well as the implementation of data privacy policies at the urban level to protect citizens' rights in digital environments.

The positive impact of AI on education and society is undeniable. Parveen et al. (2024) conclude that the use of ChatGPT fosters autonomy in learning and the acquisition of digital skills, key aspects for the academic and professional development of students.

Bhatt et al. (2024) highlight that a focus on data quality increases the accuracy of predictive models in education, which is essential for designing evidence-based education policies.

Zheng et al. (2024) state that AI-assisted simulators enhance active learning and critical competencies, strengthening the training of future health professionals.

Finally, Kuzior (2024) shows that AI in smart cities not only optimizes the management of resources and services, but also promotes sustainable development and greater citizen participation, benefiting both local communities and the environment.

Board 3. Analysis of Implementation and Perceptions of AI in Education and Key Sectors: Benefits, Challenges, and Ethical Perspectives

Study	Study Objective	Technology and Methodology Used	Identified Benefits	Challenges and Limitations	Ethical and Social Considerations	Impact on Education and Society
Palomino Vidal et al. (2024)	Evaluate AI implementation in key sectors of Latin America	Systematic literature review in sectors such as education, health, agriculture	Improved operational efficiency, innovation, and competitiveness in education and health sectors.	Significant gaps in sectors like agriculture and administration, limited by resources and lack of training.	Promote an ethical and responsible approach to AI adoption in different sectors, with clear policies on data use and user rights protection.	Contributes to technological development in critical regional sectors, promoting innovation and efficiency.
Mah & Groß (2024)	Perceptions of faculty on AI in higher education	Latent class analysis to classify faculty perceptions	Identification of four perception profiles (optimists, critics, reflective critics, and neutrals). Increased interest in professional development related to the use of AI in teaching.	Lack of AI literacy among teachers and students; need for training programs.	Foster transparency and critical reflection on AI use in education. Lack of ethical training can lead to uninformed or improper use of AI by teachers.	Supports informed adoption of AI in education, fostering the development of critical skills among faculty.
Baucon & Neto de Carvalho (2024)	Evaluate the performance of an AI system for geosciences	GPT-4 model (GeologyOracle) to answer complex questions in geosciences	High accuracy in geoscience tasks, such as rock and fossil identification. Facilitates access to specialized knowledge for students and professionals.	Variability in accuracy depending on question complexity; less effective in advanced-level tasks (doctoral).	AI tools must be used with guidance and supervision from field experts to avoid incorrect or incomplete answers in complex topics.	Promotes autonomous learning and access to specialized knowledge in geosciences.
Lee, Yoon & Hwang (2024)	Effectiveness of project-based learning in global health	Project-based collaborative learning in health; focus on global competency	Significant improvements in global health competence, communication, problem-solving, and self-directed learning.	Requires resources and coordination to implement collaborative projects in institutions with less access to technology and global health expertise.	Collaborative learning ethics must ensure equal opportunities and support for all participants to develop sought-after competencies.	Enhances global competence and essential health skills, fostering interdisciplinary collaboration.

Source: Authors.

The implementation of artificial intelligence (AI) has proven to offer remarkable benefits in various sectors, including education, health, and urban management. A relevant example is presented by Palomino Vidal et al. (2024), who conclude that AI enhances operational efficiency, innovation, and competitiveness in areas such as education and health in Latin America. This resource-constrained region particularly benefits from AI by reducing technology gaps and fostering regional development.

Mah and Groß (2024) highlight how AI in higher education generates interest in teachers, identifying different perception profiles as optimistic, critical, and reflective. This interest underscores the importance of AI in optimizing pedagogical practices and facilitating teacher professional development. In the sciences, Baucon and Neto de Carvalho (2024) illustrate that the GeologyOracle AI system is capable of achieving high accuracy in complex tasks of identifying rocks and fossils, facilitating access to specialized knowledge and promoting advanced understanding for students and professionals.

For their part, Lee, Yoon, and Hwang (2024) show that project-based collaborative learning in global health improves key competencies such as communication and problem-solving, promoting self-directed learning. This approach is particularly valuable for the training of health professionals, as it fosters interdisciplinary collaboration and strengthens essential skills.

However, these advances are not without their challenges. Palomino Vidal et al. (2024) mention the existence of gaps in the implementation of AI in sectors such as agriculture and administration, due to a lack of resources and training, which limits the full adoption and potential impact of AI. Mah and Groß (2024) identify that the lack of AI literacy among teachers and students constitutes an obstacle to its

effective implementation in higher education, suggesting the need for training programs aimed at responsible and informed use of technology.

On the other hand, Baucon and Neto de Carvalho (2024) point out that the effectiveness of the GeologyOracle system varies according to the complexity of the questions, being less accurate at advanced levels, such as doctoral studies. This highlights the need for expert oversight when employing AI tools to ensure accurate results. Lee, Yoon, and Hwang (2024) emphasize that the implementation of collaborative projects in global health requires considerable resources and coordinated planning, which can be challenging for institutions with limited access to technology and expertise in the field of health.

On an ethical level, it is essential to consider the implications of AI adoption. Palomino Vidal et al. (2024) underline the importance of adopting an ethical approach, including clear policies on data use and the protection of user rights to foster trust in AI. Mah and Groß (2024) highlight the need for transparency and critical reflection in education, since insufficient ethical training could lead to the improper use of technology, impacting students and teachers.

Baucon and Neto de Carvalho (2024) emphasize that AI tools should be used under the guidance of experts to avoid errors in complex issues, and they assure that ethics in the application of AI is key to the accuracy and reliability of results. Lee, Yoon, and Hwang (2024) stress that ethics in collaborative learning must ensure equal opportunities for all participants, promoting an inclusive and fair environment that fosters the development of essential competencies.

The studies reviewed show the positive impact of AI in different areas of society. Palomino Vidal et al. (2024) conclude that AI contributes to technological development and improves competitiveness in Latin America, transforming the economy and boosting innovation. Mah and Groß (2024) suggest that an informed adoption of AI in education promotes critical skills in teachers and more effective teaching, aligned with current demands.

Baucon and Neto de Carvalho (2024) show that AI facilitates autonomous learning and provides access to advanced knowledge in geoscience, benefiting both students and professionals. Finally, Lee, Yoon, and Hwang (2024) conclude that collaborative projects in global health promote interdisciplinary collaboration and improve essential competencies in health, contributing to comprehensive learning that benefits future professionals.

Proposals

Based on the findings and analysis of the literature, the research can generate several relevant contributions:

Board 4. Contributions and Recommendations for the Responsible Implementation of AI in Education

Contribution	Description
Guide for Responsible AI Implementation in Education	The research can provide guidelines for an ethical and effective implementation of AI, suggesting that educational institutions consider both the benefits and the ethical challenges and risks.
Proposals for Inclusive Educational Policies	Based on the challenges found, public policy recommendations can be developed to promote equality in access to and training in AI for students and teachers.
Ethical Framework for AI Use in Education	An ethical framework can be developed that considers privacy protection, the reduction of algorithmic bias, and the promotion of equity in education, which could guide future research and practical applications of AI in education.
Promotion of AI Literacy for Teachers and Students	Propose AI training programs for teachers and students that enable them not only to understand and use these tools but also to develop a critical perspective on their use and ethical implications.

Source: Authors.

The results presented highlight essential recommendations for an adequate implementation of artificial intelligence (AI) in the educational field, underlining the need for an ethical and responsible approach. Each input points to critical aspects and key areas that can guide the formulation of educational policies and practices.

First, the Guide for a Responsible Implementation of AI in Education proposes that research provide guidelines that ensure implementation that contemplates both the benefits and the associated ethical challenges. This approach reflects the importance of a balance that allows the potential of AI to be harnessed without compromising ethical principles and core educational values.

On the other hand, the Inclusive Education Policy Proposals emphasize the urgency of establishing public policies that guarantee equitable access to AI training for both students and teachers. This recommendation is based on evidence that gaps in access and knowledge can exacerbate existing inequalities, thus highlighting the need for policies that favor inclusion.

The Ethical Framework for the Use of AI in Education focuses on protecting privacy, reducing algorithmic bias, and promoting equity. Such an ethical approach is essential to ensure that AI is used fairly, without perpetuating or amplifying inequalities. The creation of a robust ethical framework can serve as a guide for future research and practical applications in the educational environment.

Finally, the Promoting AI Literacy for Teachers and Students proposes the implementation of training programs that go beyond the simple technical use of AI tools. These programs should foster critical understanding, allowing teachers and students not only to use technology, but also to reflect on its ethical implications. This training is vital for users of the education system to become informed and responsible agents.

5. Conclusions

Artificial intelligence (AI) has emerged as one of the most promising technologies in education, offering substantial benefits ranging from personalizing learning to improving academic management. AI's ability to tailor teaching to students' individual needs has driven a shift towards a more student-centric approach and streamlined administrative processes, freeing up time for teachers to focus on deeper pedagogical aspects. However, these advances also bring with them significant challenges, especially with regard to ethics and equity in their implementation.

Automating teaching and student data management raises concerns about privacy and the handling of sensitive information. Relying on large volumes of data for the effectiveness of AI models can expose students to risks related to the protection of their personal information. In addition, algorithmic bias is a persistent problem that could intensify already existing inequalities, negatively affecting vulnerable groups in terms of gender, ethnicity, and socioeconomic status. It is therefore imperative that educational institutions and technology developers work together to ensure an ethical and equitable use of AI, developing regulatory frameworks that safeguard the principles of privacy and fairness.

Despite these challenges, AI offers unique opportunities to democratize access to education, especially in areas with limited resources. AI has the potential to reduce learning gaps and provide adaptive teaching resources that fit different contexts and skill levels. However, for these opportunities to materialize equitably, it is necessary for public policies to promote equal access to technology and for teachers and students to be trained in the responsible use of these tools.

References

Al Murshidi, G., Shulgina, G., Kapuza, A., & Costley, J. (2024). How understanding the limitations and risks of using ChatGPT can contribute to willingness to use. Smart Learning Environments, 11(36). https://doi.org/10.1186/s40561-024-00322-9

Al-Zahrani, A. M., & Alasmari, T. M. (2024). Exploring the impact of artificial intelligence on higher education: The dynamics of ethical, social, and educational implications. Humanities and Social Sciences Communications, 11(912). https://doi.org/10.1057/s41599-024-03432-4

Aparicio Gómez, W. O. (2023). Artificial intelligence and its impact on education: Transforming learning for the twenty-first century. International Journal of Pedagogy and Educational Innovation, 217–230. https://doi.org/10.0000/orcid.org/0000-0002-8178-1253

Arias, F. (2012). The Research Project: Introduction to Scientific Methodology (6th ed.). Episteme.

Barrios Tao, H., Díaz, V., & Guerra, Y. M. (2020). Purposes of education in the face of artificial intelligence developments. Cadernos de Pesquisa, 51, 1–18. https://doi.org/10.1590/198053147767

Baucon, A., & Neto de Carvalho, C. (2024). Can AI get a degree in geoscience? Performance analysis of a GPT-based artificial intelligence system trained for earth science (GeologyOracle). Geoheritage, 16(121). https://doi.org/10.1007/s12371-024-01011-2

Bhatt, N., Bhatt, N., Prajapati, P., Sorathiya, V., Alshathri, S., & El-Shafai, W. (2024). A data-centric approach to improve performance of deep learning models. Scientific Reports, 14(22329). https://doi.org/10.1038/s41598-024-73643-x

Bogar, P. Z., Virag, M., Bene, M., Hardi, P., Matuz, A., Schlegl, A. T., ... & Maroti, P. (2024). Validation of a novel, low-fidelity virtual reality simulator and an artificial intelligence assessment approach for peg transfer laparoscopic training. Scientific Reports, 14(16702). https://doi.org/10.1038/s41598-024

Booth, A., Sutton, A., & Papaioannou, D. (2016). Systematic Approaches to a Successful Literature Review (2nd ed.). SAGE Publications.

Bowling, A. (2014). Research Methods in Health: Investigating Health and Health Services (4th ed.). McGraw-Hill Education.

Castañeda Urquilla, A. (2022). A journey towards artificial intelligence in education. Reality and Reflection, 22, 121–136.

Del Moral-Pérez, M. E., López-Bouzas, N., & Castañeda-Fernández, J. (2024). Transmedia skill derived from the process of converting films into educational games with augmented reality and artificial intelligence. Journal of New Approaches in Educational Research, 13(15). https://doi.org/10.1007/s44322-024-00015-8

Gallent Torres, C., Zapata González, A., & Ortego Hernando, J. L. (2023). The impact of generative artificial intelligence in higher education: a view from ethics and academic integrity. RELIEVE - Electronic Journal of Educational Research and Evaluation, 29(2), 1–21. https://doi.org/10.30827/RELIEVE.V29I2.29134

García Peña, V. R., Mora Marcillo, A. B., & Ávila Ramírez, J. A. (2020). Artificial intelligence in education. Educational Sciences, 6, 648–666. https://doi.org/10.23857/dc.v6i3.1421

García Villaroel, J. J. (2022). Implications of artificial intelligence in virtual classrooms for higher education. Revista Orbis Tertius UPAL, 5, 31–52. https://doi.org/10.0000/orcid.org/0000-0002-4231-0598

García Villaroel, J. J. (2021). Implications of artificial intelligence in virtual classrooms for higher education. Orbis Tertius UPAL, 5(10), 31-52. Universidad Privada Abierta Latinoamericana.

Giró Gracia, X., & Sancho Gil, J. M. (2022). Artificial intelligence in education: Big data, black boxes and technological solutionism. Latin American Journal of Educational Technology - RELATEC, 21(1), 129–145. https://doi.org/10.17398/1695-288x.21.1.129

González González, C. S. (2023). The impact of artificial intelligence on education: Transforming the way we teach and learn. Qurriculum. Journal of Educational Theory, Research, and Practice, 36, 51–60. https://doi.org/10.25145/j.qurricul.2023.36.03

Gonzáles Sánchez, J. L., Moscoso Parra, A. E., Villota García, F. R., Garces Calva, S. W., & Bazurto Arévalo, B. M. (2023). Application of artificial intelligence in higher education. Scientific Journal of Technical and Applied Sciences, 9, 1097–1108. https://doi.org/10.23857/dc.v9i3.3488

Haron, N. H., Mahmood, R., Md Amin, N., Ahmad, A., & Jantan, S. R. (2025). An artificial intelligence approach to monitor and predict student academic performance. Journal of Advanced Research in Applied Sciences and Engineering Technology, 44(1), 105–119.

Hart, C. (1998). Doing a Literature Review: Releasing the Social Science Research Imagination. SAGE Publications.

Hernández Sampieri, R., Fernández Collado, C., & Baptista Lucio, P. (2014). Research Methodology (6th ed.). McGraw-Hill.

Kuzior, A. (2024). Artificial intelligence in shaping the smart sustainable city. System Safety: Human - Technical Facility - Environment, 6(1), 1-8. https://doi.org/10.2478/czoto-2024-0001

Lee, S., Yoon, J., & Hwang, Y. (2024). Collaborative project-based learning in global health: Enhancing competencies and skills for undergraduate nursing students. BMC Nursing, 23(437). https://doi.org/10.1186/s12912-024-02111-8

Mah, D.-K., & Groß, N. (2024). Artificial intelligence in higher education: Exploring faculty use, self-efficacy, distinct profiles, and professional development needs. International Journal of Educational Technology in Higher Education, 21(58). https://doi.org/10.1186/s41239-024-00490-1

Marcillo Pin, K. R., Cevallos Ponce, A. A., & Gutiérrez Cevallos, R. X. (2023). Implications of artificial intelligence in higher education. Electronic Journal of Educational Training and Quality (RefCalE), 15–27. https://doi.org/refcale@uleam.edu.ec

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). Qualitative Data Analysis: A Methods Sourcebook (3rd ed.). SAGE Publications.

Moise, G., Dragomir, E. G., Șchiopu, D., & Iancu, L. A. (2024). Towards integrating automatic emotion recognition in education: A deep learning model based on 5 EEG channels. International Journal of Computational Intelligence Systems, 17(230). https://doi.org/10.1007/s44196-024-00638-x

Moreno Padilla, R. D. (2019). The arrival of artificial intelligence in education. Journal of Research in Information Technologies, 7(14), 260–270. https://doi.org/10.36825/RITI.07.14.022

Navarrete Cazales, Z., & Manzanilla Granados, H. M. (2023). A perspective on artificial intelligence in education. Educational Profiles, 45(Special), 87–107. https://doi.org/10.22201/iisue.24486167e.2023.Especial.61693

Nemt-allah, M., Khalifa, W., Badawy, M., Elbably, Y., & Ibrahim, A. (2024). Validating the ChatGPT Usage Scale: Psychometric properties and factor structures among postgraduate students. BMC Psychology, 12(497). https://doi.org/10.1186/s40359-024-01983-4

Norman Acevedo, E. (2023). Artificial intelligence in education: a valuable tool for virtual university tutors and university professors. Panorama, 17(32), 1–11. https://doi.org/10.15765/pnrm.v17i32.3681

Palomino Vidal, C., Condori Obregón, P., & Stolar Sirlupu, E. (2024). Artificial intelligence and machine learning implementation status on Latam: a systematic literature review. Indonesian Journal of Electrical Engineering and Computer Science, 36(3), 1911–1918. https://doi.org/10.11591/ijeecs.v36.i3.pp1911-1918

Parveen, K., Phuc, T. Q. B., Alghamdi, A. A., Hajjej, F., Obidallah, W. J., Alduraywish, Y. A., & Shafiq, M. (2024). Unraveling the dynamics of ChatGPT adoption and utilization through structural equation modeling. Scientific Reports, 14(23469). https://doi.org/10.1038/s41598-024-74406-4

Petticrew, M., & Roberts, H. (2006). Systematic Reviews in the Social Sciences: A Practical Guide. Blackwell Publishing.

Rodríguez Torres, Á. F., García Gaibor, J. A., Orozco Alarcón, K. E., Rodríguez Bermeo, S. D., & Barros Castro, H. A. (2023). The implementation of artificial intelligence in education: Systematic analysis. Scientific Journal Domain of Sciences, 9, 2162–2178. https://doi.org/10.23857/dc.v9i3.3548

Rouhiainen, L. (2018). Artificial intelligence: 101 things you need to know today about our future. Editorial Planeta.

Sachdeva, M., Datchoua, A. M., Yakam, V. F., Kenfack, B., Jonnalagedda-Cattin, M., Thiran, J.-P., Petignat, P., & Schmidt, N. C. (2024). Acceptability of artificial intelligence for cervical cancer screening in Dschang, Cameroon: A qualitative study on patient perspectives. Reproductive Health, 21(92). https://doi.org/10.1186/s12978-024-01828-8

Salmerón Moreira, Y. M., Luna Álvarez, H. E., Murillo Encarnacion, W. G., & Pacheco Gómez, V. A. (2023). The future of artificial intelligence for education in higher education institutions. https://doi.org/10.1016/j.caeai.2023.100127

Sambola, D. M. (2023). Artificial Intelligence in Education: State of the Art. Wani Revista del Caribe Nicaragüense, 79. https://doi.org/10.5377/wani.v39i79.16806

Setegn, G. M., & Dejene, B. E. (2024). Explainable artificial intelligence models for predicting pregnancy termination among reproductive-aged women in six east African countries: machine learning approach. BMC Pregnancy and Childbirth, 24(600). https://doi.org/10.1186/s12884-024-06773-9

Tariq, R., Mohammed, A., Alshibani, A., & Ramírez-Montoya, M. S. (2024). Complex artificial intelligence models for energy sustainability in educational buildings. Scientific Reports, 14(15020). https://doi.org/10.1038/s41598-024-65727-5

Tomalá de la Cruz, M. A., Mascaró Benites, E. M., Carrasco Cachinelli, C. G., & Aroni Caicedo, E. V. (2023). Incidences of artificial intelligence in education. RECIMUNDO, 7(2), 238–251. https://doi.org/10.26820/recimundo/7.(2).Jun.2023.238-251

Tolentino, R., Rodriguez, C., Hersson-Edery, F., Lane, J., & Abbasgholizadeh Rahimi, S. (2024). Perspectives on virtual interviews and emerging technologies integration in family medicine residency programs: A cross-sectional survey study. BMC Medical Education, 24(975). https://doi.org/10.1186/s12909-024-05874-5

Torres Cruz, E., Torres Cruz, F., Torres Segura, J. W., Basurco Chambilla, T. R., Mamani Luque, O. M., Löpez Cueva, M. A., Tito Lipa, J. A., & Coyla Idme, L. (2023). Impact of artificial intelligence on university education. Editora Científica Digital, 1, 81–91. https://doi.org/10.37885/230513147

Trejo Quintana, J. (2023). More questions than answers: Artificial intelligence and education. Educational Profiles, 45(Special), 43–55. https://doi.org/10.22201/iisue.24486167e.2023.Especial.61690

UNESCO, International Commission on the Futures of Education. (2022). Reimagining our futures together: a new social contract for education. UNESCODOC Digital Library. https://unesdoc.unesco.org/ark:/48223/pf0000381560?posInSet=10&queryId=N-EXPLORE-d0d2d716-352e-48d5-8e4c-7bf011366231

UNESCO. (2019). Beijing Consensus on Artificial Intelligence and Education. UNESCODOC Digital Library. https://unesdoc.unesco.org/ark:/48223/pf0000368303

Usher, M., & Barak, M. (2024). Unpacking the role of AI ethics online education for science and engineering students. International Journal of STEM Education, 11(35). https://doi.org/10.1186/s40594-024-00493-4

Vera, F. (2023). Integrating Artificial Intelligence in Higher Education: Challenges and Opportunities. Revista Electrónica Transform, 4, 17–34. https://doi.org/https://orcid.org/0000-0002-4326-1660

Vila Sánchez, E. M., & Penín Lama, M. (2007). Artificial intelligence techniques applied to education. Ibero-American Journal of Artificial Intelligence, 11, 7–12. https://doi.org/revista@aepia.org

Zheng, K., Shen, Z., Chen, Z., Che, C., & Zhu, H. (2024). Application of AI-empowered scenario-based simulation teaching mode in cardiovascular disease education. BMC Medical Education, 24(1003). https://doi.org/10.1186/s12909-024-05977-z